Mother's Time with Children: Does Time Matter?

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Abstract

Despite the theoretical importance mother's time with children plays in the literature on children's intellectual development, few studies have identified a significant relationship between the time children spend with mothers and their cognitive outcomes. This study uses children's time diaries from the Child Development Supplement of the Panel Study of Income Dynamics to investigate the effect of the quantity and intensity of maternal care during early childhood on children's later cognitive test scores (N = 1,008). Results show that the time mothers spend with children is positively correlated with verbal scores for children with verbally skilled mothers and that the influence of early maternal care has a persistent effect on later test scores even after lagged tests are controlled. The intensity of care or the percentage of total care devoted to active engagement is positively associated with development of analytic skills for children with skilled mothers. The findings suggest that children of mothers with better verbal skills benefit the most from spending more time with mothers. The findings also suggest that children can acquire verbal skills through passive interaction with verbally skilled mothers as well as through active interactions. On the other hand, the development of analytical skills may require more intense and direct involvement. Taken together, the results point to time use as a means of social reproduction—time with children is a pathway though which highly skilled mothers impart their human capital to their children.

Much attention has been paid to identifying the effect of maternal employment on the quantity and the quality of care children in early childhood receive, and the consequences this may have on children's wellbeing. Problematic with this literature is that none specify the pathways through which maternal employment should affect child wellbeing. Underlying these studies is the implicit assumption that women's employment necessarily reduces both the quantity and quality of maternal care necessary for children's long-term wellbeing. This assumption may be misleading in light of recent time diary studies that suggest that working parents may also be re-allocating their non-labor time in ways to prevent employment for interfering with childcare responsibilities (Zick & Bryant, 1996; Sandberg & Hofferth, 1999; Bianchi, 2000; Sayer et al. 2004). Thus, recent time diary studies highlight the importance of using direct measures of maternal involvement to understand the influences maternal care may have on child outcomes.

This study uses children's time diaries, along with traditional demographic and socioeconomic data, from the Panel Study of Income Dynamics (PSID) and its Child Development Supplement (CDS) to examine the influence of maternal time investments made during early childhood (when children are 0 to 5 years old) on children's cognitive outcomes assessed at age 5 to 12. The current study offers several important extensions to previous work. Most importantly, with the exception of one study (Huston and Aronson, 2005), most studies have used mothers' employment to proxy for the quantity and type of maternal care children receive. This study incorporates direct measures of maternal time investments rather than inferring the extent of mother-child involvement from employment status. Additionally, I distinguish between the different contexts of maternal care and explore whether contexts of care are more important for child wellbeing. Specifically, I distinguishing between the time children

spend performing activities when mothers are available but not directly participating (i.e. passive child care) from time children spend when mothers are directly engaged (i.e. active child care).

This study also introduces some methodological advances. First, this paper extends previous studies that use contemporaneous time use and child outcome data. The current research exploits the longitudinal aspects of the PSID-CDS to better identify causal relationships; this paper examine the influence of maternal time inputs made during early childhood (age 0 to 5 in 1997) on measures of cognitive development assessed five years later. Finally, this paper better controls for sources of child-specific heterogeneity that may bias estimates of maternal care. Prior analyses have only controlled for basic demographic child characteristics like birth weight, age and sex. This study uses extensive information from the PSID-CDS on child health, behavioral and cognitive difficulties during early childhood and information on the quality of children's schooling to control for potential sources of bias.

PREVIOUS STUDIES

Theories regarding children's cognitive development contend that the time parents invest in their children are crucial to fostering a stimulating and socially enriching environment for intellectual growth. In the demographic and economic literature, Becker posits that the amount of time parents devote to their children, along with their material investments, are essential inputs into the production of "quality" children (1991). In sociology, Coleman argues that social capital, which is created through the time children spend with parents, is the mechanism through which parents' own human capital is transmitted to their children (1988). Through repeated interactions, children learn to trust their caregivers, build healthy social relations and are exposed to an intellectually stimulating home environment that fosters cognitive development.

In developmental psychology, attachment theory also emphasizes the importance of consistent and available care, especially during early childhood. This theory argues parent-child

relations established during infancy form the foundation for children's ability to form secure social relations later on in life (Belsky, 2001; Vaughn, Grove, & Egeland, 1980) and the cognitive and language stimulation necessary for children's intellectual development (Belsky, 1988; Belsky and Eggebeen, 1991). This theory has been extended to suggest that even short periods of mother-child separation, up to 30 hours a week, may reduce the stimuli that is necessary for children's intellectual development.

Despite the theoretical importance mother's time with children play in the literature, very few studies have directly tested these theories using data on the actual amount and quality of time mothers spend with children. To the author's knowledge only one published study to date examines the relationship between maternal time on child outcomes from the National Institute of Child Health and Human Development Study of Early Child Care (NICHD-SECC) (Huston and Aronson, 2005). Using mother's time diaries, mothers' time with infants predicted maternal sensitivity and Home Observation for Measurement of the Environment (HOME) but not children's engagement and attachment with mothers. Additionally, the study found no significant relationship between the time mothers spent with children at 7 months and indicators of developmental status assessed at 24 and 36 months[1].

With the exception of Huston and Aronson (2005), the vast literature on maternal time inputs and child cognitive development exclusively focuses on identifying the influence mother's time investments have on cognitive outcomes by using maternal employment as a proxy for both the quantity and the quality of time mothers spend with their children. These studies, mostly using the National Longitudinal Survey of Youths (NLSY), provide mixed and inconclusive results (see Ruhm, 2000 for review of the literature). Many studies, using extensive controls for

[1] For these findings, they do not present the results of their estimation or the specifics of their estimation procedure so evaluation of these results is difficult to make.

maternal and child characteristics, have found a negative effect of employment on child cognitive outcomes when employment occurs during children's first year (James-Burdumy, 1999; Ruhm, 2000; Brooks-Gunn, Han, & Waldfogel, 2002). Other studies suggest that employment during the first five years *negatively* influences child outcomes (Ruhm, 2002; Bernal, 2002).

Some studies find that the influence of maternal employment may vary by subgroups. Desai, Chase-Lansdale and Michael find an adverse effect of maternal employment only for boys from higher income families with no significant effect for girls or children from low-income families (1989). Another study finds an adverse effect of first year employment only for non-Hispanic white children and not for Black or Hispanic children (Waldfogel, Han, & Brooks-Gunn, 2002). Other studies have found that the *negative* effects of early employment are not persistent (Harvey, 1999) or even *positive* effects of maternal employment. Parcel and Menaghan find that current maternal employment in occupationally complex jobs has a *positive* influence on children's verbal fluency (1994). Vandell and Ramanan also find a *positive* effect of maternal employment on math achievement and a *positive* effect of current employment on verbal ability (1992).

Recent time diary studies suggest maternal employment cannot be viewed as a proxy for either the quantity or the quality of care children receive because employed mothers and their spouses re-allocate their non-work time to maximize their time with children. For example, employed mothers maximize the time with children by reducing non-childcare time such as sleep, leisure and housework (Bianchi, 2000; Huston and Aronson, 2005). While working mothers, on average, do spend less time with children, much of this difference is due to differences in passive childcare; employed mothers spend less time in activities that do not involve direct one-on-one involvement—such as doing household work while supervising children—than non-working mothers (Nock and Kingston, 1988). These studies suggest that maternal employment cannot be

viewed as a proxy for either the quantity or the quality of care children receive. It is important to examine more direct measures of maternal involvement and to identify which aspects of involvement matter for child outcomes.

DATA AND METHODOLOGY

The Sample

This research uses children's time diary data and traditional survey data from the Child Development Supplement (PSID-CDS) of the Panel Study of Income Dynamics (PSID), a longitudinal study of a nationally representative sample of individuals and families in the United States, with over-samples of low-income and immigrant families. Starting in 1997, the PSID conducted the PSID-CDS, which collected data on children's time use, child development, home environment, and family characteristics for approximately 3,600 children between the ages of 0 and 12. In 2002, 2,907 of the original sample of children were re-contacted for the second round of data collection.

This study examines the relationship between mother-child interactions during early childhood, when children are between the ages of 0 to 5, and later child outcomes assessed. Therefore, sample consists of 1,008 children, which represents 73% of the sample of children who completed both weekend and weekday time diaries. Of the original 1,388 children younger five years old who were present in both waves of data, 227 children were dropped because they did not complete both weekday and weekend time diaries, and 15 children were dropped because of missing values in the time diary module. All measures of parental inputs were taken from the 1997 PSID-CDS. This includes measures of both the quantity and the intensity of time children spend with their mothers. All measures of children's outcomes are taken from the 2002 PSID-CDS.

Ordinary least squares estimation is used to regress children's test scores on maternal care, controlling for a set of maternal and child specific characteristics that are known to relate to cognitive development and maternal care. Control variables are added sequentially to examine how the relationship between maternal care and cognitive outcomes may change due to heterogeneity.

A methodological concern common to all studies that attempt to identify a causal relationship between parenting and child outcomes suffer from the issue of omitted variable bias due to unobserved differences among mothers and among children. Specifically, mothers may differ in their ability to parent and relate to their children. Children may also differ in their initial endowments such as innate cognitive ability, temperament and physical development. Bias is introduced when maternal and child characteristics that are correlated to both maternal time investments and outcomes are not adequately controlled.

First, mothers may differ in their abilities levels. To the extent that cognitive ability is an inherited trait, higher ability mothers may be more likely to have more cognitively able children. Higher ability mothers may also be more productive with the time they spend with children. For example, some mothers may be more skilled at childrearing, provide more stimulating home environment, and be more responsive and sensitive to their children's emotional needs. In other words, higher ability mothers may provide better "quality" of care. At the same time, women who provide better quality of care may also be more likely to work outside the home and/or spend more time in childcare. The estimated effects of maternal time on children's test scores may be upwardly biased, if the "quality" of parenting is not considered.

Second, the relationship between cognitive outcomes and maternal time inputs may also be explained by differences in children's initial endowments. For example, if parents are able to observe their child's initial endowments at early ages, parents may reallocated their childcare

time in ways to compensate for observed problems in their child's cognitive and behavioral development and physical health. For example, mothers may compensate for observed developmental delays by choosing to spend more time with their child, reducing their work hours or being more responsive/sensitive to their child's needs. In this case, the estimated effects of maternal time on children's test scores may be downwardly biased, if those aspects of initial ability that are observable to parents at early ages are not considered.

One strategy to address the problem of omitted variable bias is to use an extensive set of explanatory variables to capture heterogeneity among mothers and children. I use newly available data from the 1997 and 2002 PSID-CDS to measure aspects of child-specific and mother-specific characteristics that have not been accounted for in past studies, such as the majority of studies that have used the NLSY. Nearly all other studies have simply used birth weight and basic demographic variables such as gender and race/ethnicity to control for child initial endowments (Desai et al., 1989; Parcel and Menaghan, 1992; Vandell and Ramanan, 1992; Han et al., 2001; Waldfogel, Han, & Brooks-Gunn, 2002; Brooks-Gunn, Han, & Waldfogel, 2002; Huston and Aronson, 2005). In this paper, I exploit the richness of the PSID-CDS data to account to for those aspects of child endowments that may be readily observable to parents at early ages and that may, in turn, also influence how parents respond to their children.

Measures

Table 1 presents the summary of select descriptive statistics of the full sample of children as well as statistics by maternal employment and mother's verbal ability. In the next few paragraphs main variables are discussed briefly. More detailed discussion of the full list of explanatory variables used in the analysis is presented in the Appendix.

Dependent Variables: Cognitive outcomes are measure by the Woodcock Johnson Revised Test of Achievement (WJ-R). The WJ-R is a widely recognized measure of intellectual

development, reading and mathematical competence (PSID-CDS User's Guide, 2002). Cognitive assessment is composed of three subtests: applied problem solving, letter-word and passage comprehension. All assessments of cognitive ability are taken from the 2002 PSID-CDS, when children are between the ages of 5 and 12 years old. All three measures are age-standardized with mean of 100.

Quantity and Intensity of Care: A unique aspect of the PSID-CDS is its children's time use module[2]. Detailed information on children's time use was collected for up to two children within each family. Like other time use surveys, information was collected on the type of activity performed and the amount of time spent on each activity over the duration of a specified 24-hour period. Unique to the PSID-CDS, additional questions such as "who was doing the activity with the child?" and "who (else) was there but not directly involved in the activity?" were also included in the questionnaire (PSID-CDS User's Guide, 1997). As a result, time use data from the PSID-CDS provides information on the flow of children's activities, as well as the degree of adult involvement associated with each activity. In order to make daily diaries more representative of children's time use over the course of a full week, the PSID-CDS collected diaries for a random weekday and a random weekend for each child. In this paper, I use both weekday and weekend diaries to construct a representative week by multiplying weekday time use by 5 and weekend time use by 2.

Using the unaggregated time diary data from the 1997 PSID-CDS, I include measures of both the quantity of time children spend with their mothers and the intensity of mother-child

[2] Time diaries focus on capturing the chronology of events over a short period of time. This approach has been shown to be more reliable and less subject to social desirability bias than data collected from traditional, survey-based questions that ask individuals how much time they spend performing specific activities (PSID-CDS User Guide, 1997). While there are no baseline studies that have tested the consistency, validity, and reliability of time use reports from survey-based methods, substantial research has shown the time diary approach to be reliable and valid (Juster, 1985; Robinson, 1985).

interaction. Specifically, following Folbre et al. (2005), I distinguish between active and passive care. Active care is defined as the total time a child receives direct involvement with the mother (i.e. "who was doing the activity with the child"). Passive care, from a child's perspective, includes 1) total amount of time a child spends alone or with another child and no adult is recorded as participating or available 2) amount of time an adult was noted as available but not participating (i.e. "who (else) was there but not directly involved in the activity?") 3) time children spend sleeping or in personal care. Quantity of maternal care is defined as the total hours per week children spent with their mothers. Intensity of care is defined as the percentage of the total time mothers' spend with children that is use for active, one-on-one engagement.

Maternal Employment: Maternal employment is measured as a set of dummy variables indicating part-time or full-time employment in each of the first five years of a child's life. Part-time employment measures working between 1 to 34 hours per week. Full-time employment is measures working 35 hours or more per week.

Child Specific Characteristics: An extensive set of variables was used to measure children's cognitive, physical or behavioral problems during infancy and during the time between birth and the 1997 survey. These variables included any development delays experienced during infancy, hospitalization, physical and mental health. Letter word and applied problem solving tests were administered to children age 3 and older in 1997. Therefore lagged test scores are also available for a subset of children in the sample and are included in some regressions. Unique to the PSID-CDS is that it is linked to the National Center for Education Statistics Common Core of Data (NCES CCD), which provides information on the quality of children's school environment. This paper controls for the pupil-ratio of each child's school. Additionally, the usual set of demographic variables is included (i.e. sex, race, age at time diary assessment, age at cognitive test, and number of siblings).

Maternal Characteristics: Mother's verbal aptitude is measured by her passage comprehension score and is treated as a continuous variable. Mother's education is measured by 3 dichotomous variables that indicate whether mother's completed high school, high school graduate only, and at least some schooling beyond high school[3]. Other maternal and household characteristics include mother's language proficiency indicating whether English is her first language, mothers' age at child's birth, marital status, household income and sibship size.

RESULTS

The following paragraphs discuss the results of the analyses. Table 1 presents select sample statistics by maternal employment, mother's verbal aptitude and mother's education level. Table 2 and 3 present the results of ordinary least square estimation of child cognitive outcomes on total maternal care and intensity of care, respectively.

Table 1 shows that total maternal care and type of care does not significantly vary by mother's education level or by verbal aptitude but does vary by employment status. Children with mother who work fulltime receive nearly 20 hours per week less maternal care than children of non-employed mothers and children with mother who work part-time receive 10 hours less per week. Consisted with past research, most of this gap in maternal care is because of differences in the amount of passive care. In fact, children of part-time employed mothers receive only 1.8 hours less of active care than children of non-employed mother; children with mothers who work full-time, however, receive 8.3 hours less active time per week. Children of non-employed mothers receive the most amount of passive care.

[3] Alternative regressions were estimated using different specifications of maternal education and verbal ability, including continuous measures, linear splines and more finely defined dummy variables. The results were not substantitively different.

Table 1 also shows that mothers with higher verbal aptitude and who are better educated tend also to have children with higher test scores. Mother's age, income and marital status also differ by verbal aptitude and education but not employment status.

Table 2 presents the results of ordinary least square estimation of child cognitive outcomes on total maternal time investments, successively controlling for child and maternal characteristics. Model 1 control only for child's age at time diary assessment. Model 2 includes all the controls for child and maternal characteristics described in Appendix A1. Model 3 includes interactions between total maternal care with mother's verbal attitude as measured by her passage comprehension score and education level, characteristics that may indicate parenting ability. Model 4 includes lagged test scores. Since only children age 3 and older were tested in 1997, Model 4 includes only a subset of children in the full sample. The first panel examines children's letter-word scores. The second panel examines passage comprehension scores and the third panel examines applied problem solving scores. Standard errors are adjusted for the fact that the sample includes siblings and that error terms among siblings may not be independent.

The regression results suggest that the relationship between the quantity of early maternal care and child cognitive outcomes vary by the characteristics of the mother. In particular, mothers with higher verbal aptitude are better able at translating the time they spend with children into positive cognitive outcomes. The results also show that maternal employment during any of the first 5 years of life is not significantly correlated with cognitive outcomes, although these findings are not presented.

In Models 1 and 2, hours per week of maternal care has a positive, small and statistically insignificant association with both tests of verbal aptitude and a small, negative and statistically insignificant association with analytical reasoning. In Model 3, the point estimates of time inputs increase in magnitude for all three test scores once interactions are included. In particular,

interactions between maternal time and mother's verbal ability assessed by her passage comprehension scores are statistically significant for both measures of children's verbal reasoning. For children's letter-word and passage comprehension scores, the influence of maternal time increases with mother's verbal aptitude.

This result is robust even after lagged test scores are introduced in Model 4. The point estimates for maternal time and interactions between time and mother's verbal aptitude increase in magnitude and remain statistically significant at the 95% confidence level for both children's verbal test scores. For children's analytical test scores, interactions between maternal care and maternal ability also become statistically significant once lagged test scores are introduced. The results of Model 4 suggest that maternal care during early childhood has a persistent influence on latter test scores even after accounting for children's initial ability level (i.e. child aptitude assessed in 1997).

Parameter estimates from Model 3 are used to graph predicted values of children's letter-word and passage comprehension scores by hours per week mothers spend with children and by mother's verbal aptitude in Figure 1 and 2, respectively. Predicted test scores were generated by evaluating variable at the sample mean. Both figures suggest that the relationship between maternal care and children's verbal reasoning is only positively related among mothers who have high verbal aptitude. For mothers at the bottom and middle 30 percentile of verbal aptitude, the time mothers spend with children is not significantly related with test scores. These findings suggest that children of high ability mothers have the most to benefit from spending time with their mothers.

Table 2 provides modest evidence that the influence of maternal time varies by mother's education level. Interactions between maternal time and mother's education are only statistically significant in Model 3 for children's letter word scores and these estimates become statistically

insignificant once lagged test scores are introduced. Figures 3 uses parameter estimates from Model 4 to graph the predicted values of children's letter-word by hours per week mothers spend with children and by mother's education levels. Mother's time with children is positively associated with test scores among children with mothers with some college education and mothers with less than high school education.

Table 3 presents the results of ordinary least square estimation of child cognitive outcomes on the intensity of maternal care which is defined as the percentage of total mother-child time that is spend on active, one-on-one interaction. Here the paper asks the question, does the context of how care is received matter for children's test scores. Overall, like the results presented in Table 2, the point estimates for intensity of care suggest that the relationship between intensity of care and test scores varies largely by mothers' verbal aptitude; however, only interactions between intensity of care and mother's verbal aptitude for analytical reasoning are statistically significant. Specifically, the influence of intensity of care on children's analytical reasoning increases with mothers' verbal skills. Figure 4 graphs this relationship, evaluating all other variables at the sample mean. Figure 4 shows that the influence of intensity of care on test scores is positive for mothers with the highest verbal aptitude, although the relationship is relatively small. A 10% increase in the intensity of care from 60% to 70% is associated with 2 point increase is test scores for children of mothers at the top 30^{th} percentile of verbal aptitude.

DISCUSSION

The present study investigated the effect of the time mothers spend with children during children's pre-school ages on children's cognitive outcomes, using children's time diary data from the Child Development Supplement from the Panel Study of Income Dynamics on a sample of 1,008 children. In order to avoid contemporaneous effects between maternal care and child

outcomes, maternal time was assessed in 1997 and child outcomes were assessed in 2002 when children were between the ages of 5 and 12.

This paper offers several important contributions. First, with the exception of Huston and Aronson (2005), studies have exclusively used mothers' employment to proxy for the quantity and quality of maternal care that children receive. The present study uses children's time diaries from a nationally representative survey to obtain direct measures of the time children spend with their mothers. While Huston and Aronson (2005) can only obtain information on the amount of care mothers provide when children are 7 months old, this study includes time use from a cross-section of children that spans a much wider age range, from age 0 to 5. Second, this paper is the first to examine how intensity of maternal care may matter for children's wellbeing by using unique aspects of the time diary module of the PSID-CDS. Third, this study is among the first to use children's time diaries from the PSID-CDS to examine the effect of early maternal inputs on later child outcomes and includes many variables that are not available in the NLSY or NICHD-SECC, which can be used to account for child-specific heterogeneity, such as child health, behavioral and cognitive problems at infancy and the quality of children's schooling environment at time of cognitive assessment.

The findings of this study imply that maternal time does matter for cognitive outcomes but only for mothers with higher verbal aptitude. Specifically, the total amount of time mothers spend with children is positively correlated with verbal test scores for children with verbally skilled mothers and the influence of early maternal care has a persistent effect on later test scores even after differences in children's initial ability have been accounted for. Whereas total maternal time is correlated to tests of verbal skills, the intensity of care is positively associated with children's problem solving skills for children with verbally skilled mothers. The results also suggest modest interactions between maternal care and mother's education for children's letter-

word tests. In all estimated models, maternal employment is not significantly correlated with children's test scores.

Recent time diary studies have shown that the growth of maternal employment has not been accompanied by a corresponding decline in the time mothers devote to their children (Bianchi, 2000). This paper suggests that these trends in time use have important consequences for child development but that the influence of maternal time on cognitive outcomes may depend on mother's ability to productively translate childcare time into positive cognitive outcomes for their children. In particular, the findings suggest that children of mothers with better verbal skills may benefit the most from spending more time with mothers. The results of this paper point to mother's time with children as means for the social reproduction of test scores—time with children is a pathway though which highly skilled mothers impart their human capital to their children.

The results also suggest that the type of mother-child care may matter for different dimensions of cognitive development. It is total maternal care rather than intensity of care that is significantly associated with children's acquisition of verbal skills but intensity of care that is associated with the development of analytic skills. This finding is suggestive of the fact that children can acquire verbal skills through passive interactions with highly skilled mothers as well as through active interactions. Children may acquire verbal skills by listening to mothers talk on the phone or having conversations with other adults, as well as through direct contact with mothers. On the other hand, the development of analytical skills may require more intense and direct involvement.

The results show that the influence of maternal care varies by mother's verbal aptitude but only modestly by mother's education. Does this result suggest that structural influences, like education, are less important? To what extent is the observed relationship between maternal

verbal skills, maternal care and child test scores simply measuring inherited genetic ability as opposed to behavioral and structural aspects of parent-child interactions that may influence cognitive development? The paper stops short at directly assessing this question. However, one may argue that maternal verbal ability is a better and more precise measure of quality of education than total years of completed education or levels of education. In fact, Table 1 shows that there is as much variation in mother's verbal scores among those with less than 12 years of education as there is variation in mother's verbal scores among those with some college education.

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Table 1. Descriptive Statistics of Select Maternal and Child Characteristics

		Weekly Work Hours			Mother's PC Score			Mother's Education (yrs)		
	Full Sample	0	1-34	>=35	Bottom 30%	Middle 30%	Top 30%	<12	12	>12
Type of Care										
Total Care	52.0	63.27	52.46	43.2 *	51.33	51.61	53.01	54.38	51.59	51.4
	(20.8)	(19.96)	(20.01)	(19.28)	(20.95)	(20.53)	(20.96)	(21.08)	(21.18)	(20.44)
Active Care	31.5	34.68	32.83	26.31 *	30.72	31.83	32.01	33.55	30.47	31.5
	(16.7)	(18.71)	(16.29)	(15.20)	(17.38)	(16.60)	(16.28)	(19.05)	(16.86)	(15.83)
Passive Care	20.5	28.59	19.62	16.91 *	20.6	19.78	21.02	20.81	21.11	19.92
	(15.5)	(16.98)	(14.94)	(13.84)	(16.52)	(14.78)	(15.25)	(16.86)	(16.37)	(14.39)
Cognitive Outcomes										
Letter Word	106.20	107.41	105.84	106.28	99.83	106.09	112.38 *	100.02	103.39	110.36 *
	(16.64)	(17.15)	(17.00)	(15.36)	(102.58)	(15.58)	(15.22)	(16.88)	(15.13)	(16.41)
Passage Comprehension	108.40	107.78	108.68	108.31	102.58	108.55	113.76 *	103.42	106.42	111.53 *
	(14.45)	(13.87)	(15.22)	(12.92)	(14.86)	(13.28)	(13.00)	(15.25)	(14.01)	(13.72)
Applied Problem	104.80	103.11	104.99	105.65	98.78	104.20	111.17 *	96.88	102.10	109.54 *
	(17.13)	(16.22)	(17.78)	(16.07)	(15.47)	(16.80)	(16.77)	(15.17)	(14.78)	(17.77)
Mother's Characteristics										
Verbal Aptitude	31.30	31.17	31.43	31.30	25.23	31.54	36.53 *	27.87	29.96	33.55 *
	(5.16)	(4.84)	(5.29)	(4.31)	(3.70)	(1.11)	(2.26)	(4.84)	(5.82)	(4.62)
Education (yrs)	12.93	12.27	12.98	13.31 *	11.66	12.86	14.21 *	9.51	12.00	14.84 *
	(2.42)	(2.63)	(2.46)	(1.97)	(2.25)	(2.31)	(1.96)	(1.88)	(0.00)	(1.39)
Age	26.80	27.39	26.36	27.68	25.56	26.67	28.26 *	22.77	26.01	28.96 *
	(6.00)	(5.86)	(6.11)	(5.69)	(6.11)	(6.03)	(5.55)2	(6.12)	(5.82)	(5.07)
Logged Income	10.30	9.81	10.21	10.61 *	9.66	10.31	10.73 *	9.21	10.06	10.76 *
	(1.4)	(1.97)	(1.33)	(0.74)	(1.71)	(1.29)	(0.77)	(2.04)	(1.20)	(0.82)
Married (%)	69.0	75.0	67.0	67.9	45.0	76.0	83.0 *	42.0	60.0	84.0 *
	(0.45)	(0.42)	(0.46)	(0.46)	(0.49)	(0.422)	(0.36)	(0.49)	(0.48)	(0.35)

(Table1, continued)

Table 1, continued. Descriptive Statistics of Select Maternal and Child Characteristics

		Weekly Work Hours			Mother's PC Score			Mother's Education (yrs)		
	Full Sample	0	1-34	>=35	Bottom 30%	Middle 30%	Top 30%	<12	12	>12
Child's Characteristics										
Cognitive Problems (%)	2.5	2.9	2.7	1.6	3.0	1.0	3.0	2.0	2.0	3.0
	(0.16)	(0.17)	(0.16)	(0.13)	(0.16)	(0.12)	(0.17)	(0.15)	(0.13)	(0.17)
Bad Health (%)	8.2	7.0	9.3	6.4	10.0	7.8	6.8	10.0	9.2	6.8
	(0.28)	(0.26)	(0.29)	(0.25)	(0.30)	(0.27)	(0.25)	(0.30)	(0.28)	(0.25)
Birth Weight	6.90	7.01	6.91	6.74 **	6.63	6.97	7.03 *	6.82	6.74	6.99 **
	(1.4)	(1.36)	(1.37)	(1.47)	(1.47)	(1.33)	(1.33)	(1.31)	(1.44)	(1.39)
Black (%)	32.0	23.4	30.6	41.3 *	59.0	28.0	11 *	38.2	42.3	22.98 *
	(0.47)	(0.42)	(0.46)	(0.49)	(0.49)	(0.45)	(0.31)	(0.49)	(0.49)	(0.42)
Latino (%)	8.0	16.4	5.3	8.4 **	15.0	7.0	2.0 *	23.7	5.2	3.83 *
	(0.27)	(0.37)	(0.22)	(0.28)	(0.36)	(0.25)	(0.14)	(0.43)	(0.22)	(0.19)
N	1008	171	588	249	325	334	349			

Table 2. Regression Estimates of the Effects of Total Maternal Care on Child Cognitive Development

	(1)	(2)	(3)	(4)
Dependent Variable: Letter Word Score				
Total Care (Hrs/Wk)	0.034	0.015	-0.591	-0.699
	(0.026)	(0.025)	(0.147)*	(0.189)*
Mom's Passage Comprehension Test (PC)		0.534	-0.364	-0.814
		(0.123)*	(0.262)	(0.324)**
Total Care x Mom's PC Score			0.018	0.022
			(0.005)*	(0.006)*
Mom had less than 12 yrs of schooling		-1.247	-10.719	-5.927
		(1.536)	(4.074)*	(5.164)
Total Care x less than 12 yrs of schooling			0.179	0.135
			(0.069)*	(0.089)
At least some college		2.696	1.511	5.996
		(1.265)**	(3.096)	(3.781)
Total Care x Some college			0.021	-0.06
			(0.056)	(0.073)
R-squared	0.000	0.222	0.230	0.420
Dependent Variable: Passage Comprehension Score				
Total Care (Hrs/Wk)	0.02	0.012	-0.531	-0.618
	(0.024)	(0.024)	(0.140)*	(0.151)*
Mom's Passage Comprehension Test (PC)		0.519	-0.301	-0.592
		(0.125)*	(0.263)	(0.259)**
Total Care x Mom's PC Score			0.017	0.019
			(0.005)*	(0.005)*
Mom had less than 12 yrs of schooling		-0.177	-6.452	0.516
		(1.533)	(3.955)	(4.334)
Total Care x less than 12 yrs of schooling			0.12	0.07
			(0.064)+	(0.070)
At least some college		0.675	0.762	1.327
		(1.146)	(2.953)	(3.294)
Total Care x Some college			-0.005	-0.036
			(0.052)	(0.059)
R-squared	0.066	0.251	0.261	0.500

(Table2, continued)

Table 2, continued. Regression Estimates of the Effects of Total Maternal Care on Child Cognitive Development

	(1)	(2)	(3)	(4)
Dependent Variable: Applied Problem Solving Score				
Total Care (Hrs/Wk)	0.009	-0.004	-0.233	-0.584
	(0.029)	(0.029)	(0.159)	(0.220)*
Mom's Passage Comprehension Test (PC)		0.401	0.019	-0.568
		(0.129)*	(0.283)	(0.376)
Total Care x Mom's PC Score			0.008	0.016
			(0.005)	(0.007)**
Mom had less than 12 yrs of schooling		-1.41	-4.81	-0.955
		(1.631)	(4.031)	(5.477)
Total Care x less than 12 yrs of schooling			0.063	0.034
			(0.066)	(0.108)
At least some college		3.229	5.733	3.912
		(1.234)*	(3.149)+	(3.655)
Total Care x Graduated from high school			-0.05	-0.058
			(0.057)	(0.074)
R-squared	0.000	0.247	0.251	0.491
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1). Sample sizes are 934, 872, and 932 for the Letter Word Scores, Passage Comprehension, and Applied Problem Solving scores, respectively.

+ $p < 0.1$; * $p < 0.01$; ** $p < 0.05$

Table 3. Regression Estimates of the Effects of Intensity of Maternal Care on Child Cognitive Development

	(1)	(2)	(3)	(4)
Dependent Variable: Letter Word Score				
Intensity of Care (% Time in Active Care)	-0.008	-0.023	0.204	0.222
	(0.03)	(0.02)	(0.16)	(0.23)
Mom's Passage Comprehension Test (PC)		-1.203	-2.484	2.372
		(1.57)	(4.41)	(6.25)
Intensity x Mom's PC Score		2.818	4.847	-3.457
		(1.267)**	(3.63)	(4.84)
Mom had less than 12 yrs of schooling		0.534	0.954	0.797
		(0.125)*	(0.328)*	(0.49)
Intensity x less than 12 yrs of schooling			0.019	-0.019
			(0.07)	(0.10)
At least some college			-0.033	0.111
			(0.06)	(0.08)
Intensity x Some college			-0.007	-0.009
			(0.01)	(0.01)
R-squared	0.023	0.221	0.227	0.408
Dependent Variable: Passage Comprehension Score				
Intensity of Care (% Time in Active Care)	-0.009	-0.024	-0.003	-0.048
	(0.02)	(0.02)	(0.16)	(0.16)
Mom's Passage Comprehension Test (PC)		0.073	-1.07	5.736
		(1.54)	(4.02)	(4.75)
Intensity x Mom's PC Score		0.73	2.327	1.779
		(1.15)	(3.27)	(3.72)
Mom had less than 12 yrs of schooling		0.525	0.551	0.266
		(0.125)*	(0.36)	(0.36)
Intensity x less than 12 yrs of schooling			0.018	-0.021
			(0.06)	(0.08)
At least some college			-0.027	-0.04
			(0.05)	(0.06)
Intensity x Some college			0	0
			(0.01)	(0.01)
R-squared	0.062	0.252	0.253	0.501

(Table 3, continued)

Table 3, continued. Regression Estimates of the Effects of Total Maternal Care on Child Cognitive Development

	(1)	(2)	(3)	(4)
Dependent Variable: Applied Problem Solving Score				
Intensity of Care (% Time in Active Care)	-0.015	-0.024	-0.188	-0.189
	(0.03)	(0.02)	(0.14)	(0.19)
Mom's Passage Comprehension Test (PC)		-1.163	-2.611	2.254
		(1.68)	(4.42)	(5.85)
Intensity x Mom's PC Score		3.4	6.982	7.977
		(1.244)*	(3.311)**	(4.308)+
Mom had less than 12 yrs of schooling		0.391	0.035	-0.307
		(0.130)*	(0.31)	(0.44)
Intensity x less than 12 yrs of schooling			0.024	-0.015
			(0.06)	(0.09)
At least some college			-0.06	-0.124
			(0.05)	(0.072)+
Intensity x Some college			0.006	0.008
			(0.01)	(0.01)
R-squared	0.025	0.250	0.252	0.467
Additional Regressors	Age Only	B	B, I	B, I, L

Note: Coefficients for OLS regressions of specified tests are presented. Standardize errors are shwon in paraentheses. All test scores are assessed in 1997 when children are between the ages of 0 to 5. The categories of additional regressors are "Basic" Child, Maternal, and Household Characteristics (B), interactions between maternal care and mother's verbal scores and between care and mother's education (I), and lagged scores for letter word and applied problem solving tests assessed in 1997 (L). Detailed descriptions of all variables included in the analysis are presented in the appendix (Table A1). Sample sizes are 934, 872, and 932 for the Letter Word Scores, Passage Comprehension, and Applied Problem Solving scores, respectively.

+ $p < 0.1$; * $p < 0.01$; ** $p < 0.05$

Figure 1. Predicted Letter Word Scores by Mother's PC Score and Maternal Care

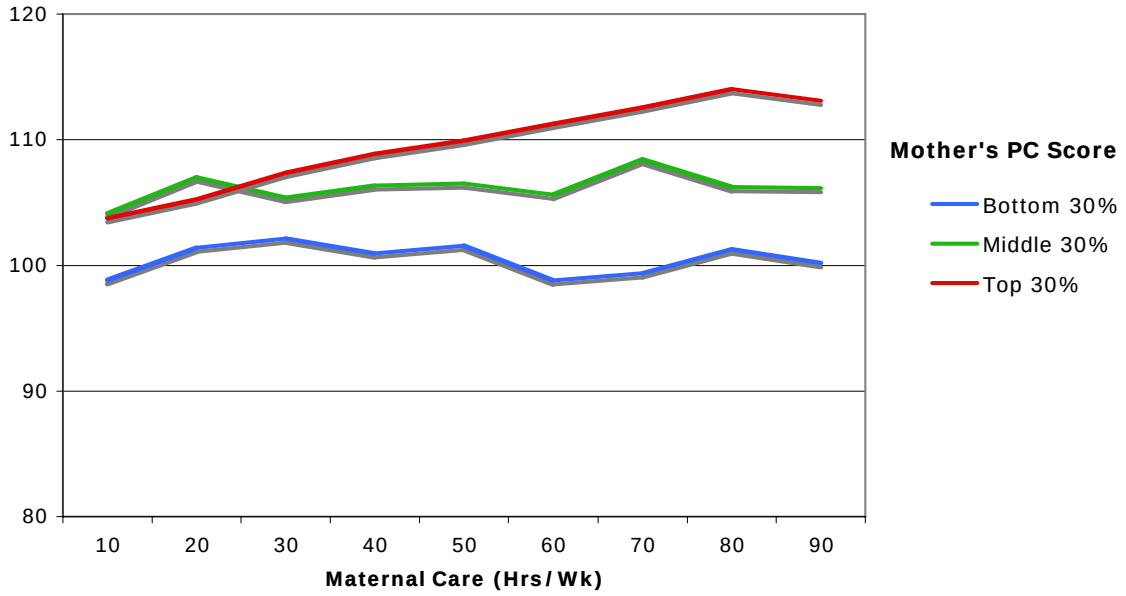

Figure 2. Predicted Passage Comprehension Score by Mother's PC Score and Maternal Care

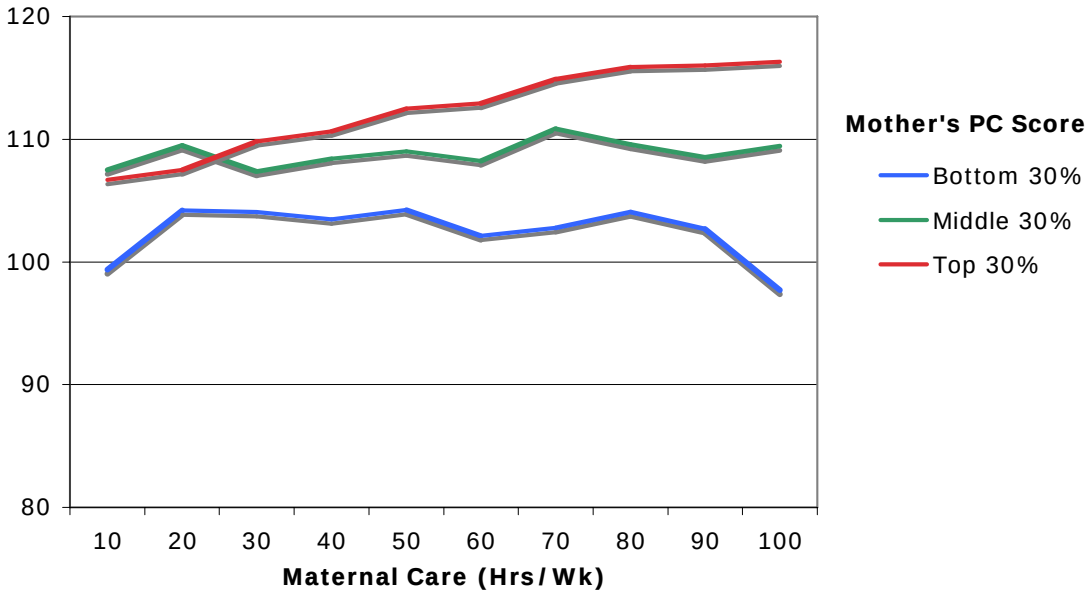

Figure 3. Letter Word Scores by Mother's Education and Maternal Care

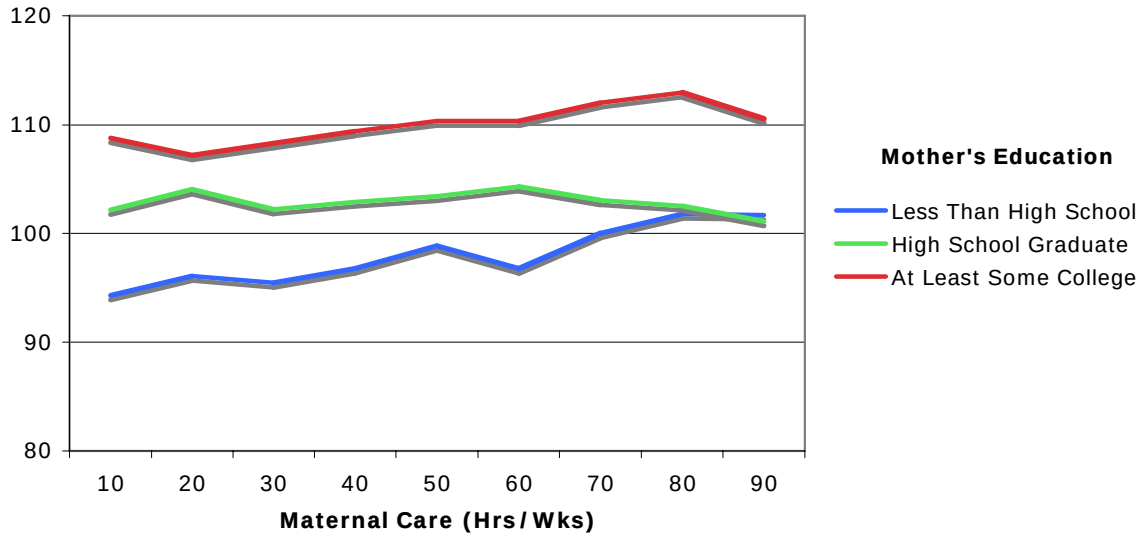

Figure 4: Predicted Applied Problem Solving Scores by Intensity of Care and Mother's PC Score

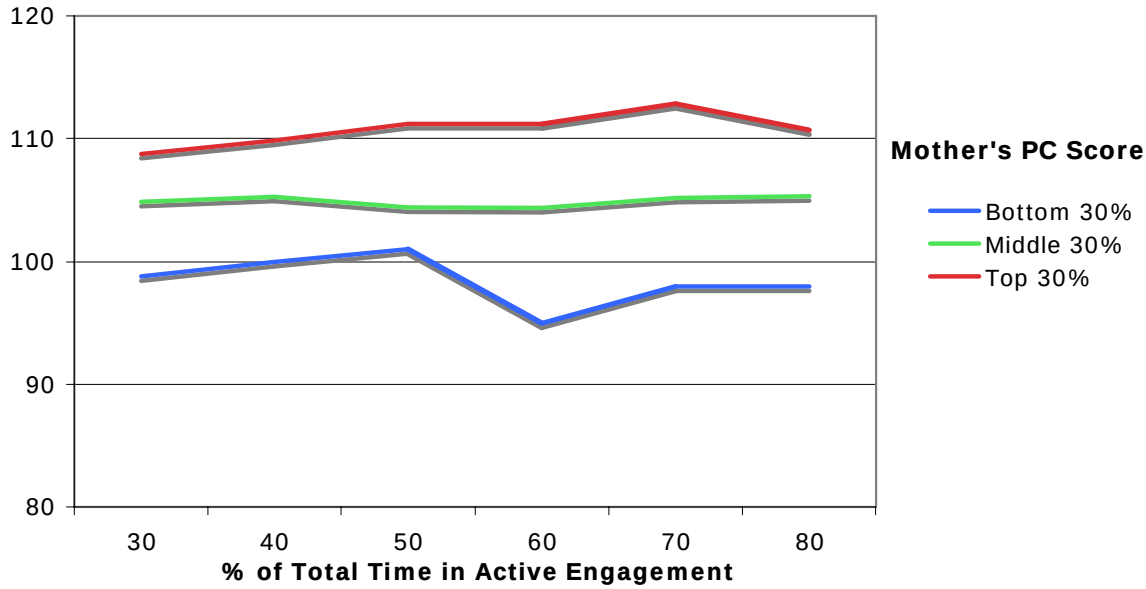

Table A1. Description of Variables Used in Analysis

Variables	Description
Type of Care (in 1997)	
Total Care	Total Hours per week mothers spend with child
Active Care	Hours per week in direct, one-on-one contact with mother
Passive Care	Hours per week being supervising but not in direct involvement with mother
Cognitive Outcomes (in 2002)	
Letter Word (LC)	Woodcock Johnson-Revised Letter Word Scores assessed when children are between 5-12 years old
Passage Comprehension (PC)	Woodcock Johnson-Revised Passage Comprehension Scores assess when children are between 5-12 years old
Applied Problem (AP)	Woodcock Johnson-Revised Applied Problem Solving Scores assess when children are between 5-12 years old
Maternal and Household Characteristics	
Mother's PC Score	Mother's Passage Comprehension Scores assessed in 1997
Mother's Education	Less than high school and at least some college (two d.v.'s)
Mother's Age	Mother's age at birth of child in years
Logged Income	Logged income at birth of child
Books	Number of books in the household
Married (%)	Marital Status at birth of child
Sibship size	Total number of siblings living in the household
Language skills	If English is mother's first language (d.v.)
Maternal employment	
Full time Work	If worked >=35 hours per week during each of the first 5 years of child's life (five d.v.'s)
Part-time Work	If worked between 0-34 hours per week during each of the first 5 years of child's life (five d.v.'s)
Not working	If did not work during each of the first 5 years of child's life (five d.v.'s)
Quality of School	Student-teacher ratio of child's school in 2002
Child Characteristics	
Cognitive Problems	Experienced cognitive problems at birth (d.v.)
Physical Problems	Experienced physical problems at birth (d.v.)
Behavioral Problems	Experienced behavioral problems at birth (d.v.)
General health at birth	Child health is worse than average at birth (d.v.)

(Table A1, continued)

Table A1, continued. Description of Variables Used in Analysis

Variables	Description
General health in 1997	If child health is fair or poor in 1997
Birth weight	Birth weight
Hospitalization	If ever hospitalized overnight as of 1997
Mental health	If ever seen a psychiatrist, psychologist, or mental health professional as of 1997
Race/Ethnicity	Child is Black or Latino (two d.v.'s)
Male	Child is male (d.v.)
Age in 1997 survey	Child's age in 1997 (five d.v.'s)
Age in 2002 survey	Child's age at time of 2002 assessment date
Lagged Test Scores	Child's Letter Word and Applied Problem Solving Scores assessed in 1997, only implemented for children aged 3-5 in 1997