

Diverging Destinies: Maternal Education and the Developmental Gradient in
Time with Children*

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ABSTRACT

Using data from the 2003-2007 American Time Use Surveys (ATUS), we compare mothers' (N = 6,640) time spent in four parenting activities across maternal education and child age subgroups. We test the hypothesis that highly educated mothers not only spend more time in active child care than less educated mothers, but that they alter the composition of that time to suit children's developmental needs more than less educated mothers. Results support this hypothesis: highly educated mothers not only invest more time in basic care and play when youngest children are infants or toddlers than when children are older, but differences across education groups in basic care and play time are largest among mothers with infants or toddlers; by contrast, highly educated mothers invest more time in management activities when children are six to 13 years old than when children are younger, and differences across education groups in management are largest among mothers with school-aged children. These patterns indicate that the education gradient in mothers' time with children is characterized by a 'developmental gradient.'

INTRODUCTION

The destinies of children born to the most and least educated women have increasingly diverged over the past several decades. Historical trends in maternal employment, family structure, and education have increased inequality among children such that those born to the most educated women have gained resources, in terms of parents' money and time, whereas those born to the least educated women have lost such resources (McLanahan, 2004). The present study investigates maternal time with children; a key parental “resource” for child development, especially during children’s early years (Fuligni and Brooks-Gunn 2004; Sayer, Bianchi, and Robinson 2004). To the extent that the destinies of children born to the most and least educated women are increasingly divergent, this particular inequality may have important implications for long-term patterns of attainment and achievement.

Whereas previous research on maternal education and time use suggests that highly educated mothers spend more time overall in active care of children than less educated mothers, our study is the first to examine whether highly educated mothers also alter the composition of their childrearing time for children of different ages in ways that may optimize children’s development. Although this study does not examine child outcomes, we invoke theories from developmental psychology to interpret the likely impact of both the level and composition of time on child development.

To investigate these patterns, we use data from multiple waves of the American Time Use Survey (ATUS). The rich time use data in the ATUS, which are obtained from daily diaries, allow us to examine the time mothers spend engaged in specific activities – basic care, teaching, play, and management – that facilitate children’s development in different ways at different ages.

The large ATUS sample size allows us to look separately at households with children in different developmental periods to determine if mothers tailor the time they spend engaged in these activities to their children's ages and, more specifically, whether the most educated mothers tailor their time more optimally than the least educated mothers.

Maternal Education and Child Time: Background Literature

Both sociological and psychological research has found that parents with different education levels raise their children differently (Hill and Stafford 1974; Lareau 1989). Parental education, as an indicator of social class, has been linked to more optimal parenting behaviors across a range of domains, including more authoritative (vs. authoritarian) parenting styles (Pinderhughes, Dodge, Bates, Pettit, and Zelli 2000), more sensitive and responsive mother-child interactions (NICHD ECCRN 2004), greater language stimulation (Hart and Risley 1995; Hoff 2003), and greater levels of parental management and advocacy (Lareau 1989). These patterns extend to parents' time investments in children: numerous studies have documented that highly educated parents, and mothers in particular, spend more time in active care of children than their less educated counterparts (Guryan, Hurst, and Kearney 2008; Hill and Stafford 1974; Sayer, Gauthier, and Furstenberg 2004). Echoing McLanahan's warning about diverging destinies, Ramey and Ramey (2010) report that the increase in parents' active care time with children over the past 40 years has emerged more strongly among highly educated parents than less educated parents, suggesting the education gradient in time with children may be widening.

Most recently, Guryan et al. (2008) report that maternal time with children increases with education using data from the American Time Use Survey (ATUS; the same data set we employ here). Because the education gradient, as they call it, for child care time differs from the

education gradients for leisure and home production (which decrease with education), they argue that parental time investments in children reflect a fundamentally distinct phenomenon. Guryan et al. posit that highly-educated parents (more so than less-educated parents) view time with children as an “investment behavior” to increase children’s human capital (for either altruistic or selfish reasons) and do not view market alternatives as highly effective substitutes for their own time investments. Yet, it remains unclear from this and previous research on maternal education and child time whether highly educated parents’ “investment behavior” also means tailoring child time to children’s developmental needs more so than less educated parents.

Maternal Education and Child Time: Theoretical Frameworks

Economic models of the family view child development as an output of household production (Becker 1965). In this framework, the household derives utility from child development, or “child quality,” which parents produce by investing time and money in children’s well-being. The productivity of the household is determined by parents’ ability to make these and other investments efficiently given time and budget constraints. All households are not equally efficient, however. We posit that efficiency in parenting can be seen, from a developmental psychological perspective, in parents’ tendency to tailor time with children in ways that optimize child development. This kind of efficiency means minimizing time on activities that are less important to children’s development and maximizing time on activities that are more important to children’s development. A key tenet in developmental theory is that an activity’s importance will vary by child age, in the ways we describe below.

Bianchi and Robinson (1997) argue that the education gradient in time spent with children is evidence that parental education is the predominant predictor of parents’ human and

social capital investments in children. Sociological theory posits that education operates this way because through educational attainment parents acquire values about social mobility and standards of success that in turn motivate certain parental behaviors (Sewell, Haller, and Ohlendorf 1970). However, a simple linear relationship between time investments in children and parental education does not necessarily reflect the concept of “developmentally effective” parenting advanced above. Presumably, for example, there is a point of diminishing returns to parental time for promoting child development, particularly for specific activities at specific developmental stages. If education enhances a person’s efficiency or effectiveness in other realms of non-market human behavior (Michael 1972), and if these realms include parenting, we would expect highly educated parents not only to spend more time with children overall, but also to tailor their child care time more effectively than less educated parents. Specifically, we would expect to see not only an education gradient in time spent with children but a “developmental gradient” such that highly educated parents vary the composition of their time according to their children’s developmental needs.

Although this proposition has not been explored in quantitative studies of parental time use, Annette Lareau’s (2003) qualitative study of family life reports that middle-class parents target their time with children towards developmentally enhancing activities. In her study, middle-class families (whose jobs by her definition require college-level skills) engage in a pattern of “concerted cultivation” to actively develop children’s talents and skills. By contrast, in lower-class families, Lareau identifies a pattern she calls “the accomplishment of natural growth” where parents attend to children’s material and emotional needs but presume their talents and skills will develop without concerted parental intervention. Although Lareau (2002:72) argues that middle-class parents tend to engage their children in “numerous age-

specific activities” her thesis was based on case studies of 12 families with school-aged children. It is not clear whether her results generalize to a larger population, or whether a “developmental gradient” exists in how middle-class parents orchestrate their children’s time.

Developmental framework for parental time investments

Developmental psychology offers a framework for understanding parenting behavior in terms of both effectiveness and Lareau’s concept of “concerted cultivation.” Specifically, developmental theory proposes that children at different developmental stages require different types of parental investments (though of course the importance of certain investments, such as warmth, adequate monitoring, and nourishment, remain constant across childhood). In the parenting literature, ‘sensitivity’ is the defining construct of effective parenting; in its broadest conceptualization the hallmark of sensitive parenting is responding contingently to children’s needs (Adamson and Bakeman 1984; Bornstein 2002; Carew 1980). Sensitivity in parents’ time investments thus means tailoring childrearing time to the specific challenges, tasks, and capacities that dominate a child’s developmental period. In the case of a five-year-old child, for example, one hour of time spent exclusively on “basic care” may confer fewer benefits to child development than an hour of time spent “teaching,” whereas an hour of “basic care” may confer greater benefits to an infant than time spent in formal teaching activities.

We identify four categories of active parenting that reflect types of parental investments best suited to a particular developmental period. These are comprised of “basic care,” which refers to routine tasks such as feeding, bathing, and physically caring for the child (which includes attending to health needs); “play,” which includes playing games, doing art projects, and pretending; “teaching,” which includes reading to the child or helping with homework; and

“management,” which refers to planning, organizing, and monitoring the child’s life outside the home. The developmental stages for which each activity is best suited are infancy, toddlerhood, the preschool period, and middle childhood, respectively, for the reasons outlined below.

Although parents engage in many other activities that surely influence children’s development, we examine mothers’ time in these activities because their relative importance to children’s well-being varies by developmental period, thus examining them allows us to test our hypothesis that the education gradient in time with children is characterized by a developmental gradient.

During infancy (birth to 12 months), parents spend most of their child care time performing basic caregiving tasks like feeding, bathing, and comforting (Bornstein 2002). Through the provision of basic care, parents help infants establish regular sleeping and eating routines, the two central challenges of infancy. According to attachment theory, it is also through warm, consistent, and sensitive responses to infants’ basic physical and emotional needs that parents establish secure emotional bonds, or attachments, with their infants. These attachments serve as children’s mental model of future relationships and form the foundation of their socioemotional development (Bowlby 1969; Ainsworth, Blehar, Waters, and Wall 1978). Although attachment theory specifies that the quality of mothers’ responses during basic care shapes mother-child attachments, a greater quantity of time in basic care increases mothers’ opportunities to demonstrate and practice their responsiveness. During infancy, then, basic care is the paramount parenting activity.

During toddlerhood (12 to 35 months), as babies become capable of initiating and maintaining social interactions and acquire the capacity for representational thought, they begin to engage in “symbolic” or pretend play (Piaget 1952). Engaging in pretend play not only reflects

children's increased capacities, but also promotes their cognitive and social skills, including attention, memory, logical reasoning, vocabulary, creativity, and behavioral and emotional regulation (Bergen and Mauer 2000; Berk 2001; Elias and Berk 2002; Lindsey and Mize 2000; Ruff and Capozzoli 2003). According to sociocultural theory, toddlers learn most during play when a parent (or other adult) facilitates and structures their activities (Keren et al. 2005; Rogoff 2003) in ways that help children explore their environment (Huble and Trevarthen 1979), grasp concepts (Sigel 1986), express curiosity about novel objects, and gain competence motivation. By actively guiding children's play, parents also positively foster compliance (Parpal and Maccoby 1985) and stimulate language development (Duckworth 1972). In toddlerhood, then, developmental theory suggests parents respond most contingently to children's developmental needs through child-directed play.

During the preschool period (ages three to five), children's advancing conversation and attention skills typically increase their appetite for didactic activities such as book-reading, puzzles, and problem-solving (Hoff 2006). These kinds of teaching activities help children master many of cognitive skills that influence early academic outcomes, such as distinguishing print in books, recognizing letters and numbers, and identifying words (Snow 2006). A large body of research has established that the frequency with which parents engage in these kinds of teaching activities is associated with language and literacy development (e.g., Bus, van Ijzendoorn, and Pellegrini 1995; Roberts, Jurgens, and Burchinal 2005) as well as early math and reading scores (e.g., Bradley, Caldwell, and Rock 1988). Thus, while child-directed play still provides important opportunities for enrichment (and although some types of teaching activities, such as reading, are important to initiate well before the pre-school period), parents' time in teaching activities may be particularly important during the years just prior to school entry.

During middle childhood (ages six to 13), children's lives extend beyond the family to include schools, peers, and extracurricular activities. As children's worlds expand, parents spend less time interacting directly with them and more time planning and monitoring their academic and social networks (Collins, Madsen, and Susman-Stillman 2002). Through this management, parents insure that children form positive relationships, learn self-management, and adopt a sense of personal responsibility in their extrafamilial lives (Collins et al. 2002). Early on, management entails learning about and arranging for enriching academic, recreational, and social opportunities (Dryfoos 1999; Vuchinich, Bank, and Patterson 1992). As children near adolescence, management also involves monitoring social networks and activities to minimize children's exposure to violence, substance use, and delinquent peers (Dishion, Capaldi, and Yoerger 1999; Dubow, Edwards, and Ippolito 1997). During middle childhood, then, parents respond contingently to children's developmental needs by actively managing their increasingly complex lives.

Hypotheses

The hypothesis that highly educated mothers tailor their childrearing time to children's developmental needs more so than less educated mothers could manifest in two ways. First, highly educated parents could invest more time in the activity most appropriate for their child's developmental stage *relative to the time they invest in these activities during other stages of development*. For example, when their child is an infant or toddler, highly educated parents should invest more time in basic care and play than they do later in a child's development. Second, highly educated parents could tailor their childrearing time to their children's

developmental needs *to a greater degree than less educated parents*. Importantly, demonstrating that highly educated parents ‘concertedly cultivate’ across time periods does not mean that less educated parents do not also tailor their time accordingly. Thus, we hypothesize that highly educated parents should not only invest more time in basic care and play during infancy and toddlerhood relative to other ages, but that the difference in the amount of mothers’ time in basic care and play across education groups – the education gradient – should be largest during infancy and toddlerhood, respectively. Likewise, the education gradient in teaching activities should be largest during the preschool years, and it should be largest for management during middle childhood. These patterns would indicate that the education gradient is characterized by a developmental gradient.

METHOD

Data

Data are drawn from the 2003-2007 American Time Use Surveys (ATUS). The ATUS is an ongoing, monthly, national survey conducted by the U.S. Bureau of the Census for the Bureau of Labor Statistics fielded in conjunction with the Current Population Survey (CPS). Households are selected so that comparisons can be made across demographic groups defined by marital status, children’s age, or other criteria. Telephone interviews (aided by CATI technology) ask one randomly-selected person aged 15 or older within each household to recount how he or she spent his or her time during the preceding day. The sample covers all days of the week and all months of the year. The ATUS collects information on the respondent’s stated primary activity, which could be a child care activity, and whether he or she was performing child care as a secondary activity. We examine only “primary” activities that are child care, not “secondary”

child care time, because only primary activity codes identify the specific developmentally enriching activity in which the parent is engaging.

These data offer several advantages for the proposed work. First, the survey's diary approach is a relatively flexible and accurate method for measuring time use, especially time devoted to caregiving. Few other U.S. nationally representative surveys have collected any information on caregiving, and not in as great detail as the ATUS. Second, the survey's large size and sampling methodology are designed to facilitate the types of comparisons between mothers with different levels of education as are proposed here. Third, the ATUS collects data on parents' demographic characteristics, such as maternal age and number of children in the household. These measures are likely associated with education and time in child care, thus their inclusion allows us to control for the influence of characteristics that distinguish parents of different education levels.

We define child age groups by the age of the youngest child in the household to insure that at least one child of the target developmental period lives in the household (this approach is also used in Aguiar and Hurst, 2009). We then compare all time mothers spend in each child care activity across the resulting age groups. We hypothesize that having an infant in the household will increase mothers' time spent in basic care relative to having only preschool or school age children, that having a preschool age child in the household will increase mothers' time spent in teaching relative to having only school age children, and so on. Our classification means that if the youngest child in the household is in middle childhood, the mother cannot report time with infants, toddlers, or preschoolers. However, if the youngest child is an infant or toddler, the mother may also report time with preschool or school age children. We address the implications

of this ambiguity in the discussion. Another limitation is that the data are pooled from cross-sectional waves, thus obviating longitudinal comparisons.

Sample

Our analytic sample is limited to our target population, that is, to women who have at least one “own child” (biological or adopted) aged 13 or younger in her home. We further eliminate any women who have more household children (children living in the household who are not necessarily the mother’s own) than own children ($n = 1756$) to limit the number of blended families included because maternal time allocation might differ in unknown ways in these families, particularly if the youngest child is not the mothers’ own. Because mothers may have greater flexibility in their weekend schedules, the amount and distribution of time they choose to devote to children on weekend days is of greater interest than time on weekdays. Therefore, we further restrict the sample to mothers whose time diary captured a weekend day. These restrictions leave us with 6640 cases for analysis. As per ATUS instructions, weights adjusted to the 2006 population are used for all years in all analyses.

Table 1 displays descriptive statistics for our analytic sample. Roughly 12% of mothers fitting our criteria have less than a high school education (including those with a GED), 28% have a high school diploma, 29% have some college or an associate’s degree, and 31% have a college degree. The mothers’ average age is just under 36 years. Our sample is predominately White/Asian/Other (69%), with a further 12% African-American and 18% Hispanic. Most families have two children.

Almost a third of the sample (32%) has a child under three years of age (birth to two years), while 23% has a youngest child older than two but younger than 6 (three – five years),

and 45% has a youngest child six or older (six – 13 years). Although we distinguish theoretically between infancy and toddlerhood (i.e., the first year of life from the second and third years), we combined these groups in analyses because distinguishing between households with youngest children in the first and second to third years of life yielded prohibitively small age group by education cell sizes.

Measures

Child care time. We examine the amount of time mothers spend in active child care per weekend day. By active care we mean time spent directly engaging with children. This time is broken into four domains – basic care, play, teaching, and management – corresponding to our developmental hypothesis. Basic care includes direct physical care of household children. Thus, if a mother was feeding (including nursing), bathing, physically comforting, physically attending to health needs, or putting a child to sleep, as examples, she was coded as engaging in basic care. Play includes sports, arts and crafts, and general play with household children. If a mother was playing a game, ‘pretend playing’, or using clay with a child, as examples, she was coded as playing. Teaching children includes reading, talking, helping with homework or any other educational activity directly related to children. Thus, for example, if a mother was reading a book, having a conversation, or solving a puzzle with a child she was coded as teaching. Management of children includes attending events, traveling, and planning activities on children’s behalf. Thus, for example, if mothers were attending a child’s performance, driving a child to an activity, or arranging for a child to participate in an activity, they were coded as managing. We based these categories on those of Guryan et al. (2008), but altered them somewhat to fit our hypotheses and limited them to time spent with household children. These

activity codes are listed in Appendix A. We also use a more global measure of primary child care time that records the amount of time spent in any of these activities.

Independent variables. Our main independent variable is maternal education. We calculated education level based on mothers' highest degree attained. Four mutually exclusive levels of education are distinguished: less than a high school degree (including GED recipients), high school degree, some college (including Associate of Arts recipients), and college degree or higher. In models, three dummy variables are entered with high school education as the reference category. The other main independent variable is age of youngest child. Models are run on the full sample with two dummy variables for child age group and either birth to two, three to five, or six to 13 as the reference category depending on which activity is under examination.

Covariates. We control for a set of characteristics that may predict maternal education level and may covary with maternal time with children. Specifically, mothers' race/ethnicity is entered to control for any possible cultural differences in parenting styles (two dummy variables for Black and Hispanic with White as the reference category). We also control for mothers' age at the time of the interview (it is mean-centered to ease interpretation of the intercept). We also enter the number of children in the household in these models, even though maternal education level arguably affects family size. Because we cannot identify which child the mother is interacting with, mothers with more children in the household should report more time with children, all else equal. If family size varies by age of youngest child, then family size will confound the basic patterns we aim to investigate. Having multiple children could also change the nature of time spent with the youngest children as the oldest could do some child care, especially play. The number of children in the household is centered at one.

Analysis Plan

We begin by examining unadjusted differences in mothers' time in child care by education level, age of youngest child, and activity type. The mean minutes for each subgroup will indicate whether, unadjusted for any exogenous characteristics, child time patterns are characterized by both education and developmental gradients.

Next, in tobit models, we regress time in each activity type, as well as our global measure of all types of child care time, on dummy variables for maternal education level and child age group controlling for maternal race, age, and family size. Six variables interacting maternal education and child age are entered to determine if differences by education level vary significantly across age groups. The reference categories in these models are high school education and *the child age group for which the activity is most important developmentally*. Thus, in models predicting time in basic care and play, birth to two is the reference category because basic care and play are the primary parenting activities when children are infants and toddlers. In the model predicting time in teaching, ages three to five is the reference because teaching becomes paramount during the preschool years, and in the model predicting management, ages six to 13 is the reference because management becomes paramount during middle childhood. Because we hypothesize educational differences will be largest in the age group for which each activity is most important, and that group is always the reference, significant negative regression coefficients for the interactions between college education (and some college) and both non-omitted age groups would indicate that educational differences are indeed largest for the omitted age group.

We use tobit models because they are designed to estimate linear relationships between variables when there is extreme censoring in the dependent variable (Breen 1996; Greene 2003). Tobit models are often applied to time use data because time is necessarily left-censored at zero and a substantial proportion of cases often report zero time spent in any given activity. (Kalenkoski, Ribar, and Stratton 2005; 2008; Kimmel and Connelly 2007). Indeed, a large number of cases are censored at zero minutes in each activity in our data. For example, nearly 80% of mothers do no teaching and nearly 80% do no playing on the diary day (see Table 1). The tobit model allows one estimation method to predict the probability of being censored and the expected value of the uncensored portion, conditional on observation (Breen 1996; Greene 2003).

We present marginal effects on the unconditional expected value for each type of care generated from the tobit models (Greene, 2003). We then generate predicted means from the marginal effects for the number of minutes mothers spend in each of these types of care at specific levels of maternal education and child age. These results are presented in figures 1-5.

RESULTS

Bivariate Results

Table 2 displays the average time spent in each of the four activities, and in total care, as minutes per weekend day. Consistent with Guryan et al.'s findings, a clear education gradient emerges at all ages in terms of total care time as well as time spent in most activities. However, the magnitude of the gradient varies by child age and activity type. In terms of total care time, the largest differences by mothers' education emerge in the youngest and the oldest age groups. College educated mothers of children ages 0-2 spend 67 more minutes in total care than those

with only a high school degree. By contrast, college educated mothers of three to five year olds spend 21 more minutes in total care than high school educated mothers. Among mothers of six to 13 year olds, those with a college education spend 22 more minutes in total care than their counterparts with only a high school education.

More interestingly, this overall education gradient masks important variations in the pattern by activity type. For basic care and play, the largest education gaps emerge when youngest children are birth to two, with college educated mothers spending about 42% more time in basic care (30 more minutes) and approximately 94% more time in play (32 more minutes) than those with only a high school degree. In contrast, when youngest children are ages three to five, college educated mothers spend only 5 minutes more in basic care (11% more time) and play (19% more time), respectively, than those with only a high school degree. Finally, when youngest children are ages six to 13, college educated mothers spend about 4 more minutes per weekend day in basic care than mothers with only a high school education and about the same amount of time in play.

For time spent teaching, the education gradient is more consistent across age groups, although a developmental gradient does emerge. When youngest children are ages birth to two, college educated mothers spend five extra minutes (or 95% more time) teaching children than mothers with only a high school degree. In contrast, when youngest children are ages six to 13, college-educated mothers spend three extra minutes (or 59% more time) teaching than mothers with only a high school degree. The largest gap emerges when children are ages three to five: in this group, college educated mothers spend about eight more minutes per weekend day teaching (or 155% more time) than high school educated mothers. Nevertheless, it should be noted that all

mothers spend the least amount of time in teaching at every developmental stage, so even large percentage differences equal small differences in actual minutes per weekend day.

Finally, the education gradient for management widens as youngest children age. When youngest children are birth to two years old, college educated mothers spend roughly the same amount of time in management as those with a high school degree. In contrast, when youngest children are six to 13 years old college educated mothers spend 14 more minutes per weekend day in management, or 130% more time, than mothers with a high school degree.

Multivariate Results

To determine if the bivariate patterns obtain when demographic differences are held constant, and to test whether education differences are statistically significant and different across age groups, we run tobit regression models for time in all care and in each of the four activity types with maternal education levels and child age groups interacted, controlling for mothers' race/ethnicity, age, and family size. In each model, significant negative effects for the interactions between college (and some college) and child age groups would support the hypothesis that college (and some college) educated mothers tailor their childrearing time to children's developmental needs more so than high school educated mothers. For example, because child age birth to two is the reference category in models predicting time in basic care and play, a significant negative interaction between college educated and child age six to 13 would indicate that the gaps in basic care and play between college and high school educated mothers are smaller when children are in middle childhood than when they are infants and toddlers. Likewise, because child age six to 13 is the reference category in models predicting time in management, a significant negative interaction between college educated and child age

birth to two would indicate that the gap in management time between college and high school educated mothers is smaller when children are infants and toddlers than when they are in middle childhood.

Results from the model predicting total child care reflect patterns that emerge in bivariate analyses (Table 3). An education gradient exists such that college educated mothers spend more time in all care than high school educated mothers. Moreover, the gradient differs by age of youngest child. The significant negative effects of college interacted with age three to five and college interacted with age six to 13 (and some college interacted with age three to five) indicate that differences by maternal education in total child care time are smaller when youngest children are preschool and school age compared to when children are very young. Results from this model are also displayed in Figure 1. It shows that the gap (between college-educated mothers and high-school educated mothers) in total care time is over 60 minutes when children are birth to two but roughly 20 minutes when children are three to five and six to 13.

For mothers' time in basic care, significant, negative interactions emerge between higher maternal education and child age group that suggest a developmental gradient in mothers' time in basic care. College educated mothers spend more time in basic care than high school educated mothers during all developmental periods, however, this difference is significantly larger when youngest children are infants and toddlers than when children are preschool or school age, as the significant negative interactions between college and child ages three to five and college and child ages six to 13 indicate. Figure 2 displays predicted means for this model. It shows that the gap (between college and high-school educated mothers) in basic care time is lower by 22

minutes when children are three to five versus birth to two and by 26 minutes when children are six to 13 versus birth to two (Figure 2).

A similar pattern emerges for play. Here again, the reference group is youngest children (i.e., birth to two years). The significant, negative interactions between college educated and child ages three to five (and child ages six to 13) indicate that the differences between college educated mothers and high school educated mothers in play are significantly smaller when youngest children are preschool or school age than when they are very young (Table 3). Specifically, the difference between college and high school educated mothers' time in play is lower by 25 minutes when children are preschool age and by 31 minutes when they are school age compared to when children are infants and toddlers (Figure 3). Thus, college educated mothers, to a greater extent than less-educated mothers, emphasize play when youngest children are infants and toddlers and de-emphasize play as children grow older, suggesting the education gradient for time in play, as in basic care, is characterized by a developmental gradient.

Table 3 also shows results for models predicting mothers' time spent teaching. In these models, child ages three to five serve as the reference. Thus, significant negative interactions between college (and some college) educated and child ages birth to two and six to 13 would suggest the education gradient is largest when youngest children are three to five. Indeed, the interaction between college educated and child ages six to 13 is negative and significant, indicating that the difference between college and high school educated mothers' time in teaching is largest when children are ages 3-5 (the difference in predicted means in the two groups is 8 minutes) and smallest when children are ages 6-13 (the difference in predicted means in the two groups is 2 minutes) (see Figure 4). Although no other significant interactions emerge,

the interaction between college and child ages birth to two is negative, as are the interactions between some college and both non-omitted child age groups. Taken together, these results suggest a pattern consistent with the hypothesis that mothers with college and some college spend more time in teaching when youngest children are preschoolers than when they are infants, toddlers, or school age, again supporting our notion of a developmental gradient.

Finally, patterns by age diverge sharply for mothers' time spent in management when compared to time spent in all other activities. In these models, child ages six to 13 serves as the reference because the education gradient is hypothesized to be largest when youngest children are that age. Indeed, significant negative interactions between college educated and child ages birth to two and three to five indicate that although mothers with a college degree spend more time in management than high school educated mothers overall, those differences are far larger when youngest children are six to 13 years than when children are infants and toddlers or preschool age. Figure 5 displays predicted mean minutes in management for mothers by education level and child age. When youngest children are infants and toddlers, mothers with college, some college, and high school educations spend almost equal time in management (mean minutes 11, 13, and 14, respectively). However, when youngest children are six to 13 years, mothers with a college education spend 25 minutes in management versus 13 minutes for high school educated mothers. Similar differences emerge when comparing mothers with some college and those with only a high school education, although the interaction terms are smaller and only approach statistical significance. These results indicate that for time spent in management, the education gradient is largest when youngest children are six to 13, a result which supports the hypothesis that college educated mothers attend to a developmental gradient in management more so than less educated mothers.

Although these analyses include mothers interviewed on weekend days only, we replicate all analyses with mothers interviewed on weekdays to assess the sensitivity of our results to diary day. In the weekday sample, the signs of all significant maternal education by child age interaction terms in the models predicting all child care time, basic care, play, and management are the same as in the weekend sample. In models predicting all child care and basic care, the interactions that are significant in the weekend sample are also significant in the weekday sample at the .05 level. Only in models predicting time in teaching do the patterns in the weekday sample not resemble the developmental gradient that emerged in the weekend sample. This similarity suggests that the educational and developmental gradient patterns obtain throughout the week, although they emerge more strongly on weekend days (these results are available upon request).

DISCUSSION

In his 1972 book, Robert Michael wrote that “a distinguishing characteristic of human capital is that it is embedded in an individual and therefore goes with him wherever he goes – into the labor market, into the theater, into the voting booth, and into the kitchen” (Michael, 1972: 3). Michael argued that human capital enhanced one’s capabilities as an efficient consumer (of purchased goods and services, in that research). The present study illustrates this idea by showing that mothers’ human capital (i.e., her education) influences not only the amount of time she spends with her children (which may not be related to efficiency in a linear fashion) but the composition of that time with her different-age children.

Specifically, we found (as have others before us) an “education gradient” in mothers’ use of time: in almost all cases, highly educated mothers spend more time than less educated mothers in the broad categories of child time investments that promote development. However, we also

identified a “developmental gradient” such that highly educated mothers shift the composition of their time in ways that specifically promote children’s development at different developmental stages. Specifically, the education gradient in basic care and play is greatest when youngest children are infants and toddlers (birth to two) – precisely when children most require parents’ time on such basic activities as bathing and feeding and also precisely the age when parent-child play is at its most developmentally-appropriate. The education gradient for teaching is greatest when youngest children are preschool age (three to five), precisely when time spent in learning activities such as reading and problem solving best prepare children for school entry. Conversely, the education gradient in management is greatest when youngest children are between the ages of six and 13 – precisely the ages at which parental management is a key, developmentally-appropriate input.

Most of our significant results emerged in the comparison between mothers with a college education and those with only a high school education; the differences between mothers with some college and those with only a high school education reflected the hypothesized direction, but were seldom statistically significant. This pattern suggests the developmental gradient may be particularly pronounced among college educated mothers. This phenomenon echoes the findings reported in Ramey and Ramey (2010) who describe the “rugrat race” among highly-educated parents. These parents are spending an ever-increasing amount of time in child care to, in the Rameys’ view, increase the chances their children will gain entry into a good college. At the same time, whereas the Rameys emphasize increasing divergence by parental education in time in “management-type” activities with school-age children, our findings show that, with respect to total child care time, the educational gradient is most apparent in households with the youngest age children, a point also made by Hurst (2010), who argues that nearly all of

the increase over time in educational differences in time use is driven by households with young children (see also Sacks & Stevenson, 2010). Thus, although college-educated mothers in our sample may be attempting to build their children's resumes by enrolling them in a plethora of extra-curricular activities, as described by Ramey and Ramey, they appear to have also adopted the mantra, championed in academic research (e.g. Heckman, 2011) as well as in the popular press, that parental investments in the earliest years are key ingredients in children's long-run success.

Before considering the implications of our results, it is important to note their limitations. Most notably, we do not identify which household child the mother is interacting with during a particular activity. Thus, we cannot argue that mothers are spending more time in basic care with infants and toddlers than they are with six to 13-year-olds, only that when an infant or toddler lives in the house, mothers are spending more time in basic care and play than they do when only six to 13-year-olds live in the house. However, if this ambiguity biased our estimates, we believe it could only have minimized the developmental gradient in mothers' time use that we identified. The inclusion of older children in the infant and toddler subgroup families theoretically dilutes age group variation, making differences in mothers' time use across age groups, and differences in the education gradient across age groups, harder to detect.

In sensitivity analyses, we assessed the impact of mothers' interacting with children of different ages in the same household by restricting our sample to families with only one child. In these families, we can safely assume that mothers report all time with the youngest age child. For basic care, teaching, and management, the estimated interactions between maternal education and child age groups are comparable in sign and size. The developmental gradient in play does

not emerge, however, among one child families. It is difficult to interpret this difference from the full sample results because the one child sample, which is much smaller ($N = 2184$), may differ from multiple child families on a number of unobservable characteristics that could influence time spent in play. One possibility, however, is that college educated mothers of only children maintain higher levels of play throughout children's school years than their counterparts with multiple children because the basic care of younger children does not monopolize their time for play with older children. Because the possible uniqueness of one child families would limit the generalizability of our findings, these sensitivity analyses are not our preferred results even though they clarify the interpretation of mothers' time.

Another limitation of the ATUS is one shared by all time diary surveys: child care time is self-reported. Thus, it is possible that college educated mothers emphasize different activities when reporting their time rather than actually spending their time differently. For instance, perhaps college educated mothers believe they "should" spend time engaging in enriching activities with their children, therefore, when talking to their children while doing other household tasks, they are likely to report their "primary" activity as "talking to children." In the same situation, high school educated mothers may report the household task as their "primary" activity, with talking to their children coded as "secondary" child care time. In the absence of observational data, it is difficult to determine the extent to which differences in reporting drive differences by parent education level. However, observational studies comparing the quantity and quality of parents' language use with children by parent education (Hart and Risley 1995), as well as parents' time spent in child-directed activities (Lareau 2003), suggest the education gradient found in time diary data is not strongly biased by reporting differences.

Other particularities of the ATUS limited our analyses in less obvious but still important ways. For one, we could not determine whether mothers were interacting with their biological or non-biological household children. It is plausible that mothers allocate time differently between biological and non-biological children, thus distinguishing between them might reveal more precise time use patterns. However, by excluding mothers who reported more household children than own children, thereby reducing the proportion of blended or stepfamilies in the analytic sample, we reduced the possibility that mothers' time with non-biological children altered our findings. It also may be true that examining time with children as a primary activity ignores meaningful time mothers spend with children in other types of activities, such as family meals, travel not directly related to children, or conversations during household tasks. However, it is impossible in the ATUS to determine whether children are the focus of attention during tasks such as meals, travel, or household chores, only that they were with the mother in the same room or location, so to include these kinds of activities would likely capture time not directly relevant to children's development. Finally, data on fathers' education level (as reported by mothers) is only available if mothers lived with the father or another partner, therefore we could not control for fathers'/partners' education in our analyses.

Despite these limitations, the rich information on mothers' time use in the ATUS allowed us to identify two important gradients in maternal time with children, one educational and one developmental. As a next step, future research should test our theoretical proposition that children at different developmental stages benefit from different types of parental investments using data that includes child outcome measures. Specifically, these analyses could investigate whether, in fact, time in basic care and play are most strongly linked to child outcomes during children's infancy and toddlerhood, whether teaching activities are most strongly linked to child

outcomes during the preschool years, and whether time in management is most strongly linked to child outcomes during middle childhood. Moreover, these analyses could explore the idea that the “ideal” amount of time spent in different child care tasks may differ for children with different developmental characteristics or needs, by maternal education level or socioeconomic circumstances, as well as by the goals that parents in different contexts may have for their children (see, e.g., Edin and Kefalas 2007; Furstenberg, Cook, Eccles, Elder, and Sameroff 1998).

Although we have identified a developmental gradient in mothers’ time with children by education level, we cannot know whether the developmental gradient arises directly or indirectly from maternal education. It is possible that mothers learn about child development during college, thus highly-educated mothers are consciously acting on knowledge attained in formal schooling, or that college alters mothers’ goals for their children and thus their parenting values, as sociological theory would suggest (Sewell et al. 1970). Alternatively, mothers with parenting values that make them more responsive to children’s emerging skills and abilities simply may select to receive more education or may progress educationally because of stronger academic ability.

The patterns we observe could also reflect the numerous correlates of maternal high education. For instance, highly-educated mothers are more likely to have higher incomes, to be married, and to have spouses who are more involved in childrearing; they may also have more flexible work schedules due their different types of employment. All of these demographic correlates of maternal education represent plausible pathways through which maternal education is associated with time use. Finally, highly educated mothers could differ from less educated

mothers in their consumption motives for spending time with children (Sacks & Stevenson, 2010).

Highly-educated mothers could also differ in their preferences for or beliefs about “investing in children” and its later-life economic returns for children (Heckman, 2011). This explanation supports the view that highly educated parents “concertedly cultivate” their children’s development in ways that may optimize children’s long-run success. Lareau (2003) describes highly educated parents concertedly cultivating children through a set of behaviors, such as scheduling and monitoring enriching extracurricular activities and advocating for children with teachers, which constitute “management” by our definition. Lareau interviewed families with school age children, therefore, the prominence of management in her description jibes with developmental theory and our findings. However, our results also suggest that highly educated parents concertedly cultivate children in different ways at different ages and that the parenting strategies Lareau identifies may reflect broader patterns established much earlier in children’s lives, patterns that could have long-term implications for children’s achievement and attainment. To the extent that highly-educated parents increasingly adopt these patterns of investing in their children, the destinies of the children of college-educated parents may diverge even farther from those of their less-advantaged peers.

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Table 1. Descriptive Statistics of Weekend Diary Sample

Variable	Mean	SD	% Participating
All Child Care	86.84	111.69	72.0
Basic Care	44.38	68.67	59.0
Teaching	6.74	22.13	21.0
Play	23.49	62.27	21.0
Management	12.24	45.59	24.0
Less Than HS	0.12	--	--
High School	0.28	--	--
Some College	0.29	--	--
College Degree	0.31	--	--
Maternal Age	35.34	7.53	--
White / Asian / Other	0.69	--	--
African American	0.12	--	--
Hispanic	0.18	--	--
Number of Own Children At Home	2.03	0.96	--
Youngest Child Age 0-2	0.32	--	--
Youngest Child Age 3-5	0.23	--	--
Youngest Child Age 6-13	0.45	--	--

Note. All descriptive statistics are weighted.

Table 2. Average Minutes in Each Child Care Activity, by Age

Youngest Child Aged 0-2						
Education Level	<i>n</i>	All Care	Basic Care	Play	Teaching	Management
< HS	273	102.43	61.74	28.92	1.40	10.37
HS	374	117.70	70.69	34.25	4.43	8.32
Some College	547	139.99	81.40	46.05	4.68	7.86
College or Beyond	736	184.56	101.36	65.57	8.70	8.94
Youngest Child Aged 3-5						
Education Level	<i>n</i>	All Care	Basic Care	Play	Teaching	Management
< HS	200	66.45	44.41	16.19	3.44	2.40
HS	343	86.72	43.54	27.12	4.89	11.17
Some College	430	80.72	43.22	20.35	6.54	10.61
College or Beyond	552	108.69	48.98	32.23	12.51	14.97
Youngest Child Aged 6-13						
Education Level	<i>n</i>	All Care	Basic Care	Play	Teaching	Management
< HS	359	34.53	19.03	4.44	3.49	7.57
HS	746	38.22	15.06	6.02	6.13	11.01
Some College	1,061	44.60	16.61	7.10	7.46	13.43
College or Beyond	1,019	59.63	19.18	5.70	9.73	25.01

Table 3. Tobit Model Results for Mothers' Time Spent in Each Activity

	(1) Full	(2) Basic	(3) Play	(4) Teach	(5) Mgmt
Less than High School	-9.222 [6.110]	-5.840 ⁺ [3.444]	-2.557 [2.510]	-2.268 [1.401]	-3.314 [2.078]
Some College	14.004* [5.756]	7.576* [3.332]	2.289 [2.404]	1.030 [1.392]	3.365 ⁺ [1.729]
College	48.833** [5.906]	23.748** [3.464]	11.127** [2.689]	5.760** [1.572]	11.340** [1.921]
Child Age 3-5	-24.531** [5.635]	-17.487** [3.052]	-6.182** [2.258]		0.005 [2.231]
Child Age 6-13	-77.117** [5.405]	-50.160** [3.183]	-30.198** [3.001]	-1.481 [1.230]	
Child Age 0-2				0.735 [1.381]	-0.114 [2.177]
<HS * 3-5	-2.518 [9.642]	7.755 [6.200]	-4.031 [3.676]		-4.224 [2.969]
<HS * 6-13	15.808 ⁺ [9.323]	16.410* [6.059]	6.781 [5.854]	0.825 [2.419]	
Some College * 3-5	-18.062* [7.528]	-6.575 [4.432]	-6.967** [2.514]		-4.935* [2.102]
Some College * 6-13	-6.641 [7.078]	-7.078 ⁺ [3.996]	-3.105 [3.200]	-0.609 [1.525]	
College * 3-5	-25.482** [6.806]	-12.949** [3.816]	-6.612** [2.400]		-6.864** [1.667]
College * 6-13	-20.593** [6.354]	-13.902** [3.535]	-10.808** [2.139]	-2.730* [1.112]	
<HS * 0-2				-2.359 [1.739]	1.215 [3.680]
Some College * 0-2				-1.795 [1.427]	-4.047 ⁺ [2.163]
College * 0-2				-1.765 [1.311]	-9.351** [1.436]
Maternal Age	-.488* [.196]	-.469** [.117]	-.283** [.0964]	.0718 ⁺ [0.040]	-0.097 [0.074]
Black	-25.587** [3.146]	-5.670** [2.009]	-11.682** [1.136]	-1.234 ⁺ [0.710]	-2.283 ⁺ [1.255]
Hispanic	-25.728** [2.296]	-10.534** [1.768]	-6.401** [1.285]	-0.437 [0.688]	-1.990 ⁺ [1.194]
Number of Children	7.805** [1.192]	6.274** [.703]	-1.493* [0.580]	0.624* [0.245]	3.393** [0.442]
<i>N</i>	6640	6640	6640	6640	6640

Note. Standard errors displayed in brackets below marginal effects.

+ $p < .10$, * $p < .05$, ** $p < .01$

Figure 1. Predicted mean minutes mothers spend in total care by child age and maternal education.

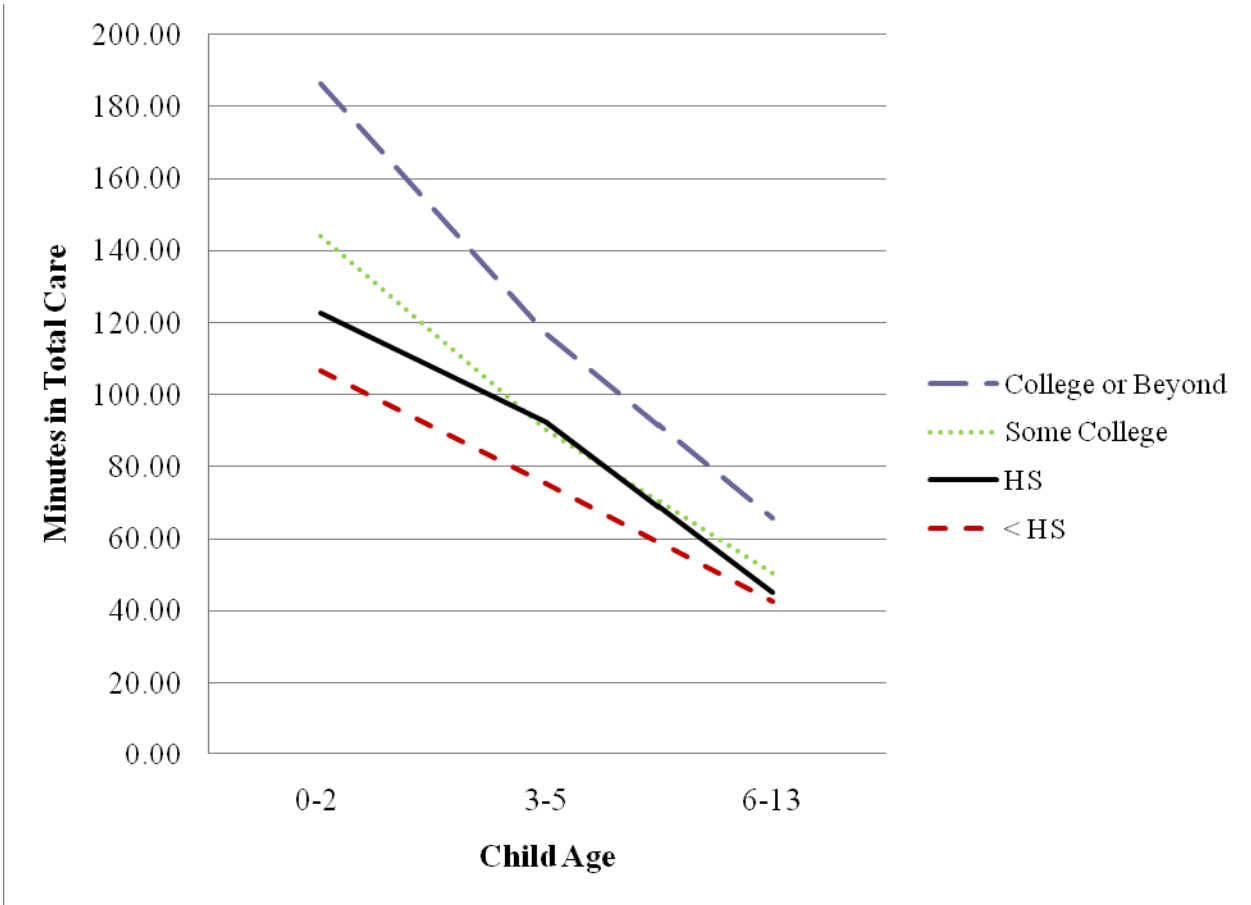


Figure 2. Predicted mean minutes mothers spend in basic care by child age and maternal education.

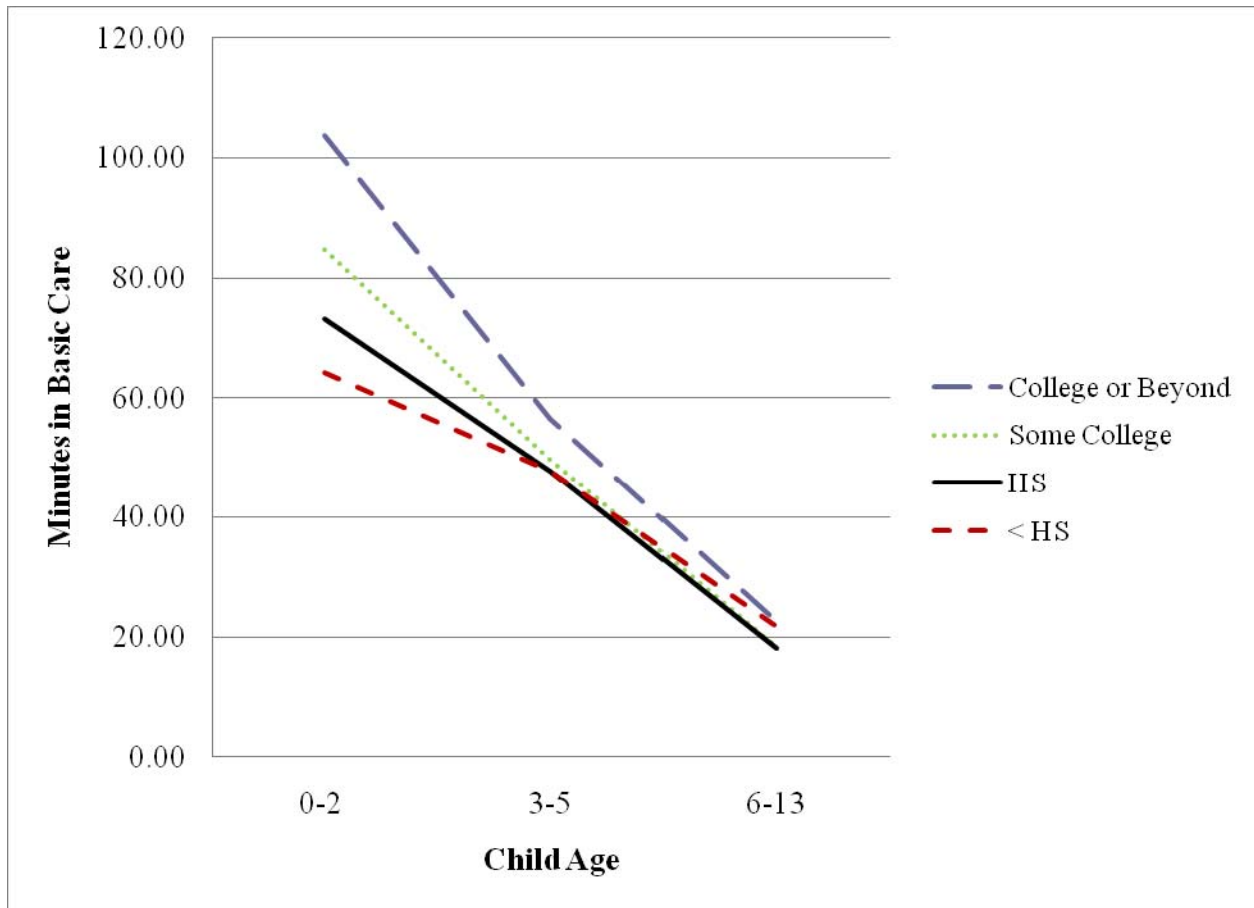


Figure 3. Predicted mean minutes mothers spend in play by child age and maternal education.

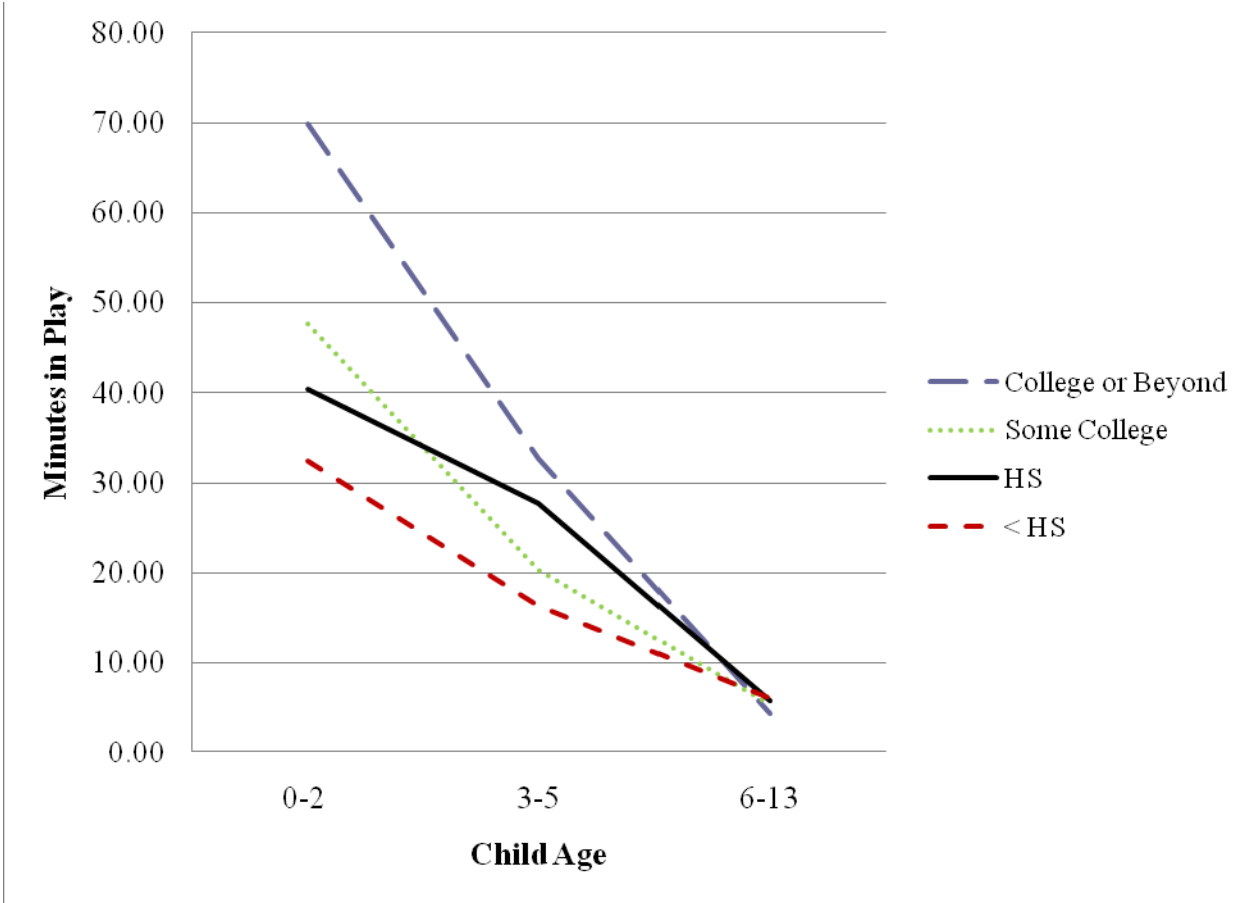


Figure 4. Predicted mean minutes mothers spend in teaching by child age and maternal education.

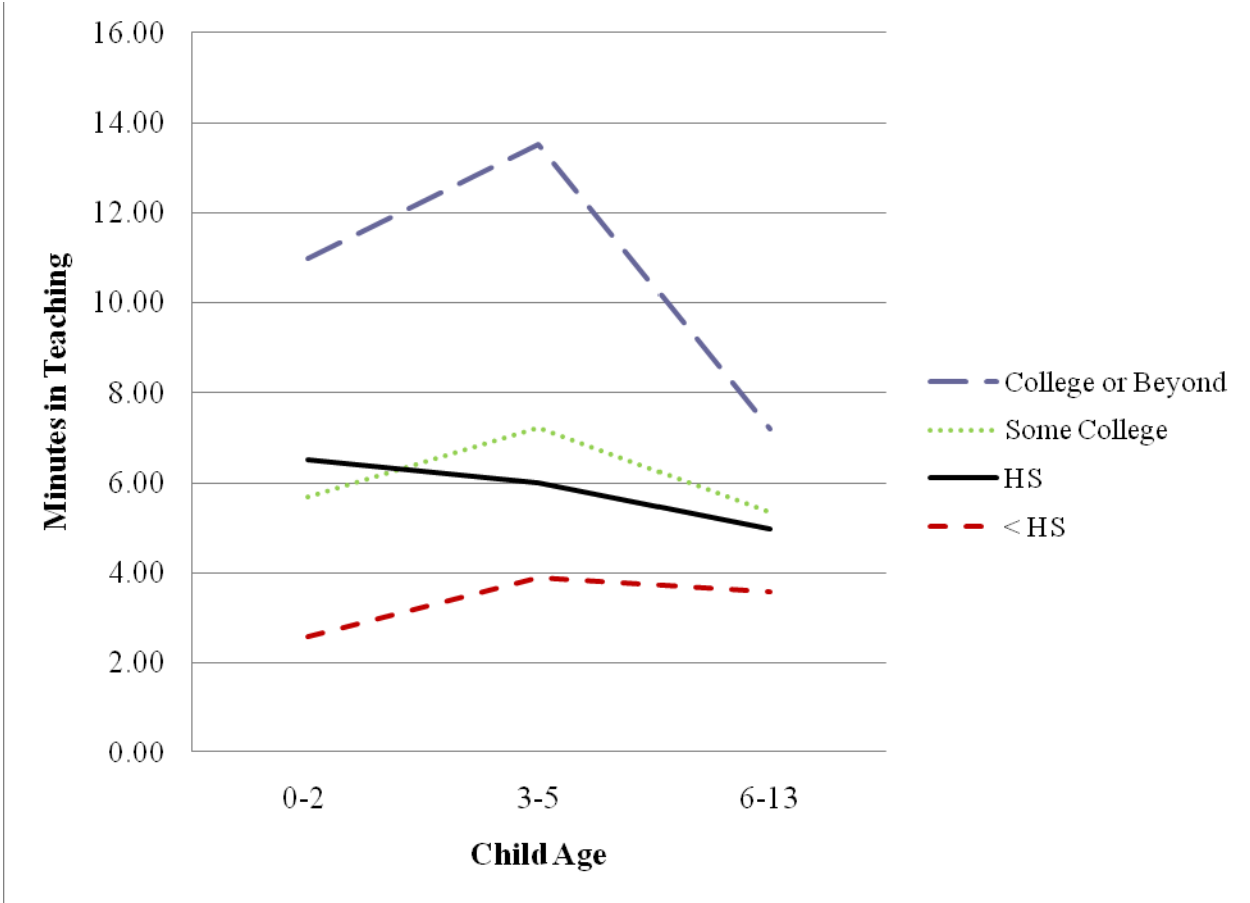
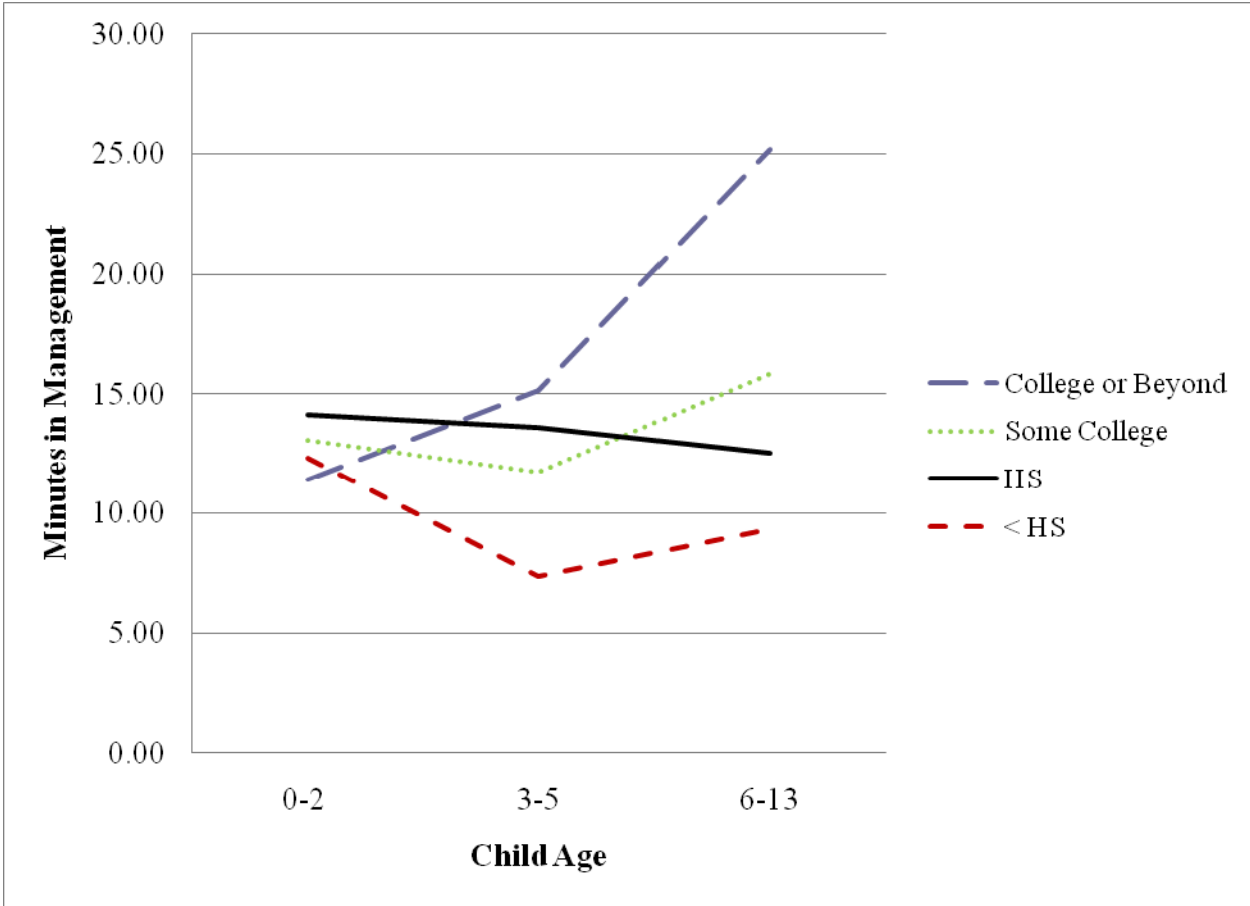


Figure 5. Predicted mean minutes mothers spend in management by child age and maternal education.



APPENDIX A

Child Care Activity	ATUS Codes
Total care	Includes all time spent in child care as a “primary activity”; this time is divided entirely below into the four activity categories.
Basic care	“Physical care for household children” “Looking after household children (as a primary activity)” “Caring for and helping household children (as a primary activity)”
Play	“Playing with household children, not sports” “Arts and crafts with household children” “Playing sports with household children”
Teaching	“Reading to/with household children” “Helping/teaching household children (not related to education)” “Activities related to household children’s education” “Talking with/listening to household children”
Management	“Attending household children’s events” “Waiting for/with household children” “Picking up/dropping off household children” “Activities related to household children’s health” “Organization/planning for household children” “Travel related to caring for/helping household children”