

Does Amount of Time Spent in Child Care Predict Socioemotional Adjustment During the Transition to Kindergarten?

National Institute of Child Health and Human Development Early Child Care Research Network

To examine relations between time in nonmaternal care through the first 4.5 years of life and children's socioemotional adjustment, data on social competence and problem behavior were examined when children participating in the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care were 4.5 years of age and when in kindergarten. The more time children spent in any of a variety of nonmaternal care arrangements across the first 4.5 years of life, the more externalizing problems and conflict with adults they manifested at 54 months of age and in kindergarten, as reported by mothers, caregivers, and teachers. These effects remained, for the most part, even when quality, type, and instability of child care were controlled, and when maternal sensitivity and other family background factors were taken into account. The magnitude of quantity of care effects were modest and smaller than those of maternal sensitivity and indicators of family socioeconomic status, though typically greater than those of other features of child care, maternal depression, and infant temperament. There was no apparent threshold for quantity effects. More time in care not only predicted problem behavior measured on a continuous scale in a dose-response pattern but also predicted at-risk (though not clinical) levels of problem behavior, as well as assertiveness, disobedience, and aggression.

Over the past 25 years, the United States has experienced major changes in childrearing arrangements for young children. This transformation stems, in part, from increased maternal employment associated with changes in the role women play in society. In 1975, 34% of mothers with children under 6 years of age were in the workforce. In 1999, the corresponding figure was 61% (National Research Council and Institute for Medicine, 2000). Even more significant have been the changes with regard to mothers of infants. Today, the majority of mothers in the United States who return to work after having a child do so before their child's first birthday. Recent

figures (for 1998–1999) indicate that 58% of all women with infants under 1 year of age are in the labor force (Bureau of Labor Statistics, 2000); comparable rates in 1970 and 1985 were 27% and 46%, respectively (Kamerman, 2000). In the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care, the overwhelming majority of mothers who were employed in their infants' first year returned to work and placed their child in some kind of routine nonmaternal care arrangement before the child was 6 months of age (NICHD Early Child Care Research Network, 1997a; see also Hofferth, 1996). Moreover,

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Dallas; Chris Payne, University of North Carolina, Greensboro; Deborah Phillips, Georgetown University; Robert Pianta, University of Virginia; Suzanne M. Randolph, University of Maryland, College Park; David Redden, Research Triangle Institute, Chapel Hill, NC; Wendy Robeson, Wellesley College; Susan Spieker, University of Washington; Deborah Lowe Vandell, University of Wisconsin, Madison; Marsha Weinraub, Temple University. We express our appreciation to the study coordinators at each site who supervised the data collection, the research assistants who collected the data, and especially the families and child care providers who welcomed us into their homes and workplaces and cooperated willingly with our repeated requests for information.

Correspondence concerning this article should be addressed to NICHD Early Child Care Research Network, OEP, Office of the Director, NICHD, 6100 Executive Blvd. Room 4A01, Rockville, MD 20852.

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the amount of time that children enrolled in the NICHD study spent in nonmaternal care on a weekly basis once it was initiated remained more rather than less stable, with those experiencing 30 or more hours of care per week beginning in the first year of life (i.e., the majority) likely to maintain this high level of care throughout their preschool years. Considered together, these data suggest that nonmaternal care initiated in infancy for an extensive period each week is now a routine experience for many families in the United States.

How does such early and extensive nonmaternal care experience affect children's development, especially their socioemotional adjustment? Despite long-standing debate regarding the effects of nonmaternal care, reviews of the relevant literature published in the late 1970s and early 1980s revealed few discernible negative associations between early child care and psychosocial adjustment (Belsky & Steinberg, 1978; Clarke-Stewart & Fein, 1983). As more evidence became available, one series of papers argued that early and extensive nonmaternal care—that is, care initiated in the first year of life for more than 20 to 30 hr per week—was associated with elevated levels of aggression and noncompliance when children were 3 to 8 years of age (Belsky, 1986, 1988, 1990, 1994; Belsky & Rovine, 1988). There followed considerable discussion of this interpretation of the available data by a number of scholars (Clarke-Stewart, 1988; Phillips, McCartney, Scarr, & Howes, 1987; Richters & Zahn-Waxler, 1990; Thompson, 1988). Moreover, the emergence of additional evidence (e.g., Bates et al., 1994; Belsky & Eggebeen, 1991; Vandell & Corasaniti, 1990) led to the suggestion that it was lots of time in spent in care across the infancy, toddler, and preschool years—that is, early, extensive, and continuous care—that was associated with poorer socioemotional adjustment (Belsky, 1994, 2001).

Weaknesses of the data available in the 1980s were numerous and included (a) failure to take into account pre-existing family background factors that could account for the association between care use and child outcomes (Richters & Zahn-Waxler, 1990; Thompson, 1988), (b) failure to evaluate the quality of care (e.g., Belsky, 1984; Goelman & Pence, 1987; Howes, 1990; Howes & Olenick, 1986; McCartney, 1984; Phillips, 1987; Phillips et al., 1987; Thompson, 1988), and (c) questions as to whether elevated levels of aggression and noncompliance associated with the timing and amount of nonmaternal care might reflect assertiveness and independence from adults rather than problem behavior (Clarke-Stewart, 1989).

The NICHD Study of Early Child Care was launched in the early 1990s as a response to the

need for well-designed research to address questions concerning whether experiences in nonmaternal child care settings are associated with children's development. Designed to remedy a number of the problems inherent in previously collected data, the NICHD study measured children's experiences with nonmaternal care and their developmental outcomes from birth in a diverse sample of families in 10 locations across the United States. The NICHD data are thus well suited to address the following questions concerning relations between the use of nonmaternal care and children's socioemotional development that have been much discussed over the past 15 years: First, does cumulative amount of time spent in nonmaternal child care across the infancy, toddler, and preschool years predict children's socioemotional adjustment after considering potentially confounding family background factors? Second, do aspects of child care other than cumulative amount of time in nonmaternal care, especially quality of care (but also type and stability), account for detected associations? Third, might the quality of parenting explain, at least in part, the process by which cumulative amount of time in nonmaternal care is related to children's social functioning? Fourth, is there a threshold at which the effects of time in care become particularly pronounced (e.g., 20 hr per week, 30 hr per week)? Fifth, to what extent does timing of child care experience, in terms of average hours of care per week across the first 4.5 years, account for the detected effects of cumulative quantity of care? And finally, do detected linkages between quantity of care and socioemotional adjustment reflect high levels of problem behavior and children's cognitive-linguistic and social-emotional development at 54 months of age (NICHD Early Child Care Research Network, in press-b).

In addressing each of these questions, the research reported herein extends in new and different ways work reported to date by the NICHD Early Child Care Research Network. By focusing upon the socioemotional adjustment of children at 54 months of age and in kindergarten, the current inquiry provides a longitudinal update of related findings pertaining to children's self control and adjustment at 24 and 36 months of age previously reported in this journal (NICHD Early Child Care Research Network, 1998; see below). By focussing primarily, though not exclusively, on issues of quantity of care, this work complements two other focused reports dealing principally with quality of care (NICHD Early Child Care Research Network, in press-a) and with type of care (NICHD Early Child Care Research Network, submitted) that together

form a set of three in-depth, follow-up investigations of a more general analysis of multiple features of child care and children's cognitive-linguistic and social-emotional development at 54 months of age (NICHD Early Child Care Research Network, in press-b). What is thus new and different about this study is the focus on children before and after entry into school, along with consideration of issues of thresholds of quantity of care, timing of care, elevated levels of problem behavior, and distinctions between aspects of socioemotional adjustment (i.e., aggression, disobedience, assertiveness).

Before detailing the methods and results of this inquiry, we review evidence linking quantity of time children spend in child care, operationalized in terms of the early initiation of care, the average weekly hours spent in care, or both, with children's socioemotional adjustment. First, we consider literature related to quantity of care and adjustment in preschool-aged children and then early-school-aged children in the United States, before briefly reviewing findings related to children living outside the United States. Next, we consider research examining the cumulative quantity of care experienced across the infant, toddler, and preschool years (rather than during the first or second year only). Finally, we consider alternative explanations of research linking time spent in child care and socioemotional adjustment. The review shows that even though findings from reported studies are by no means perfectly consistent, there are grounds for anticipating associations between cumulative time in child care across the infancy, toddler, and preschool years and socioemotional adjustment, while highlighting a variety of issues that merit further consideration.

Early Child Care and Adjustment in the Preschool Years

Findings from small-sample studies linking increased levels of aggression or noncompliance with more experience in a variety of child care arrangements (Crockenberg & Litman, 1991; Rabinovich, Zaslow, Berman, & Hyman, 1987) or center-based care (Rubenstein, Howes, & Boyle, 1981; Schwarz, Strickland, & Krolick, 1974) were confirmed in two much larger scale survey studies. Baydar and Brooks-Gunn (1991) found, using data on 572 (White) children included in the 1986 child supplement of the National Longitudinal Study of Youth (NLSY) and controlling for maternal education and intelligence, that maternal employment in the first year, and thus reliance on a variety of nonmaternal care arrangements, predicted increased behavior problems in 3- and 4-year-old children. In a second

study, Hofferth (1999) found, using data from the nationally representative Panel Study of Income Dynamics ($n = 519$) and controlling for a host of background variables (i.e., child age, gender, age of household head, family structure, parental employment, parental education, number of children in family, urban vs. rural residence, race), that entering any of a variety of child care arrangements during the first year of life predicted higher scores on an index of behavior problems at ages 3 to 4, especially aggressive behavior. Furthermore, entry in the second year also increased the child's behavior problems, with the association increasing from Year 1 to Year 2. Findings held across socioeconomic strata in both of these large-scale surveys.

Even though the research just cited indicates that the early initiation of nonmaternal care is a predictor of problem behavior at preschool age, not all research replicates such results. Indeed, some investigations of center-based care have documented positive effects of early care experiences (Field, Masi, Goldstein, Perry, & Park, 1988; Howes, 1988; MacCrae & Herbert-Jackson, 1975; McCartney & Rosenthal, 1991; Prodromidis, Lamb, Sternberg, Hwang, & Broberg, 1995). Crockenberg and Litman's (1991) study of working mothers and children experiencing a variety of nonmaternal care arrangements found longer work hours by mothers (i.e., full-time employment) to be associated with greater child compliance at home and in the lab in a small-sample study of 2-year olds (see also Greenstein, 1993).

The Early School Years

Although it is clear that associations between timing and amount of care and socioemotional adjustment are varied—and that type of care arrangement does not easily account for the inconsistency in the database—further evidence that early or extensive child care is associated with problem behavior comes from research on children of school age. When Haskins (1985) prospectively followed a sample of high-risk, African American children who began center-based care in infancy as part of an early intervention program, he found them to be more physically aggressive (i.e., hit, kick, push) as kindergarteners than children whose center-based care was initiated after the first year of life. Similar results emerged in Egeland and Heister's (1995) prospective investigation of children from high-risk, predominantly Caucasian families who experienced a variety of child care arrangements, in that those who began child care in their first year were more

aggressive and had more externalizing problems in kindergarten, even after controlling for family background factors. Moreover, in first grade, children with early child care experience had higher behavior problem scores than age-mates without early child care experience, much like home-reared children with histories of insecure attachment. In both studies, child care effects dissipated as children got older.

Further evidence of a link between early child care and problem behavior in the early school years can be found in follow-up studies of the effects of early maternal employment. Such a literature is relevant to a discussion of child care effects because, especially in the first years of life, the major reason nonmaternal care is used is because of mothers' (and fathers') employment. Although Harvey (1999) reported that early maternal employment was not related to children's social adjustment in a study of children associated with NLSY, when Han, Waldfogel, and Brooks-Gunn (2001) followed up a subsample of 138 White children from the NLSY originally studied by Baydar and Brooks-Gunn (1991), they observed that resumption of employment by mother before the end of the child's first year, and thus reliance on early nonmaternal care (of a variety of types), predicted higher levels of mother-reported externalizing behavior in the early school years. Similarly, Youngblade, Kovacs, and Hoffman's (1999) recent research on 171 eight- to nine-year-olds from maritally intact Caucasian families indicated that children whose mothers were employed during the first year of life and were in varied routine nonmaternal care arrangements "evinced more acting out, less frustration tolerance, less skill with peers and were nominated more often by peers for 'hitting' and 'being mean' than children whose mothers were not employed" (Youngblade et al., 1999, p. 2), though effects on girls became nonsignificant when concurrent maternal employment was controlled (Hoffman & Youngblade, 1999). When considered collectively, the investigations just reviewed indicate that the timing or amount of early child care, or both, have repeatedly, though not always, been related to problem behavior in the early school years.

International Studies

Research conducted outside the United States also has documented associations consistent with those already reviewed between time in, and timing of, early child care and problem-type behavior (e.g., Bermuda: McCartney, Scarr, Phillips, Grajik, &

Schwarz, 1982; Italy: Varin, Crugnola, Ripamonti, & Molina, 1994; Sweden: Sternberg et al., 1991; but see Andersson, 1989, 1992, for contrasting evidence). Perhaps most noteworthy given how quantity of child care will be examined in the research reported herein is Borge and Melhuish's (1995) investigation of a complete cohort of 10-year-olds in one Norwegian community. In this work, "children were rated by teachers (but not parents) to show higher levels of problems when there had been a higher degree of maternal employment (i.e., years and hours), hence of nonparental care, in the first four years" (p. 37), even after controlling for family social class and child IQ.

Multiple Years of Care

The Borge and Melhuish (1995) strategy of examining care not simply in a single year but across multiple years was first implemented in the United States by Vandell and Corasaniti (1990) studying 236 White third graders from suburban elementary schools in Dallas, Texas. It is also the strategy adopted in this investigation because, as what follows suggests, it may be lots of time spent in nonmaternal care across the entire infancy, toddler, and preschool periods that most consistently predicts noncompliance, aggression, and problem behavior at school age (Belsky, 1994, 2001). Vandell and Corasaniti found that children whose full-time care was initiated in their first year and continued until school entry were rated by mothers and by teachers as more noncompliant and as getting along more poorly with peers than other children. These 8-year-olds were also less liked by classmates, according to peer reports, and received the poorest conduct evaluations on their report cards. Children whose continuous full-time care began in their second year of life functioned almost as poorly. This may explain why Belsky and Eggebeen (1991), who modeled their own analysis of the problem behavior of more than 1,200 four- to six-year-olds included in the 1986 NLYS child supplement on those of Vandell and Corasaniti, found that children whose mothers were employed full-time (more than 30 hr per week) beginning in their first or second year and continuing through their first 3 years were indistinguishable from one another. Like Vandell and Corasaniti, however, both sets of children evinced more behavior problems than age-mates whose mothers worked less extensively and who thus experienced less nonmaternal care. This was so even after controlling for birth order, maternal education, family poverty status, maternal intelligence, and race.

These findings are consistent with those from an investigation of 589 kindergartners from three public schools in Tennessee and Indiana. After controlling for family background factors, Bates et al. (1994) observed that children who spent more time in any kind of child care during their first 5 years of life showed more negative adjustment (i.e., teacher-rated behavior problems, peer-rated aggression, peer dislike, observed aggression) than children with less child care experience. Likewise, Park and Honig (1991) found in their investigation of 105 preschoolers in center-based child care that children who began full-time nonparental care in the first 9 months of life and continued in full-time care thereafter were rated by teachers as, and observed to be, more hostile-aggressive (i.e., fights, destructive, kicks, hits) and noncompliant than age-mates with less intensive and extensive care experience. In a study of 120 boys from working- and middle-class families, Belsky (1999) reported that more time in nonmaternal care across the first 3 and 5 years of life predicted more mother-reported externalizing problems when children were, respectively, 3 and 5 years old.

It is not the case, however, that all investigations of multiple years of early child care or maternal employment detect links with problem behavior. Harvey's (1999) NLYS investigation of maternal employment through the first 3 years of life and social functioning up to the late elementary school years provided little evidence of risk associated with early, extensive, and continuous maternal employment. And although the NICHD Study of Early Child Care found that more time in nonmaternal care through the first 2 years of life predicted less social competence and more problem behavior when children were 24 months of age, by the time children were 3 years of age, this was no longer the case (when the predictor was quantity of care through age 36 months). Indeed, one reason for the current inquiry is to determine whether the findings that emerged at age 2 but were gone by age 3 are present around the time of the transition to kindergarten.

Explanations of Quantity-of-Care Effects

Should it turn out that quantity effects reemerge, even after taking into consideration family background factors (e.g., maternal education, family income-to-needs ratio, maternal depression), it will be necessary to discount or entertain other potential confounding or explanatory factors and processes. It might be the case, for example, that features of child care other than quantity—such as its quality, type,

and stability—could be responsible for apparent effects of time spent in nonmaternal care. Alternatively, or additionally, it could be that effects of quantity of care on socioemotional adjustment themselves derive from effects of child care on parenting.

Other features of child care. Although much of the more recent work published on quantity of care and children's social development has controlled for family background factors, almost no research reporting negative associations between quantity of early child care and socioemotional adjustment has simultaneously examined child care quality. Thus, many of the findings under consideration could be a function of low-quality care rather than of a high amount of care. Because quality of care is perhaps the single most consistent predictor of child functioning of all features of care examined in the literature (e.g., Burchinal, Roberts, Nabors, & Bryant, 1996; Clarke-Stewart, 1989; Howes, Phillips, & Whitebrook, 1992; Howes, Smith, & Galinsky, 1995; Lamb, 1998), it is imperative to determine whether effects of quantity of care remain when quality of care is taken into consideration.

The same holds for (in)stability of care, as it is conceivable that changes in child care arrangements could engender uncertainty about the continuing availability of any nonmaternal care provider, undermine the child's emotion regulation, or both. Consistent with this possibility is evidence that familiar and stable caregivers or care arrangements may reduce the stress experienced by infants (Cummings, 1980, 1986) and the likelihood of the child developing an insecure attachment to his or her mother (Suwalsky, Zaslow, Klein, & Rabinovitch, 1986; see also NICHD Early Child Care Research Network, 1997b). Therefore, we include as an index of instability of care the number of different child care arrangements experienced through the first 3 years of life (i.e., the operational definition of instability) when testing whether effects of quantity remain after taking into consideration other features of child care.

Because type of child care might also be responsible for quantity of care effects, two ways of measuring type of care are used when determining whether quantity of care effects remain significant after taking into consideration other features of child care. Findings on aggression from experimental investigations of high-quality center-based programs (Haskins, 1985; Schwarz et al., 1974) seem to lend support to the hypothesis that it is specifically time spent in large-group settings that is responsible for

associations between quantity of care and problem outcomes. Alternatively, it may not be center-based care per se, but peer-group experience beginning at an early age that is responsible for the quantity of care effects under consideration. In light of these possibilities, in this research we evaluate quantity of care effects after taking into consideration experience in center-based care and in any nonmaternal care arrangement in which at least three children are present. By operationally defining peer-group exposure in this way, we identify children who experienced something akin to a "peer group" even when not in a child care center.

Parenting quality. What transpires in the family may also account for why time in child care could be associated with noncompliance, aggression, and problem behavior. Both theory and evidence suggest that parenting or, more specifically, the sensitivity of mothers in interacting with their children could contribute to the association between quantity of care and socioemotional adjustment. Brazelton (1986), Sroufe (1988), and Belsky (1999, 2001) have suggested that routine nonmaternal care, particularly when initiated very early in life, could undermine a mother's sensitivity toward her infant by reducing the amount of time available for the mother to learn the baby's signaling patterns and behavioral rhythms. Consistent with this argument is evidence from the NICHD study showing that more time in care predicts less harmonious mother-infant interaction and less sensitive mothering at 6, 15, 24, and 36 months of age, even when quality of child care and family selection variables are controlled (NICHD Early Child Care Research Network, 1999). Also consistent with this reasoning are findings from Belsky's (1999) study showing that not only did more time in care predict more negative mothering during the child's second and third years of life but that controlling for these effects in a mediational analysis eliminated significant linkages between lots of time in care and elevated levels of mother-reported externalizing problems at 3 and 5 years of age. The fact, however, that other studies failed to find effects of amount of care on parenting (Braungart-Reiker, Courtney, & Garwood, 1999; Burchinal, Bryant, Lee, & Ramey, 1992; Goldberg & Easterbrooks, 1988; Zaslow, Pedersen, Suwalsky, & Rabinovich, 1989) raises questions about the potential role of parenting with respect to the negative effects of lots of time in care on socioemotional adjustment. In this inquiry we address this issue by examining maternal sensitivity and hypothesize that controlling for this factor will attenuate any detected effects of quantity of child care.

Research Questions

On the basis of the literature reviewed, the research presented herein was designed to determine the following: (a) whether amount of time spent in nonmaternal child care through the first 54 months of life is related to socioemotional adjustment after controlling for family selection effects; (b) whether any such findings pertaining to quantity of care can be accounted for by other aspects of child care experience (i.e., quality, stability, type, peer-group exposure); (c) whether maternal sensitivity might be a mechanism by which quantity of care comes to predict socioemotional adjustment; (d) whether quantity-of-care effects are especially apparent when some threshold of time in care is reached; (e) whether timing of child care experience, in terms of average hours of care per week across the first 4.5 years, accounts for detected effects of cumulative quantity of care; and (f) whether detected linkages between quantity of care and socioemotional adjustment pertain to high levels of problem behavior or actual aggressive behavior rather than assertiveness.

Method

Overview of Study Design

Children at 10 geographic sites were followed from birth to kindergarten. Mothers were interviewed in person when infants were 1 month old. When children were 6, 15, 24, 36, and 54 months old, we assessed the home and family environment and, for those in nonmaternal child care, we observed the child care setting. Mothers were telephoned every 3 or 4 months in the intervening periods to update reports on child care use. Children's cognitive skills and social behavior were assessed at 15, 24, 36, and 54 months of age and in the fall of the kindergarten year. Parent, caregiver, and kindergarten teacher reports of children's social competence and behavior problems at 4.5 years and in kindergarten are the focus of this report.

Participants

Families were recruited through hospital visits to mothers shortly after the birth of a child in 1991 in 10 locations in the United States. During selected 24-hr intervals, all women giving birth were screened for eligibility and willingness to be contacted again. Of the 8,986 mothers who gave birth during the sampling period, 5,416 (60%) agreed to be telephoned in 2 weeks and met the eligibility require-

ments (mother over 18 and spoke English, mother healthy, baby not multiple birth or released for adoption, live within an hour of research site, neighborhood not too unsafe for teams of researchers to visit). Of that group, a conditionally random sample of 3,015 was selected (56%) for a 2-week phone call; the conditioning assured adequate representation (at least 10%) of mothers without partners, mothers without a high school degree, and ethnic mothers. At these calls, families were excluded if the infant had been in the hospital more than 7 days, the family expected to move in the next 3 years, or the family could not be reached with at least three attempts at contact. A total of 1,526 who were selected for the call were eligible and agreed to an interview; of these, 1,364 completed a home interview when the infant was 1 month old and became the study participants. These 1,364 families were similar on years of maternal education, percentage in different ethnic groups, and presence of partner in home to the eligible hospital sample. The resulting sample was diverse, including 24% ethnic minority children, 11% mothers not completing high school, and 14% single-parent mothers.

At 4.5 years, 1,081 children and their parents continued to be enrolled in the study. Mothers had an average of 14.4 years of education, and 15% were without a partner; average family income was 3.6 times the poverty threshold; and 79% of the children were European American, non-Hispanic. The participants differed from the 283 children who were recruited but were lost to follow-up. Mothers of participants had significantly ($p < .05$) more education ($M = 14.4$ years vs. 13.6 years) and were more likely to have a husband or partner in the household (85% vs. 77%); The children were less likely to be African American, non-Hispanic (11% vs. 17%); and the families had higher family incomes as determined by their income-to-needs ratio ($M = 3.6$ vs. 3.4). (The income-to-needs ratio is an annually adjusted, per capita index comparing household income with federal estimates of minimally required expenditures for food and shelter. An income-to-needs ratio of 1.0 is the U.S. government definition of poverty; therefore, a ratio of 3.0 represents a per capita income 3 times the poverty level.)

In kindergarten, 1,058 children and their parents continued to be enrolled in the study. Mothers had an average of 14.4 years of education, and 15% were single; average family income was 3.7 times the poverty threshold; and 79% of the infants were European American, non-Hispanic. The participants differed from the 306 children who were recruited but were lost to follow-up. Mothers of participants

had significantly ($p < .05$) more education ($M = 14.4$ years vs. 13.5 years) and higher family incomes (income-to-needs ratio: $M = 3.7$ vs. 3.3), and were more likely to have a husband or partner in the household (85% vs. 77%). The children were significantly less likely to be African American, non-Hispanic (11% vs. 19%).

Despite the selective loss of more minority and at-risk families over time (i.e., lower income, less education), the sample was by no means a simple White, middle-class one. With respect to the retained families, 27% of mothers had no more than a high school education (at time of enrollment), 25% had incomes no greater than 200% of the poverty level, and 20% were minority (i.e., not non-Hispanic European American).

Longitudinal Modeling of Repeated Measures

Before detailing the methods and measures used in this study, note should be taken of the fact that as many, but not all, measures were obtained more than once, hierarchical linear modeling (HLM) techniques were often used to generate two scores to describe patterns of change over time from measurements of the same construct obtained by the same method on multiple occasions. HLM is useful in describing patterns of change over time for each individual, and it provides more precise and interpretable indexes of developmental patterns than more traditional methods (Bryk & Raudenbush, 1992). The HLM analyses estimated individual growth curves, and we selected two measures of individual trajectories from the individual growth curves. One measure, the maximum-likelihood estimate of the intercept, reflects the predicted mean of the repeated measurements of a particular construct at the mean of the included assessment ages (i.e., 6, 15, 24, 36, and 54 months). Age was mean centered; therefore, intercepts reflect the predicted mean for the individual's growth curve at the average age (27 months). The second measure, the individual's slope, estimates the linear change in the construct across the multiple measurement occasions. Positive slope values reflect degree of increase in the variable over time, whereas negative slope values reflect degree of decrease in the variable over time. Thus, a child whose average number of hours spent in nonmaternal care increased over time would have a positive slope for the variable quantity of care, whereas one whose hours per week in care decreased over time would have a negative slope. The use of HLM to create summary scores on repeatedly measured constructs reduces the autocorrelation and error misestimation

associated with simple averages. A full description of the method can be found in Bryk and Raudenbush (1992).

Child Care Characteristics

Consistent with all other reports from the NICHD Study of Early Child Care and many other studies of child care (e.g., Casper, 1996; Kisker & Maynard, 1991; Riley & Glass, 2002; Veum & Gleason, 1991), nonmaternal child care was defined as regular care by anyone other than the mother, including care by fathers, relatives, and nannies (whether in home or out of the home), family day care providers, and centers. Several features of individual children's care experiences measured from birth through 54 months figure importantly in this report.

Quantity. Cumulative amount of time in nonmaternal care through the first 4.5 years of life was determined from telephone interviews with mothers at 3- or 4-month intervals about the number of hours and the types of care used during the prior 3 to 4 months. Two indexes were used in the analyses: the average number of hours per week that nonmaternal care was used from ages at the mean age between 3 months through 4.5 years (i.e., HLM intercept) and the linear rate of change (i.e., HLM slope) of hours per week over time.

Quality. Quality was defined by the caregiver-child interaction and stimulation experienced by the target child in the child care setting. Observational assessments were obtained at ages 6, 15, 24, and 36 months of age for children who were in nonmaternal care for 10 or more hours per week. At 54 months, the criterion for observation was being in care for 7.5 or more hours per week (because many children were enrolled in preschool programs 3 days per week for 2.5 hours per day). Quality was assessed during two half-day visits scheduled within a 2-week interval at 6 to 36 months and one half-day visit at 54 months.

At each visit, observers completed two 44-min cycles of the Observational Record of the Caregiving Environment (ORCE), during which they first coded the frequency of specific caregiver behaviors and then rated the quality of the caregiving. Positive caregiving composites were calculated for each age level observed by averaging these ratings. At 6, 15, and 24 months, the positive caregiving composite was based on the mean of five 4-point ratings: sensitivity to child's nondistress signals, stimulation of child's development, positive regard toward child, detachment (reflected), and flatness of affect (reflected). Cronbach's alphas for the compo-

site were .89 at 6 months, .88 at 15 months, and .87 at 24 months. At 36 months, these same five ratings plus two additional ratings—fosters child's exploration and intrusive (reflected)—were included in the composite. Cronbach's alpha was .83. At 54 months, the positive caregiving composite was the mean of 4-point ratings of caregivers' sensitivity and responsiveness, stimulation of cognitive development, intrusiveness (reflected), and detachment (reflected). Cronbach's alpha was .72. For this report, two cumulative indexes of positive caregiving were formed by HLM analyses using scores for all periods in which a child's care settings were rated: average quality of nonmaternal care at the mean age (i.e., HLM intercept) and linear rate of change over time in quality of nonmaternal care (i.e., HLM slope).

To ensure that observers at the 10 sites were making comparable ratings, all observers were certified before beginning data collection. The certification test at each age consisted of six 44-min videotapes that had been master-coded by experts. Exact agreement with the master codes at 60% or better was required. To prevent observer drift, all observers took two additional coding tests during the 10 months of data collection at each age assessment; a criterion of 60% exact agreement was used to allow continued data collection. In addition, observer agreement was assessed during live, on-site observations. At each site, all possible pairs of observers were required to visit both home-based and center-based child care.

Reliability estimates for the positive caregiving composite score were computed for both the master-coded videotapes and live observations using Pearson correlations and the repeated-measures ANOVA formulation described in Winer (1971, p. 287). Reliability exceeded .90 at 6 months, .86 at 15 months, .81 at 24 months, .80 at 36 months, and .90 at 54 months.

At least one child care quality assessment was obtained for 91% of the sample of children studied at 4.5 years of age (985 of 1,081); at least two assessments were obtained for 779 children. Of the 1,064 children, 697 were observed for all eligible periods; 232 children were not observed in an eligible setting at one age; 70 children were not observed at two ages; 34 children were not observed at three ages; and 16 children were not observed at four ages. Thirty-four children were never in regular nonmaternal care for 10 or more hours a week.

Type. For each of 16 epochs (3-month intervals from birth to 36 months and 4-month intervals after 36 months), the child's primary care arrangement was classified as a center, a child care home (any home-based care outside the child's own home

except grandparent care), in-home care (by any caregiver in the child's own home except father or grandparent), grandparent care, or father care. Information was available on each setting with respect to the number of children present other than the target child. Epochs in which children were in nonmaternal care less than 10 hours per week were coded as exclusive maternal care. Two indicators of type of care are used in this report. Center care reflects the proportion of epochs in which the child received care in a center, and peer-group exposure reflects the proportion of epochs in which a child was in any child care setting in which there were at least two other children in addition to himself or herself.

Instability. For each of twelve 3-month epochs from birth to 36 months, a count was made of the number of times the mother reported that the child started a new child care arrangement, or one that had previously stopped and then started again. Because of a few extreme scores, this variable was truncated at the 95th percentile. Children who received no nonmaternal care received scores of 0. Thus, low scores reflected more stable arrangements and high scores reflected less stable arrangements.

Maternal, Child, and Family Characteristics

The following maternal, child, and family characteristics were included in the analyses as controls for selection effects: maternal education in years, the mean family's income-to-needs ratio (family income divided by the poverty threshold for its household size), partner status (the proportion of 3- to 4-month epochs during which mother reported living with a partner or husband), child sex, infant temperament (see the following discussion), ethnic group (non-Hispanic African American, non-Hispanic European American, Hispanic, or other), and maternal depressive symptoms (the intercept or predicted mean and linear slope over 4 years) as measured by the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The mother reported the family income and household size at 6-, 15-, 24-, 36-, and 54-month assessments. The family income was divided by the income determined by the U.S. Census as the poverty threshold for a family of that size. For example, an income of \$15,455 in 1995 for a family of four would have an income-to-needs ratio of 1.

Infant temperament was measured by means of fifty-five 6-point items from the Infant Temperament Questionnaire completed by mothers at 6 months (Medoff-Cooper, Carey, & McDevitt, 1993). The composite measure reflected difficult temperament

and was created by calculating the mean of the nonmissing items with appropriate reversal of scales, so that numerically large scores consistently reflected a more "difficult" temperament. Thus, higher scores reflected a more negative disposition, that is, a child seen as more intense, less positive in mood, and less adaptable to daily routines. Cronbach's alpha was .81.

In addition, a composite measure of maternal sensitivity, based on evaluations of observed maternal behavior at 6, 15, 24, 36, and 54 months (NICHD Early Child Care Research Network, 1999) served as a potential explanatory factor, rather than control variable, in the analyses to be reported. Mother-child interaction was videotaped in semistructured 15-min observations at each age. The observation task at 6 months had two components. In the first 7 min, mothers were asked to play using any toy or object available in the home or none at all; for the remaining 8 min, mothers were given a standard set of toys they could use in play with their infants. At 15, 24, 36, and 54 months, the observation procedures followed a three-boxes task in which mothers were asked to show their children age-appropriate toys in three containers in a set order (see Vandell, 1979). The mother was instructed to have her child play with the toys in each of the three containers and to do so in the order specified.

At each age a maternal sensitivity composite was constructed based on three ratings. At 6, 15, and 24 months it comprised the sum of three 4-point ratings: sensitivity to nondistress, positive regard, and intrusiveness (reversed). At 36 and 54 months, three 7-point ratings were composited: supportive presence, respect for autonomy, and hostility (reversed). Two cross-age composite scores were created, after standardizing scores at each age, using HLM procedures, predicted mean maternal sensitivity at the average age (i.e., intercept), and linear rate of change over time (i.e., slope).

Tapes from all research sites were shipped to a single site for coding. Coders were blind as to other information about the families. Intercoder reliability was determined by assigning two coders to 20% of the tapes randomly drawn at each assessment period. Intercoder reliability was calculated as the intraclass correlation (Winer, 1971), which ranged from .83 to .87 for the maternal sensitivity composites over time.

Child Adjustment at 4.5 Years and Kindergarten

The child outcomes examined in this study were mother-, caregiver-, and teacher-reported measures

of social competence and problem behavior, and child–teacher relationship conflict obtained when children were 54 months of age or in kindergarten. In addition, at 54 months, children were observed in a dyadic interaction with a friend, and their peer interactions in child care settings were observed.

Social competence. Mothers completed the Social Skills Questionnaire from the Social Skills Rating System (SSRS; Gresham & Elliott, 1990) for their children at both times of measurement. Teachers completed the instrument when children were in kindergarten. This instrument is composed of 38 items describing child behavior, each rated on a 3-point scale reflecting how often the child exhibited each behavior. Items are grouped into four areas: cooperation (e.g., keeps room neat and clean without being reminded), assertion (e.g., makes friends easily), responsibility (e.g., asks permission before using someone else's property), and self-control (controls temper when arguing with other children). The total score used in this report represents the sum of all 38 items, with higher scores reflecting higher levels of perceived social competence ($\alpha = .93$ for kindergarten teacher; .86 and .88 for mothers at 54 months and kindergarten, respectively). The SSRS was normed on a diverse, national sample of children in the 3- to 5-year age range and showed high levels of internal consistency (median = .90) and test–retest reliability (.75 to .88) and moderate concurrent and predictive validity to other indexes of social competence.

For children who were in child care at least 7.5 hr per week at age 54 months ($n = 833$), caregivers completed a slightly modified version of the California Preschool Social Competency Scale (CPSC; Levine, Elzey, & Lewis, 1969). The CPSC is a 30-item instrument assessing a range of social competencies especially relevant in settings where there are other children (e.g., safe use of equipment, using names of others, greeting new child, initiating group activities). Four items were added to index specific features of peer play (cooperation, following rules in games, empathy, and aggression). All items were rated on 4-point scales. Items scored as not applicable were set as missing. The total score for social competence was the sum of the 34 items, with higher scores denoting greater social competence ($\alpha = .88$).

Behavior problems. Mothers, caregivers, and teachers completed appropriate versions of the Child Behavior Checklist (CBCL; Achenbach, 1991), a widely used measure of behavior problems. The CBCL 4–18y, completed by mothers at 54 months and in kindergarten, lists 113 problem behaviors; the

parent rates each as not true (0), somewhat true (1), or very true (2) of her child. At 54 months, the TRF 2–5y was completed by caregivers, and at kindergarten age, the 100-item TRF 5–18y was completed by teachers. Reliability and validity of these instruments are well established (Achenbach, 1991). The total problem behavior score served as the dependent variable in the primary analysis. Raw scores were converted into standard T scores, based on normative data for children 4 to 11 years of age. In secondary analyses designed to address the question of whether quantity of child care was related to aggression and disobedience or just assertiveness, three composite measures were created by summing select items from the CBCL. An assertiveness subscale was based on items such as bragging and boasting, talks too much, argues a lot, and demands attention. A disobedience subscale was based on items such as defiant—talks back to staff, disrupts classroom discipline, temper tantrums, lying and cheating, and fails to carry out assigned tasks. The aggression subscale was based on items such as cruelty to others, destroys own things, gets in many fights, attacks others, hits others, and explosive and unpredictable. The decision was made not to use the formal aggression subscale score from the CBCL because it includes items from all the subscales just described (i.e., items reflecting disobedience and assertiveness, as well as aggression).

Teacher–child conflict. At 54 months and at kindergarten, child care providers and teachers completed the Student–Teacher Relationship Scale (STRS; Pianta, 2001). The STRS is a widely used indicator of teachers' perceptions of the quality of their relationship with a specific child, and one specific scale, Conflict, appears to be a particularly informative indicator (e.g., Birch & Ladd, 1997; Hamre & Pianta, 2001). Teacher-reported conflict in kindergarten is predictive of later disciplinary problems in school, controlling for pre-existing problem behavior (Hamre & Pianta, 2001) and is related to poorer school achievement and problems in peer relations (Birch & Ladd, 1997; Hamre & Pianta, 2001). As such, teacher–child conflict reflects a unique feature of the child's adjustment to the school (or preschool) setting.

In the present sample, caregivers completed the STRS at 54 months for the children in child care, and kindergarten teachers completed the STRS in the late fall of kindergarten. Coefficient alphas for the Conflict scale were .86 at 54 months and .90 at kindergarten.

Dyadic peer interaction. At 54 months, study children were videotaped while they interacted with

a peer during three structured play episodes, and trained observers coded 10 ratings of social behavior for each episode. The first episode involved a cartoon mouse pop-up game, the second used a single hand-held picture-viewing apparatus, and the third used a doctor kit. Ratings were made using 5-point Likert scales for behavior in each episode, then averaged across episodes for each scale. Scales indicating negative behaviors were recoded into 3-point scales because of the low frequency of occurrence. Two composite indicators of the quality of interactions with the peer were computed for each child. Negative interaction was computed as the sum of ratings on "contributes to negative interaction," "aggression," and "negative mood." Positive interaction was computed as the sum of "contributes to positive interaction," "prosocial behavior," and "positive mood." Coefficient alpha was .75 for the positive interaction composite and .67 for the negative interaction composite. The negative dyadic interaction composite was highly skewed and had limited nonzero values; therefore, it was dichotomized as 0 if below the median (-.94) and 1 otherwise.

Behavior in child care. As part of the ORCE child care observation at 54 months, the interactions of the study child with peers in the child care setting were recorded during each of the observation periods (see previous description). Two composites were derived from time-sampled codes of the child's behavior. Children were observed across six 10-min segments, with each 10 min consisting of ten 30-s observe and 30-s record intervals. Observers were trained to reliability based on agreement with precoded videotapes. Observers were required to reach exact agreement on 60% of intervals coded across 18 taped observations before being certified to collect data in the field. Once in the field, observers were also required to conduct two live reliability observations with a second observer. Estimates of live agreement for individual time-sampled codes (correlations) ranged from .58 to .99.

The child care positive composite was computed as the sum of three codes: cooperative play, boisterous play, and other positive or neutral interaction. The child care negative composite was computed as the sum of four codes: physical aggression, verbal aggression, negative behavior toward peer, and other negative nonaggressive acts. The negative interaction composite was highly skewed and had limited nonzero values; therefore, it was dichotomized as 0 if below the median (2) and 1 otherwise.

Correlations were obtained for concurrent associations within the sets of 54-month and kindergarten

outcomes and for cross-time associations between analogous measures at both periods (all correlations reported are significant at $p < .05$). For the 54-month outcomes, the highest associations were between caregiver reports of social competence and externalizing problems ($r = -.63$), social competence and conflict ($r = -.50$), and externalizing problems and conflict ($r = .68$). Mother-reported social competence and externalizing problems were moderately associated ($r = -.32$). The remaining concurrent associations among dependent measures at 54 months were low. At kindergarten, the highest associations were again between teacher reports of social competence and externalizing problems ($r = -.56$), social competence and conflict ($r = -.55$), and externalizing problems and conflict ($r = .75$). Mother-reported social competence and externalizing problems were moderately associated ($r = -.42$). Over time, correlations were as follows: mother-reported social competence ($r = .67$), mother-reported problems ($r = .72$), teacher-reported social competence ($r = .28$), teacher-reported externalizing problems ($r = .40$), and teacher-reported conflict ($r = .34$). Thus, for several outcome measures at both periods there was moderate overlap, and for similar measures across periods there was also moderate overlap. Because of these associations, the findings reported are discussed in relation to the overall pattern of results, recognizing that these multiple indicators of social functioning share variance.

The mean, standard deviation, and ranges of all variables are presented in Table 1. Overall, mothers, caregivers, and teachers rated the sample well within the normal range on all standardized measures. The mean CBCL externalizing T scores were approximately 50 at both time points according to mothers and teachers, with 50 being the mean for the norming population. Few children scored in the clinical range, defined as a T score of 65 or above, and about 16% of the same scored in the at-risk range, defined as a T score of 60 or above (1 *SD* above the mean). The SSRS social competence mean scores ranged from 99 to 103, again falling close to the expected population mean of 100. Further details about all data collection procedures are documented in Manuals of Operation of the study (<http://public.rti.org/secc/>).

Results

Table 1 presents descriptive statistics on all variables used in the analyses. Most of the sample entered into at least part-time nonmaternal care early in their lives. By 3 months of age, almost half of the sample

Table 1
 Descriptive Statistics on All Analytic Variables

Variable	M	SD	Minimum	Maximum	N
Quantity of child care (hours)					
Mean hours per week (3–54 months)	27.0	15.4	–0.5	61.6	982
Linear change/slope (3–54 months)	0.2	0.3	–1.1	1.2	982
Mean child care hours 3–6 months	21.0	18.0	0	62.5	982
Mean child care hours 7–12 months	23.7	18.5	0	80.0	980
Mean child care hours 13–24 months	26.0	16.7	0	65.8	982
Mean child care hours 25–36 months	26.8	17.0	0	68.8	982
Mean child care hours 37–54 months	32.7	15.8	0	92.3	982
Child and family characteristics					
Gender (1 = male)	50%				982
Ethnicity:					
Black	11%				982
Hispanic	6%				982
Other	4%				982
Mother's education	14.5	2.4	7.0	21.0	982
Income-to-needs ratio (6–54 months)	3.8	2.8	0.2	27.4	982
Child temperament at 6 months	3.2	0.4	1.5	4.4	982
Depression mean (i.e., HLM intercept: 6–54 months)	9.2	5.4	1.4	31.7	982
Depression linear slope (6–54 months)	0.2	0.7	–2.8	4.1	982
Parenting mean (i.e., HLM intercept: 6–54 months)	0.1	0.6	–2.9	1.3	982
Parenting linear slope (6–54 months)	–0.0	0.1	–0.3	0.2	982
Other child care experiences					
Center care: proportion time	0.2	0.3	0	1.0	982
Quality mean (HLM intercept: 6–54 months)	2.8	0.2	2.1	3.4	982
Peer group exposure: proportion time	0.6	0.3	0	1.0	982
Instability (3–34 months): number of changes	10.8	4.2	0	18.0	982
Child Social Functioning					
Mother ratings: 54 months					
Social competence	98.7	13.3	53.0	130.0	935
Externalizing problems	51.6	9.4	30.0	82.0	940
Caregiver ratings: 54 months					
Social competence	104.8	13.5	46.1	135.0	725
Externalizing problems	50.1	9.5	35.0	87.0	689
Conflict	18.8	6.6	12.0	49.0	691
Observations: 54 months					
Dyadic play positive	0.1	2.5	–8.4	7.9	698
Dyadic play negative (> median)	0.4	0.5	0	1.0	694
Child care positive (log) ^a	2.3	1.0	0	4.0	838
Child care negative (> median)	0.5	0.5	0	1.0	838
Mother ratings: kindergarten					
Social competence	102.9	14.7	56.0	130.0	938
Externalizing problems	50.0	9.7	30.0	81.0	940
Teacher ratings					
Social competence	103.5	14.1	49.0	130.0	893
Externalizing problems	49.9	9.0	39.0	89.0	903
Conflict	10.7	5.4	7.0	34.0	905
Mother ratings: 54 months					
Aggression items	1.3	1.9	0	12.0	931
Disobedience items	2.9	2.1	0	14.0	934
Assertive items	3.7	2.1	0	10.0	936
Caregiver ratings: 54 months					
Aggression items	1.3	2.4	0	14.0	593
Disobedience items	1.9	2.6	0	14.0	676
Assertive items	0.4	0.6	0	2.0	698

Table 1 Continued

Variable	<i>M</i>	<i>SD</i>	Minimum	Maximum	<i>N</i>
Mother ratings: kindergarten					
Aggression items	1.2	1.8	0	13	924
Disobedience items	2.7	2.2	0	13	925
Assertive items	3.4	2.1	0	10	926
Teacher ratings: 54 months					
Aggression items	0.7	1.8	0	16	891
Disobedience items	1.8	2.9	0	20	880
Assertive items	1.4	2.12	0	10	894

^aLog transformation.

was being cared for by someone other than the mother for at least 10 hr per week. Almost three fourths of the children were in at least part-time care by their first birthday. On average, children were experiencing 21 hr of child care between 3 and 6 months, with increases in average hours of care per week across early childhood. Between 37 and 54 months, children were experiencing an average of 32.7 hr of routine nonmaternal care per week. Note that the average hours per week that children were in nonmaternal child care from 3 to 54 months ranged from 0 to almost 62 hr, with a mean of 27 hr per week and a standard deviation of almost 15 hr. However, more than half the children experienced changes in hours of care per week of at least 15 hr per week across adjacent reporting periods. At the same time, cross-time stability coefficients show that children who experienced lots of time in nonmaternal care at one point also experienced lots of time in care at other periods. Indeed, the cross-age correlation in average hours per week in care ranged from a high of .81 ($p < .001$) between the third and fourth year to a low of .46 ($p < .001$) between mean hours of care in the first and fourth years. Overall, children showed modest increases in hours of care across the 51-month period. We chose indexes from individual growth curve analyses to describe individual differences in child care experience and they serve as the primary quantity-of-care predictors of child outcomes in this investigation. The hours intercept ($M = 27.0$, $SD = 15.4$) represents the predicted mean hours of care experienced at the mean age between 3 and 54 months (i.e., HLM intercept). The hours slope ($M = .17$ hr per month, $SD = 18$) describes the extent to which hours increased (i.e., positive value) or decreased (i.e., negative value) linearly over time.

Statistical analyses were undertaken to answer a series of questions posed in the introduction and some additional questions that emerged during the data analysis. Fourteen outcomes were evaluated,

and we used the consistency of findings across the multiple indicators of social functioning as the criterion for determining when an effect was detected. Rather than relying on a single regression analysis that would include in a single prediction model all the explanatory variables considered in this inquiry, we analyzed the data in a series of interrelated steps (i.e., nested regression models) so that we could address distinctive and logically ordered questions in a lawful sequence. Thus, we first asked whether quantity of care predicted multiple indexes of socioemotional adjustment when controlling for a substantial number of family background factors that past work has shown to be confounded with use of child care. Next, we asked whether initially detected quantity effects remained significant or were attenuated when other features of child care that might account for quantity effects were taken into consideration (i.e., quality, type, instability) and, thereafter, whether the same was true when maternal sensitivity was added to the prediction model. Results from these analyses stimulated the search for thresholds at which hours of care per week might have especially pronounced effects and for evidence that effects of time in care might be more or less pronounced during particular periods such as the first 6 months or the first 2 years of life. Finally, we sought to determine whether quantity of care predicted high levels of problem behavior and, in particular, aggression and disobedience rather than just assertiveness.

Effects of Quantity Controlling for Background Factors

To evaluate the relation between time in nonmaternal child care and socioemotional adjustment, an initial multiple regression model (i.e., Model 1) was estimated. This base model was applied to each of nine dependent variables measured at 54 months and five measured at kindergarten to determine the

effects of two indicators of quantity of child care after controlling for family background factors. The two indicators of child care quantity represented the predicted mean number of hours per week of care experienced by that child at the mean age between 3 and 54 months of age (i.e., HLM intercept) and linear change over time for that child (i.e., HLM slope) in hours of care per week across the same developmental period. The covariates included in the base model to control for background factors were site (represented by nine dummy-coded variables), child gender (male), child ethnicity (African American non-Hispanic, Hispanic, other), 6-month difficult temperament, maternal education at enrollment, average income-to-needs ratio from 6 to 54 months, and average maternal depression (i.e., HLM intercept) and linear change over time in maternal depression (i.e., HLM slope) across the same period. As analyses revealed that significant interactions between family and child care factors, and among child care factors, were detected at a rate no greater than chance, no interaction effects are presented, consistent with standards of reporting adopted by the NICHD Study of Early Child Care.

The effects of the two quantity of care predictors in the base model, mean hours of care per week, and linear change in hours per week are detailed under three columns in Table 2, each labeled "Model 1: Base." The first such column (i.e., fourth column of table) indicates whether the two quantity variables, when considered together, significantly predicted a particular outcome (i.e., "pooled"). Inspection of the relevant data shows that the two quantity variables significantly predicted three of the nine 54-month outcomes—caregiver-reported social competence, externalizing problems, and conflict—and three of the five kindergarten outcomes—mother-reported externalizing problems and teacher-reported externalizing problems and conflict. The second column labeled "Model 1: Base" (i.e., seventh column in the table) presents the effect of the individual quantity predictor, mean hours per week of care, net of all other factors in the base model; the third column labeled "Model 1: Base" (i.e., tenth column) presents the same information for the second quantity predictor, linear change over time in hours per week in nonmaternal care.

Inspection of the relevant data indicates that children who averaged more time in nonmaternal child care across their first 54 months of life scored lower on caregiver-rated social competence and higher on caregiver-rated externalizing problems and caregiver-child conflict at 54 months, and were observed to engage in more negative dyadic play at

this age. More time spent in child care also predicted, at kindergarten age, more mother- and teacher-reported externalizing problems and more teacher-child conflict. Furthermore, when hours spent in child care increased (vs. decreased) over time, children were rated by caregivers at age 4.5 years as being less socially competent and as showing more externalizing problems, but they were observed to engage in more positive behavior during the child care observations. Change in time spent in child care proved unrelated to kindergarten outcomes, however.

Alternative Explanation: Other Features of Child Care

As part of a series of nested regression analyses, a second model (i.e., Model 2) was estimated to determine whether effects of quantity of care just described would remain significant—or even emerge for the first-time (i.e., suppression effects)—when four other features of child care were added to the base model: average quality of child care, proportion of time spent in center care, proportion of peer-group exposure, and instability of care. To the extent that quantity of care effects remain significant with these other variables included, this would indicate that quantity effects were not exclusively a function of other features of child care purposefully excluded from the base model. Inspection of the fifth column in Table 2, which reports the significance of the two quantity of care predictors combined when additional child care factors are added to the base model, indicates that in only one of six cases did a previously significant pooled effect of quantity prove insignificant in Model 2 (i.e., maternal report of externalizing problems in kindergarten: from $p < .05$ to $p > .05$) and that two previously insignificant pooled quantity of care effects proved significant once other features of child care experience were taken into consideration (i.e., mother-reported social competence at 54 months and in kindergarten: from $p > .05$ to $p < .01$ and $.05$, respectively).

Inspection of the second column labeled "Model 2" in Table 2 (i.e., eighth column of table) shows that all significant effects of hours of care per week (i.e., HLM intercept) detected in Model 1 remained significant when the four additional child care variables were added to the prediction model, and that in the case of mother-rated social competence, a previously insignificant effect of hours per week in care proved significant, indicating that more time in care predicted less mother-reported social compe-

Table 2

Effects of Quantity of Care (Mean Hours per Week, Linear Change Over Time) in Model 1 (Base: Covariates Only), Model 2 (Plus Additional Child Care Predictors), and Model 3 (Plus Maternal Sensitivity)

54 months ^c	Pooled tests ^a			Hours of care per week ^b			Linear change over time in hours/week				
	N	Stat ^d	Model 1: base	Model 2: adds child care	Model 3: adds parenting	Model 1: Base	Model 2: adds child care	Model 3: adds parenting	Model 1: base	Model 2: adds child care	Model 3: adds parenting
M social competence	935	B		*	*	-0.05	-0.09 **	-0.07 *	-0.04	-0.04	-0.03
CG social competence	725	B	***	***	***	-0.13 ***	-0.15 ***	-0.13 **	-0.12 **	-0.12 **	-0.10**
M.externalizing prob.	940	B				0.06	0.05	0.04	-0.01	-0.01	-0.01
CG externalizing prob.	689	B	***	***	***	0.25 ***	0.23 ***	0.22 ***	0.08 *	0.07 *	0.07
CG conflict	691	B	***	***	***	0.22 ***	0.20 ***	0.18 ***	0.07	0.06	0.05
Dyad. play (positive)	698	B				0.01	-0.04	-0.03	-0.02	-0.03	-0.02
Child care (positive)	838	B				0.02	-0.01	0.01	0.07 *	0.06	0.07
Dyad. play (negative)	694	OR				1.01 *	1.01*	1.01	1.42	1.43	1.41
Child care (negative)	838	OR				1.01	1.01	1.01	0.92	0.86	0.85
Kindergarten ^c											
M social competence	938	B		*		-0.03	-0.06	-0.04	-0.04	-0.04	-0.03
T social competence	893	B				-0.05	-0.04	-0.02	0.02	0.02	0.03
M externalizing prob.	940	B	*			0.09 **	0.08 *	0.08 *	0.01	0.00	-0.00
T externalizing prob.	903	B	***	**	**	0.14 ***	0.11 **	0.10 **	-0.03	-0.05	-0.05
T conflict	905	B	***	*	*	0.13 ***	0.09 *	0.09 *	-0.02	-0.03	-0.04

^aTwo degrees of freedom tests of no effect on intercept (mean) or slope (linear change).

^bBase model with factors for site, gender, ethnicity, mother's education, maternal depression (intercept, slope) 6-54 months average income-to-needs ratio, 6-month temperament. Model 2 adds child care factors: average quality of care, proportion of center care, proportion of peer group exposure, instability of care. Model 3 adds parenting factors: mean (i.e., HLM intercept) and linear change (i.e., HLM slope) from 6 to 54 months.

^cM = mother; CG = caregiver; T = teacher.

^dB = beta; OR = odds ratio.

* $p < .05$. ** $p < .01$. *** $p < .001$.

tence at 54 months. Nevertheless, comparison of parameter estimates from Model 1 and Model 2 shows that effects of hours per week were modestly smaller in the model including additional child care predictors than in the base model for five of the original seven significant effects (e.g., T externalizing) and in one case larger (i.e., caregiver social competence). The largest changes in regression coefficients for hours per week emerged for kindergarten teacher's report of externalizing problems and conflict.

Inspection of the third column labeled "Model 2" in Table 2 (i.e., 11th column of table) shows that in one of three cases a previously significant effect (in Model 1) of linear change over time in hours per week of child care became insignificant when additional features of child care were taken into consideration (i.e., positive child care). In sum, even though inclusion of four additional features of child care in the prediction model attenuated some of the originally detected effects of quantity of child care, in the main, effects of quantity remained significant even with indicators of child care quality, type, and instability taken into consideration.

Alternative Explanation: Maternal Sensitivity

As the third step in the series of nested regression analyses, Model 2 was modified by adding two

additional predictors reflecting average maternal sensitivity (i.e., HLM intercept) and linear change in maternal sensitivity (i.e., HLM slope) so that quantity of care effects could be re-examined after controlling for patterns of parenting that prior work on this sample showed were predicted by quantity of care (NICHD Early Child Care Network, 1999). Although small reductions of the hours coefficients were observed for selected outcomes, all but one of the pooled effects of the two quantity of care predictors in Model 3 (i.e., six of seven) remained significant when the two maternal sensitivity predictors were added to Model 2. Consideration of specific parameter estimates from Models 2 and 3 indicates that seven of eight significant effects of hours of care per week (i.e., HLM intercept) and one of two significant effects of linear change over time in hours per week (i.e., HLM slope) remained significant when maternal sensitivity predictors were added to the prediction model. By and large, then, the previously detected effects for quantity of care remained significant when the alternative predictor of maternal sensitivity was added to the model.

To illuminate further the effects of average hours per week of care across the first 54 months detected in Model 3, Table 3 presents the adjusted mean scores for each outcome as a function of quantity of care grouped in terms of 0–9, 10–29, 30–45, and > 45 hr

Table 3
Adjusted Means (SD) for Developmental Outcomes by Quantity of Care Groups (Average Hours per Week)

	0–9		10–29		30–45		> 45	
54 months								
M social competence	101.1	(1.09)	98.9	(0.66)	97.5	(0.70)	98.7	(1.28)
CG social competence	108.2	(1.30)	104.7	(0.80)	103.8	(0.84)	103.2	(1.47)
M externalizing	50.4	(0.79)	51.8	(0.47)	51.6	(0.50)	52.9	(0.91)
CG externalizing	47.8	(0.94)	49.0	(0.60)	51.3	(0.60)	53.1	(1.02)
CG conflict	16.8	(0.67)	18.4	(0.43)	19.7	(0.43)	19.9	(0.73)
Dyadic play positive	0.4	(0.25)	– 0.1	(0.15)	0.3	(0.16)	– 0.4	(0.29)
Child care positive	2.35	(0.09)	2.3	(0.06)	2.4	(0.06)	2.3	(0.10)
Kindergarten								
M social competence	104.6	(1.20)	102.2	(0.72)	102.6	(0.76)	103.2	(1.44)
CG social competence	104.6	(1.23)	103.4	(0.74)	103.4	(0.77)	102.3	(1.45)
M externalizing	48.2	(0.80)	50.2	(0.48)	50.3	(0.51)	51.1	(0.96)
T externalizing	48.4	(0.77)	49.3	(0.47)	50.6	(0.49)	52.1	(0.91)
T conflict	10.2	(0.47)	10.3	(0.29)	11.0	(0.30)	11.7	(0.56)

Note: Quantity effects controlling for sex, gender, ethnicity, mother's education, maternal depression (intercept and slope), 6–54 months average income-to-needs ratio, 6-month temperament, average quality of care, proportion of peer group exposure, instability of care, parenting (intercept and slope). M = mother; CG = caregiver; T = teacher.

of nonmaternal care per week. Given the various groupings of hours per week of care found in the literature, these groupings were selected to reflect limited, moderate, high, and very high quantities of nonmaternal care. Inspection of the relevant adjusted means shows that where significant effects of average quantity of care emerged in Model 3, small but steady increases in negative outcomes (e.g., externalizing problems) and small but steady decreases in positive outcomes (e.g., social competence) are evident as one progresses from limited to moderate to high to very high quantities of nonmaternal care. At the same time, it should be noted that even children experiencing the greatest amount of nonmaternal care do not score, on average, in (or even near) the at-risk range on externalizing problems (i.e., ≥ 60). Furthermore, the absolute differences between the adjusted means for the groups with the lowest and highest amounts of care are in all cases less than one half of the sample standard deviation (see Table 1).

Effect sizes. Through this point the focus of results has been on the nature and significance of quantity of care effects. To evaluate the explanatory power of each predictor included in Model 3 and to illuminate the absolute and relative power of quantity of care to predict socioemotional adjustment, effect size estimates were calculated for all predictors in Model 3 for the 7 (of 14) developmental outcomes found to be related to quantity of care. Two effect size estimates were calculated for each predictor for each outcome, one conservative and one liberal. The former took the form of a partial correlation representing the relation between each predictor in Model 3 and each outcome after controlling for all other predictors in the model. The latter took the form of a structural coefficient, reflecting the ratio of the correlation between the intercept from hours of care growth curve and the outcome divided by the multiple correlation from Model 3 (Courville & Thompson, 2001); the multiple correlation is the square root of the R^2 for Model 3 as shown in Table 3. Thus, the structural coefficient reflects the relative predictive power of each predictor included in the analysis model without adjusting for shared variance among the predictors. Structural coefficients reflect the attenuated zero-order correlations under the assumption that all unmeasured variance would show the same linear association as the measured variance. These coefficients are interpreted within the context of a given model (i.e., within each column in Table 3) by identifying the coefficients that are largest as the best unconditional predictors if the overall model provides significant prediction of the

outcome. Examination of both the structural coefficients and partial correlations provides information about both the degree to which the predictor is associated with the outcome and the degree to which it provides unique prediction. Table 4 presents these effect size statistics for the four relevant 54-month outcomes, and Table 5 presents the corresponding statistics for the three relevant kindergarten outcomes.

Considering first the 54-month data, it can be seen in Table 4 that significant quantity of care effects range from small, as evident in the partial correlation of .08 ($p < .05$) linking average hours of care per week with mother-reported social competence, to substantial, as evident in the structural coefficient of .64 ($p < .001$) linking the same quantity variable with caregiver-reported conflict. Noteworthy, though, is that quantity of care, especially average hours per week, is typically a stronger predictor of the child outcomes displayed in Table 4 than are the other four features of child care included in Model 3. Of importance, nevertheless, is that higher quality of care significantly predicts greater mother- and caregiver-rated social competence and lower levels of caregiver-rated behavior problems and conflict, though only when the more liberal effect size estimates are considered (i.e., no significant partial correlations); that a greater proportion of time spent in center-based care predicts more caregiver-reported behavior problems and conflict; that greater peer-group exposure predicts less social competence and greater conflict reported by caregivers; and that instability of care is generally unrelated to the outcomes under consideration.

Not to be missed in this description of child care effect sizes is the fact that several background factors treated as covariates in the nested regression analyses proved to be stronger predictors of some or several outcomes than any child care factor. This is especially true of the social class indicators of maternal education and family income-to-needs ratio (averaged across 6–54 months) and to some limited extent of maternal depression (averaged across 6–54 months; see mother-reported social competence) and child gender. With the exception of maternal report of social competence, the maternal report measure of difficult temperament proved to be an insignificant predictor. It is maternal sensitivity, especially average sensitivity over time, that proves to be the most consistent and generally strongest predictor of all outcomes displayed, with greater sensitivity predicting greater caregiver- and mother-reported social competence and less caregiver-reported behavior problems and conflict.

Table 4
Summary of Predictors of Select Month 54 Outcomes: Conservative (r_p) and Liberal (r/R) Effect Sizes

Covariate predictors	Mother-reported social competence		Caregiver-reported social competence		Caregiver-reported problems		Caregiver-reported conflict	
	r_p	r/R	r_p	r/R	r_p	r/R	r_p	r/R
Child gender = male	.16***	.36***	-.15***	-.36***	-.03	-.05	.01	.06
Child ethnicity = Black	.02	-.27***	.04	-.26***	-.02	.22*	.02	.22
Child ethnicity = Hispanic	-.02	-.14	.01	-.11	-.03	.04	.02	.17
Child ethnicity = Other	-.01	-.09	-.01	-.01	.02	.03	-.00	-.05
Mother's education	-.02	.39***	.06	.49***	-.06	-.42***	-.00	-.18
Average income-to-needs ratio (6-54 months)	.00	.33***	-.02	.36***	.02	-.24**	.03	-.09
Difficult temperament (6 months)	-.17***	-.52***	-.04	-.15	.04	.13	.05	.09
Mother's depression (average)	-.14***	-.63***	-.03	-.33***	.03	.32	.03	.28*
Mother's depression (slope)	.01	-.00	-.04	-.08	.03	.06	.07	.20
Child care predictors								
Quantity: mean hours/week	-.08*	-.05	-.12**	-.24***	.20***	.56***	.16***	.64***
Quantity: linear change/slope	-.04	-.14	-.11**	-.37***	.08*	.25**	.05	.21
Quality mean	-.02	.16*	.00	.30***	-.01	-.32***	-.02	-.37**
Center proportion	.04	.04	.03	-.08	.06	.40***	.07	.49***
Instability (3-34 months)	.08*	.15	.00	.01	-.05	.01	.01	.10
Peer group exposure: proportion	-.06	-.15	-.08*	-.21***	.01	.14	.07	.28*
Parenting								
Maternal sensitivity: mean	.16***	.67***	.16***	.72***	-.13***	-.61***	-.09*	-.46***
Maternal sensitivity: linear change over time	.04	.21**	.05	.21*	-.13***	-.32***	-.07	-.26*
R^2		.18***		.16***		.17***		.11***

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5
Summary of Predictors of Select Kindergarten Outcomes: Conservative (r_p) and Liberal (r/R) Effect Sizes

Covariate predictor	Mother-reported problems		Teacher-reported problems		Teacher-reported conflict	
	r_p	r/R	r_p	r/R	r_p	r/R
Child gender = male	-.05	-.11	.00	.05	.12***	.37***
Child ethnicity = Black	-.06	.15	.06	.39***	.09*	.43***
Child ethnicity = Hispanic	-.04	.02	-.00	.03	-.02	-.06
Child ethnicity = Other	-.05	-.08	-.02	-.04	-.01	-.00
Mother's education	-.00	-.41***	.02	-.29***	.01	-.24*
Average income-to-needs ratio (6-54 months)	-.01	-.36***	.00	-.22*	.00	-.17
Difficult temperament (6 months)	.03	.24**	-.04	.06	-.05	-.02
Mother's depression (mean)	.24***	.80***	.04	.35***	.00	.22*
Mother's depression (linear change)	.08*	.23*	-.06	-.10	-.04	-.03
Child care predictors						
Quantity: mean hours/week	.07*	.16*	.08*	.36***	.08*	.37***
Quantity: linear change over time	.00	.09	-.06	-.00	-.03	.03
Quality	.01	-.16	-.04	-.39***	.01	-.26**
Center proportion	.02	.11	.08*	.40***	.10**	.45***
Instability (3-34 months)	-.01	.01	.02	.08	-.03	-.00
Peer group exposure: proportion	-.00	.06	.02	.21	-.01	.12
Parenting						
Maternal sensitivity: mean	-.09**	-.56***	-.12***	-.63***	-.09**	-.55***
Maternal sensitivity: linear change over time	-.13***	-.43***	-.16***	-.39***	-.14***	-.39***
R^2		.17***		.14***		.12***

* $p < .05$. ** $p < .01$. *** $p < .001$.

Similar trends emerge when kindergarten outcomes are examined in Table 5. Effect sizes of quantity of care tend to be smaller relative to those considered in Table 4, which is generally true of the explanatory power of other child care and non-child care predictors as well. In the case of average quantity of care across the first 54 months of life, significant associations range from a small partial correlation of .07 ($p < .05$), linking this quantity indicator with mother-reported problems, to a moderate structure coefficient of .37 ($p < .001$), linking the same predictor with teacher-reported conflict. Even though this average hours of care per week is more consistently related to the kindergarten outcomes in question than any other child care predictor, in several cases other child care variables are stronger predictors of particular outcomes. Specifically, more time spent in centers predicts more teacher-reported problems and conflict, and lower quality of child care predicts more teacher-reported problems and conflict (but only stronger than quantity in the former case). Neither instability of care nor peer-group exposure significantly predicts the three kindergarten outcomes under consideration.

Once again, though, maternal education, family income-to-needs ratio, and maternal depression consistently predict the kindergarten outcomes, though only sometimes more strongly than child care variables. Finally, maternal sensitivity once more most consistently and, often, most strongly predicts the kindergarten outcomes, with change in maternal sensitivity over time (i.e., slope) becoming a more consistent predictor than was evident in Table 4. Not only is greater sensitivity predictive of less negative socioemotional adjustment in kindergarten, but increases in sensitivity over time also predict lower levels of mother- and teacher-reported behavior problems and less teacher-child conflict.

Identifying Threshold Effects

There have been repeated suggestions in the literature that potentially negative effects of time spent in child care emerge after some threshold of hours is crossed (e.g., 20 hr per week: Belsky & Rovine, 1988; 30 hr per week: Vandell & Corasaniti, 1990). Results presented through this point showing that more time in care predicts less socioemotional adjustment (i.e., lower social competence, greater problem behavior, more conflict) when quantity of care is treated as a continuous variable thus stimulated interest in identifying thresholds for these effects. But because there is no consensus in

the literature regarding specific a priori cutoffs for hours per week in care, we conducted piecewise regression in hopes of identifying thresholds. This analytic technique is designed to identify points at which the relation between independent variable (i.e., quantity of care) and dependent variable (i.e., child outcomes) changes over the scale of the independent variable (Willett, Singer, & Martin, 1997). As it turned out, no threshold effects proved detectable, indicating that the linear relation between more time in care and poorer socioemotional adjustment was just that—unchanging in the sense that as quantity of care increased, so did problem behavior scores in a constant dose-response fashion.

Timing of Child Care

Some studies in the literature have focused on amount of child care or maternal employment in the first year (e.g., Bates et al., 1994; Belsky & Rovine, 1988), other studies have focused on the first 2 and 3 years (e.g., Belsky & Eggebeen, 1991; Harvey, 1999), and still other studies have focused the first 4 or 5 years (e.g., Borge & Melhuish, 1995; Vandell & Corasaniti, 1990). In addressing the issue of quantity of care as a function of timing or child age, this naturalistic study confronted an ecological challenge, in that hours per week in care was more rather than less stable across the first 4.5 years of life. Indeed, the cross-age correlation in average hours per week in care ranged from a high of .77 ($p < .001$) across Years 1 and 2 to a low of .50 ($p < .001$) for Years 1 through 4. In fact, the part-whole correlation between average hours of care in any one year and average hours of care across the first 54 months ranged from .95 ($p < .001$) for Year 2 (as well as Year 3) to .66 ($p < .001$) for Year 5. Such realities make teasing apart timing effects difficult, as the variance shared by predictors reflecting amount of care in any year is so great that it is likely that the variance shared between quantity of care in any year and any outcome will likely be shared across years (i.e., limited unique effects).

In view of this circumstance, two strategies were adopted in attempt to illuminate timing effects in predicting each of the outcomes found to be related to average hours per week of nonmaternal care across the first 54 months of life (i.e., Model 3). First, Model 3, which included all covariates, multiple features of child care, and maternal sensitivity, was estimated several times to predict each dependent variable, replacing the variable mean hours of care per week across the first 54 months with a quantity of care variable reflecting different periods (i.e., an

alternative prediction approach). Thus, in one model, average hours of care across 3 to 54 months was replaced with a variable reflecting average hours of care across 3 to 6 months. In a second—and separate—model, the quantity of care predictor was average hours of care across 3 to 12 months; in a third model, average hours of care across 3 to 24 months; in a fourth model, average hours of care across 3 to 36 months; and in a fifth model, average hours of care across 3 to 54 months. This strategy was adopted because time in care accumulates from birth through age 4.5 years; therefore, it seemed appropriate to examine the effect of accumulating care history.

The second strategy adopted in hopes of illuminating timing effects involved a separate estimation of Model 3, again predicting each of the outcomes that were related to average hours of care in the first 54 months. In this second set of regression equations, however, four quantity of care variables were included as predictors in the same regression equation (along with covariates, other child care variables, and maternal sensitivity), each reflecting a distinct and nonoverlapping developmental period: 3 to 6 months, 7 to 12 months, 13 to 24 months, 25 to 36 months, and 37 to 54 months (i.e., a unique prediction approach). In this model, the unique predictive power of amount of care experience in each developmental period (i.e., not shared with any other developmental period) is tested. It is important to note that if one (or more) periods in such an analysis appears to be a stronger predictor of the outcome in question than another period, this does

not necessarily mean that a period of greater susceptibility to quantity of care effects (i.e., a sensitive period) has been detected. All it means is that quantity of care during the period in question shares more unique variance with the outcome. Other periods may actually be stronger predictors, if considered alone, but because they share their predictive power with other periods, that shared predictive power is accorded to no particular period in the analyses.

The results of the two sets of regression analyses are presented in Table 6 for the four relevant 54-month outcomes and in Table 7 for the three relevant kindergarten outcomes. Under each dependent variable listed in each table are two sets of standardized regression weights. The weights in the first set reflect the power of quantity of care, across different periods, to predict each outcome as determined in a series of separate regression equations focused on amount of care in five periods (i.e., alternative predictors): 3 to 6 months, 3 to 12 months, 3 to 24 months, 3 to 36 months, and 3 to 54 months. Below this first set of regression weights are standardized regression coefficients emerging from a single regression equation estimated for each dependent variable, each weight reflecting the unique predictive power of quantity of care in five periods (i.e., unique predictors): 3 to 6 months, 7 to 12 months, 13 to 24 months, 25 to 36 months, and 37 to 54 months. Several trends are evident in the data.

First, as quantity of care across longer periods is considered, the predictive power of average hours per week of nonmaternal care tends to increase,

Table 6
Cumulative and Unique Effects^a of Quantity of Care (Average Hours per Week) on Select 54-Month Outcomes as a Function of Period^b

Alternative predictors	Mother-reported social competence (<i>n</i> = 933)	Caregiver-reported social competence (<i>n</i> = 724)	Caregiver-reported problems (<i>n</i> = 688)	Caregiver-reported conflict (<i>n</i> = 690)
3–6 months	–0.01	–0.02	0.11**	0.09*
3–12 months	–0.03	–0.04	0.11**	0.10*
3–24 months	–0.05	–0.06	0.15***	0.13**
3–36 months	–0.06	–0.09*	0.19***	0.16***
3–54 months	–0.06	–0.12**	0.20***	0.17***
Unique predictors				
3–6 months	0.05	0.06	0.04	0.03
7–12 months	–0.00	0.01	–0.08	–0.07
13–24 months	–0.06	0.03	–0.02	0.02
25–36 months	–0.02	–0.11	0.24***	0.19*
37–54 months	–0.04	–0.11*	0.06	0.04

^aStandardized regression coefficients.

^bQuantity effects controlling for sex, gender, ethnicity, mother's education, maternal depression (intercept and slope), 6–54 months average income-to-needs ratio, 6-month temperament, average quality of care, proportion of peer group exposure, instability of care, parenting (intercept and slope).

p* < .05. *p* < .01. ****p* < .001.

Table 7
Cumulative and Unique Effects^a of Quantity of Care (Average Hours per Week) on Select Kindergarten Outcomes as a Function of Period^b

Alternative predictors	Mother-reported problems (<i>n</i> = 938)	Teacher-reported problems (<i>n</i> = 901)	Teacher-reported conflict (<i>n</i> = 903)
3–6 months	0.05	0.12***	0.10**
3–12 months	0.06	0.12***	0.09**
3–24 months	0.07*	0.12***	0.10**
3–36 months	0.07*	0.11**	0.10**
3–54 months	0.08*	0.12**	0.10**
Unique predictors			
3–6 months	0.01	0.11*	0.09
7–12 months	0.02	–0.01	–0.05
13–24 months	0.05	0.02	0.07
25–36 months	–0.05	–0.01	–0.01
37–54 months	0.07	0.03	0.01

^aStandardized regression coefficients.

^bQuantity effects controlling for sex, gender, ethnicity, mother's education, maternal depression (intercept and slope), 6–54 months average income-to-needs ratio, 6-month temperament, average quality of care, proportion of peer group exposure, instability of care, parenting (intercept and slope).

p* < .05. *p* < .01. ****p* < .001.

usually slightly, except for teacher-reported externalizing problems and conflict, where prediction remains virtually unchanged from the period 3 to 6 months to the period 3 to 54 months. Thus, average hours per week in care across the first 4.5 years proves generally more predictive than average hours per week in care across the first 3 years, which proves generally more predictive than average hours per week in care across the first 2 years, which proves more predictive than average hours per week in care across the first year only. At the same time, the data in the top halves of Tables 6 and 7 indicate that the more time children spend in nonmaternal care during the earliest period (i.e., 3 to 6 months), the more externalizing problems and conflict with caregiver and teacher are evident at 54 months and in kindergarten.

Inspection of the data in the bottom halves of Tables 6 and 7 reveals, however, that with the exception of predicting teacher-reported externalizing problems in kindergarten, neither amount of nonmaternal care in the period 3 to 6 months or in the first year makes a significant unique prediction once time in care during other age periods is taken into consideration. The same is true across all outcomes for the second year of life and for most outcomes for the third year of life and for the period 37 to 54 months. Note, however, that more time in nonmaternal care during the third year of life uniquely predicts greater caregiver-reported exter-

nalizing problems and conflict at 54 months (but not in kindergarten), and that more time in care for the period 37 to 54 months uniquely predicts less caregiver-reported social competence at 54 months. These results may reflect the results found for the effect of hours slope reported in Table 2.

Predicting Higher Levels of Problem Behavior

Having found in the first set of analyses presented in Table 2 that more time in nonmaternal child care through 54 months of age predicted more problem behavior, as reported consistently by teachers at both 54 months and kindergarten, but by mothers only at kindergarten age, we sought to determine whether children who experienced more hours of child care were more likely to evince levels of problems considered high by certain a priori standards. It is important to note that we were not able to examine the criteria for identifying clinical levels of problems (i.e., scores above 2 *SD* the mean at any time or above 1.5 *SD* according to two informants) because too few children in our sample met those criteria (*n* < 50 in the largest group and *n* < 20 in other groups). Instead, we used a recommended "risk" cutoff score of 1 *SD* above the mean (e.g., *t* ≥ 60). This corresponds to scoring at or above the 84th percentile. Achenbach (1991) recommended that children in this range could be, but not necessarily should be, referred for further evaluation for clinical-level problems.

Logistic regression analyses examined whether children classified in the four quantity-of-care groups reflecting limited, moderate, high, and very high levels of child across their first 4.5 years of life care differed in the proportions of children scoring in the at-risk range of *t* ≥ 60. The full model covariates were included in these analyses, along with the four child care hours groups. Descriptive results shown in Table 8 indicate, consistent with the regression analyses reported using the continuous scaling of child care hours and externalizing behavior, that the proportion of children scoring in the at-risk range tended to increase as amount of time in care increased, relative to the proportion of children in the at-risk range who experienced lower amounts of nonmaternal care. At the same time, the overwhelming majority of children did not score in the at-risk range, even when considering those experiencing the most child care.

Aggression and Disobedience or Assertiveness?

When data such as those emerging from this inquiry have been reported in the past linking

Table 8

Adjusted Proportion of Children Scoring 1 or More SDs Above or Equal to Mean (60) on Externalizing Problems as Rated by Mothers (M) and Caregivers (CG) at 54 Months and Mothers (M) and Teachers (T) in Kindergarten^a

54 months CBCL externalizing scores				
Hours/week	N	Caregiver	N	Mother
0-9	117	2%	153	10%
10-29	241	12%	358	17%
30-45	249	18%	331	14%
>45	82	24%	98	26%
Kindergarten CBCL externalizing scores				
Hours/week	N	Teacher	N	Mother
0-9	147	9%	152	8%
10-29	341	12%	359	12%
30-45	324	15%	336	12%
>45	91	19%	93	21%

^aProportions are adjusted for site, child gender, child ethnicity, maternal education, average income-to-needs ratio (6–54 months), 6-month temperament, maternal depression (intercept and slope), parenting (intercept and slope), child care quality (intercept), proportion of center care, proportion of peer group exposure, instability of care. CBCL stands for Child Behavior Checklist (Achenbach, 1991).

amount and timing of child care with problem behavior, the suggestion has been advanced that assertiveness may be confused with aggressive and disobedient behavior by raters (Clarke-Stewart, 1989). To address this issue, items on the externalizing problem behavior scale were sorted to create three subscales: one reflecting aggression (e.g., cruelty to others, destroys own things, gets in many fights, threatens others, hits others), one reflecting disobedience or noncompliance (e.g., defiant, uncooperative, fails to carry out assigned tasks, temper tantrums, disrupts class discipline), and a third reflecting assertiveness (e.g., bragging or boasting, talks too much, demands or wants attention, argues a lot). Internal consistency reliability (i.e., coefficient alpha) for these three subscales for mothers (54 months, kindergarten), caregivers (54 months), and teachers (kindergarten) ranged from .67 (54 months, mother-rated assertiveness) to .85 (54 months, kindergarten-teacher-rated aggression). The resulting scale scores were then subject to a Poisson regression that included all the predictors from Model 3 (i.e., covariates, multiple child care predictors, maternal sensitivity). (The Poisson regression is appropriate for analyzing data in which the outcome is a count of relatively rare events. The CBCL ratings on the selected items were all highly skewed toward 0; therefore, use of multiple regression methods was inappropriate.)

Table 9

Effects of Quantity of Care (Mean and Slope) in Model 3 on Aggression, Disobedience, and Assertiveness: Using Poisson Regression^a

54-month subscales	N Pooled ^b	Hours of care per week	Linear change: hours per week
Mother-rated aggression	931	<i>ns</i>	<i>ns</i>
Mother-rated disobedience	934	<i>ns</i>	<i>ns</i>
Mother-rated assertiveness	936	(+) *	<i>ns</i>
Teacher-rated aggression	593	***	(+) ***
Teacher-rated disobedience	676	***	(+) ***
Teacher-rated assertiveness	698	***	(+) ***
Kindergarten subscales			
Mother-rated aggression	924	<i>ns</i>	<i>ns</i>
Mother-rated disobedience	925	<i>ns</i>	<i>ns</i>
Mother-rated assertiveness	926	*	(+) **
Teacher-rated aggression	891	*	(+) **
Teacher-rated disobedience	880	**	(+) ***
Teacher-rated assertiveness	894	***	(+) ***

^aPositive coefficients (+) indicate an increase in mean outcome; negative coefficients (-) indicate a decrease in mean outcome.

^bTwo degrees of freedom tests of no effect of hours intercept and slope controlling for sex, gender, ethnicity, mother's education, maternal depression (intercept and slope), 6–54 months average income-to-needs ratio, 6-month temperament, average quality of care, proportion of peer group exposure, instability of care, parenting (intercept and slope).

* $p < .05$. ** $p < .01$. *** $p < .001$.

The resultant effects of the two quantity of care predictors—mean hours per week of care across the period 3 to 54 months (i.e., HLM intercept) and linear change in hours per week across the same period (i.e., HLM slope)—are displayed in Table 9. Inspection of the table reveals that the more time children spent in nonmaternal care across their first 4.5 years, the more mothers, caregivers, and teachers characterized them as assertive at 54 months and in kindergarten, and the more caregivers at 54 months and teachers in kindergarten characterized them as aggressive and disobedient. It would seem, then, that more time in care across the first 4.5 years, though not change in hours of care per week over time, is predictive of more aggression and disobedience, according to caregiver and teacher reports, and assertiveness, according to mother, caregiver, and teacher reports.

Discussion

The primary purpose of the current study was to examine in more detail than has been possible in prior research issues related to the socioemotional adjustment of children who vary in the amount of routine nonmaternal care they experience across

their first 4.5 years of life. Perhaps most significant in terms of extending past work was our ability to examine effects of time in child care after taking into consideration a variety of other factors, including family background factors and other attributes of child care, especially its quality. Much past work summarized in the introduction suggesting that risks are associated with lots of time spent in nonmaternal care beginning in the opening year(s) of life has been challenged because it failed to take into account factors such as these that could be responsible for previously detected associations between timing of and time spent in nonmaternal care and indexes of socioemotional adjustment (e.g., McGurk, Caplan, Hennessy, & Moss, 1993; Phillips et al., 1987; Richters & Zahn-Waxler, 1990; Thompson, 1988).

Effects of Quantity and Other Features of Child Care

Consistent with findings from many, but not all, studies cited in the introduction, results from the current research show, even after controlling for multiple family background factors, multiple features of child care assessed longitudinally, and repeated assessments of maternal sensitivity, that more time in nonmaternal care across the first 4.5 years of life (i.e., quantity intercept) predicted several interrelated indicators of social functioning: (a) less social competence reported by mothers and caregivers at 54 months (but not at kindergarten age), (b) more externalizing problems reported by caregivers at 54 months and by mothers and teachers at kindergarten age, and (c) more adult-child conflict reported by caregivers at 54 months and by kindergarten teachers. Thus, quantity of nonmaternal care was significantly, even if modestly, associated with less positive adjustment as reported by three sets of respondents, each of whom had extensive experience with children in one of three settings (child care, home, kindergarten).

The fact that quantity of care proved unrelated to observational measures of child functioning once the full set of control variables were included in the prediction model (i.e., Model 3) could be a result of the limited amount of time that behavior was observed and the relatively low frequencies of the behaviors measured. The fact that change over time in quantity of care (i.e., quantity slope) significantly predicted only a single 54-month outcome and no kindergarten outcomes in the full prediction model indicated that it was likely the cumulative amount of time that children spent in nonmaternal care across the infancy, toddler, and preschool years that was

related to socioemotional adjustment (in the primary analyses: Models 1–3) rather than increases or decreases in nonmaternal care experience. Furthermore, the fact that significant effects of average hours of care per year detected at 54 months on caregiver reports of externalizing problems and adult-child conflict were replicated at kindergarten age using different raters (i.e., kindergarten teachers)—raters with roughly equivalent experience with and knowledge of the children they evaluated—suggests that the results reported are unlikely to be an artifact of raters of children in full-time care simply having more opportunity to witness negative behavior than raters of children with more limited care experience.

It must be noted, of course, that effect size estimates of time spent in nonmaternal care were never large and certainly modest, though when considered in terms of the more liberal, structure-coefficient effect size estimates, several qualified as moderate in magnitude, especially at 54 months. Recall as well that effect sizes of all predictors, including maternal sensitivity and indexes of socioeconomic status, were generally smaller when it came to predicting kindergarten outcomes. Such results that show that as time between the measurement of predictor and outcome increases predictive power tends to decrease, are consistent with the notion that development is an open-ended process and that early developmental experiences should not be presumed to have enduring effects.

Even though detected effects of quantity of child care were by no means strong, it must be regarded as noteworthy that they emerged after controlling for a variety of family background factors; remained significant for the most part even when multiple aspects of child care, as well as maternal sensitivity, were taken into consideration; and were not restricted to adjustment outcomes based on a single reporter. This is not to say, however, that they were unaffected by inclusion in prediction models of other features of child care (i.e., Model 2) and maternal sensitivity (i.e., Model 3). Recall that regressions coefficients representing quantity effects often (but not always) became smaller when these other predictors were taken into consideration, even as they remained significant. Clearly, child care factors other than quantity of care and maternal sensitivity accounted for some, though by no means all or even most, of the initially detected (in Model 1) quantity-of-care effects.

In fact, findings pertaining to the effects of other features of child care should not be overlooked in

this investigation, the primary focus of which has been on quantity of care. Recall that effect size estimates showed, at least when more liberal structure coefficients were considered, that higher quality of care predicted more mother- and caregiver-reported social competence, lower levels of externalizing problems, and less caregiver-reported conflict at 54 months and fewer externalizing problems and less conflict according to kindergarten teachers. Recall as well that more experience in child care centers predicted more externalizing problems and adult-child conflict at both 54 months and at kindergarten age, with kindergarten effects being independent of the parallel effects of more time spent in nonmaternal care of any kind. What this means is that when children spent more time in nonmaternal care of any kind, and more of that time in center-based care in particular, they were especially likely to be rated highly on externalizing problems and teacher-child conflict in kindergarten. Experience with two or more agemates in a child care arrangement and instability of care proved related to some 54-month outcomes, but none of these were replicated at kindergarten age (and so are not discussed further). In sum, even though average number of hours of child care proved to be the most consistent and usually the strongest predictor of socioemotional adjustment among the multiple features of child care considered in this inquiry, it was by no means the only aspect of child care that was significantly related to children's socioemotional adjustment.

Thresholds of Quantity

In addition to examining effects of time spent in nonmaternal care, net of a variety of other factors, we sought to extend research on child care in several ways. In some cases we proved successful, whereas in others we did not. Evidence did not emerge, for example, that it was experiencing more than 20 or 30 hr per week of care on average that was especially important, as regression analyses designed to detect points at which the relation between quantity of care and development outcome changed failed to identify any such thresholds. Thus, it appears that a linear dose-response relation most accurately characterizes the association between amount of child care experience and socioemotional adjustment in the NICHD data.

Timing and Quantity

When it came to illuminating issues of timing, the fact that individual differences in amount of care

were stable over time, even though change was discerned, severely constrained our capacity to draw strong conclusions. Consider in this regard the fact that with respect to 54-month outcomes, there was a consistent tendency for predictive power to increase—ever so modestly—as the period examined with respect to quantity of care became progressively longer, from 3 to 6 months, to 3 to 12 months, to 3 to 54 months. Such data seem consistent with Belsky's (1999, 2001) conclusion that it is early, extensive, and continuous care—and thus cumulative quantity of care—that is most likely to be predictive of lower levels of socioemotional adjustment. Yet the same pattern of increasing predictive power of quantity of care as the period considered increased was not evident when teacher-reported kindergarten outcomes were the focus of analysis. In fact, when considering externalizing problems and adult-child conflict, the predictive power of average quantity of care across 3 to 54 months was exactly the same as that across 3 to 6 months. Such findings raise the prospect that it is the initiation of lots of time in care in the first 6 months of life that is most developmentally influential.

Yet when issues of timing were examined in a different way, not by considering increasingly lengthy periods but by testing unique effects of particular periods, the story that emerged was different. This is because controlling for amount of care at ages older than 3 to 6 months resulted in only a single instance of quantity of care in this period evincing any unique predictive power (i.e., teacher-reported externalizing problems). Results such as these suggest that the first 6 months of life is not a sensitive period per se, but rather that the effects of earlier experiences (i.e., the first 6 months) are contingent on later experiences. Thus, it may be that reductions in amount of time spent in child care at older ages would, for the most part, attenuate the modest effect of lots of time in care in the first 6 months of life. But this conclusion must be embraced cautiously—and contingently—because the data on unique effects also revealed some unique predictive power, though only for 54-month outcomes, of quantity of care experienced in the third year (i.e., caregiver-reported problems and conflict) and in the period 37 to 54 months (i.e., caregiver-reported social competence).

Perhaps the best summary of timing findings would be that (a) some evidence indicates that it is the cumulative quantity of nonmaternal care, typically initiated in infancy and experienced across the infancy, toddler, and preschool years, that is most predictive of socioemotional adjustment rather than

the amount of time spent in nonmaternal care during any particular period; (b) some evidence indicates that later social adjustment varies as a function of exposure to more hours in care during infancy itself; and (c) some evidence indicates that amount of care experienced in the third year (i.e., caregiver-reported problems and conflict at 54 months) and fourth year (i.e., caregiver-reported social competence at 54 months) affects socioemotional adjustment independent of hours in care experienced in other developmental periods. However, qualifying these observations must be appreciation of the fact that the nonexperimental nature of the NICHD study greatly limits our capacity to tease apart timing effects, given that children who spent lots (or little) time in nonmaternal care in their first 6 months or first year or two of life tended to do so at later ages as well.

High Levels of Problem Behavior and Aggression, Disobedience, and Assertiveness

Given the fact that the children participating in the NICHD Study of Early Child Care are not principally from high-risk families, it would be surprising to find a substantial portion of the sample evincing clinical levels of problem behavior. And, in fact, they do not, so much so, in fact, that even a study like this of hundreds of children provides an insufficient number scoring above the clinical cutoff ($T > 70$) to permit confident, multivariate evaluation of relations between very high levels of externalizing problems and quantity of child care. Nevertheless, examination of relations between at-risk levels of externalizing problems, defined as scoring at or above 1 *SD* above the mean of the standardization sample (i.e., $T > 60$), did prove possible. It showed, consistent with results considered through this point, that as average amount of child care per week across the first 54 months of age increased, so did the likelihood that children—though only a modest proportion—would score in the at-risk range on externalizing problems.

It is important to point out that although, by definition, approximately 17% of children scored at or above 1 *SD* above the mean in the norming sample of the CBCL, this is a questionable benchmark to use when considering the proportions of children presented in Table 8 scoring high on problem behavior as a function of time in nonmaternal care, for two reasons: (a) the NICHD study sample cannot be assumed to be identical to the CBCL norming sample and (b) the data presented are based on adjusted problem behavior scores. In

fact, the proportion of the analysis sample scoring at or above 1 *SD* above the mean on externalizing problems (after adjusting for multiple covariates) was always less than 17%: 13.9% and 15.7%, respectively, in the case of caregiver and mother ratings at 54 months, and 13.3% and 12.2%, respectively, in the case of teacher and mother ratings in kindergarten. These, perhaps, are more appropriate benchmarks.

Ever since findings linking aggression and problem behavior with lots of time in nonmaternal care or its initiation very early in life emerged in the research literature, questions have arisen about the interpretation of such data. Clarke-Stewart (1988, 1989) and others (McGurk et al., 1993) have suggested that assertiveness may be confused with aggression or disobedience and thus discussion of “risks” associated with early child care could be misguided. To illuminate this issue and advance research in this area, items from the problem behavior inventory administered to mothers, caregivers, and teachers were combed for items that could reasonably be categorized as reflecting assertiveness, disobedience, and aggression. The final set of analyses reported in this article showed that the effects detected in the case of caregiver- and teacher-rated externalizing problems were not simply a function of more time in child care predicting greater assertiveness (though this was true with respect to maternal reports); rather, more time in child care predicted more aggressive, disobedient, and assertive behavior according to caregiver reports at 54 months and teachers in kindergarten.

Importance of the Family

One of the most significant conclusions of this inquiry is that even though quantity of child care, as well as other features of child care, significantly predicted multiple indexes of socioemotional adjustment, it was other facets of the ecology of child development that proved most predictive of social competence, problem behavior, and adult-child conflict. Recall that the most consistent and strongest predictor of all developmental outcomes to which quantity of child care proved to be related was maternal sensitivity: When mothers provided more sensitive care (i.e., sensitivity intercept), their children evinced greater social competence, fewer problem behaviors, and less conflict with adults at both 54 months and in kindergarten; this was also true of child functioning at kindergarten age when maternal sensitivity increased across the infant, toddler, and preschool years (i.e., sensitivity slope). Important as well is that more positive and less

negative adjustment was related to growing up in a household in which mothers were more highly educated and less depressed, and in which there were greater economic resources. It is critical to keep in mind such apparent influences of the family rearing environment when considering relations detected in this inquiry between any feature of child care and child development.

Conclusion

The past 15 to 25 years have witnessed a great deal of debate among developmentalists, parents, and policy makers about how child care may affect child development. The NICHD study was planned to address this issue (and many more), within acknowledged limits of a nonexperimental research design. In planning this work, the investigators were cognizant of multiple problems that plagued past research and the confusion it has caused in interpreting research findings in this area of inquiry. The NICHD study has not overcome all these limits by any means, though it has been able to overcome many of them. In so doing, it has been able to address a variety of issues about which there has been open and healthy intellectual disagreement.

The results of the present study advance understanding of potential effects of amount of time spent in early child care in showing, most significantly, (a) that the more time children spend in any of a variety of nonmaternal care arrangements across the first 4.5 years of life, the more externalizing problems and conflict with adults they manifest at 54 months of age and in kindergarten, as reported by mothers, caregivers, and teachers; (b) that these effects remain, for the most part, even when quality, type, and instability of child care are controlled, as well as maternal sensitivity and other family background factors; (c) that the magnitude of quantity of care effects are limited, though typically greater than those of other features of child care, though not of maternal sensitivity and family socioeconomic status; (d) that there is no apparent threshold for quantity effects; (e) that in most cases effects of quantity of care are of a cumulative nature or effects of time spent in nonmaternal care in the earliest months and years of life are contingent on amount of care experienced subsequently; and (f) that more time in care not only predicts problem behavior measured on a continuous scale but at-risk (though not clinical) levels of problem behavior, as well as assertiveness, disobedience, and aggression. It should also be noted that these correlational findings also imply that lower levels of problems were associated with less time in child care.

Even though the effects of time spent in nonmaternal care were statistically significant, it must be acknowledged that, in the main, effect sizes associated with them were limited (Cohen, 1977). When it comes to interpreting effect sizes, it is important to remember that Cohen offered conventions to guide power analysis, not as a metric with which to dismiss statistically significant findings. Evaluations of the practical importance of research findings that are modest in magnitude are not straightforward, because effect size estimates are affected by measurement, design, and method (McCartney & Rosenthal, 2000). In the health domain, small effects are taken seriously. Consider the fact that the effect of aspirin on reducing heart attack is statistically very small ($r^2 = .001$, with corresponding $r = .034$; Rosenthal, 1994), yet the findings have influenced medical practice.

In advancing the conclusions presented previously, we acknowledge that despite the inclusion of controls for selection effects, it remains possible that the detected relations between time in care and problem behavior could reflect effects of children's behavior on use of nonmaternal care. Conceivably, children who are more aggressive and disobedient than others could be placed in child care at younger ages and for longer periods, and children who are shy and nonaggressive may be less likely to be placed in child care, particularly with large groups of children. Seemingly inconsistent with this analysis, however, is the fact that effects of time in care remained even when mother-reported difficult temperament at age 6 months was taken into consideration and were evident when just time in care in the first 6 months of life was used to predict socioemotional adjustment. Nevertheless, the correlational nature of our longitudinal data does not permit an unambiguous determination of causal direction.

This observation highlights the need for future work focused on mechanisms or processes of influence, especially as most quantity effects remained significant, even if attenuated, when maternal sensitivity and other features of child care were controlled. In addition to future work focused on family interaction processes, including parenting, children's physiological stress reactivity may also be worthy of investigation (Booth, Carver, & Granger, 2000; Stansbury & Gunnar, 1994). This is because relations have been detected between separation from mother and children's threshold for cortisol production as well as the size of the cortisol increase in response to a stressor (Gunnar, Mangelsdorf, Larsen, & Herstgaard, 1998). In fact, recent

research indicates that long days in child care are associated with elevated levels of cortisol among 3- and 4-year-olds (Dettling, Gunnar, & Donzella, 1999; Tout, de Hann, Kipp Campbell, & Gunnar, 1998). Additional research on social processes taking place within child care environments also merits consideration.

When set in a larger context, the results summarized here regarding amount of time spent in child care may have implications for school readiness and the transition to school (Pianta & Cox, 1999). National surveys of kindergarten teachers reveal the emphasis they place on the importance of social and emotional competencies—following directions, getting along with peers, cooperation with adults, and other markers of self-regulation—in determining the degree to which a child is succeeding in making an adjustment to kindergarten (Rimm-Kauffman, Pianta, Cox, & Early, 2000). In light of these views, there is reason to wonder whether amount of time in child care will prove related to children's adjustment as they progress in elementary school (and beyond). The ongoing investigation of the NICHD sample will afford the opportunity to address this topic. Most important with regard to the findings of the present study, we plan to examine the extent to which the significant increments in problem behavior and adult-child conflict associated with amount of nonmaternal care are stable or interact with schooling experiences as children move through their elementary school years. Just as high levels of maternal sensitivity and features of child care other than quantity attenuated some of the apparent consequences of quantity of care, high-quality classroom experiences could mitigate the negative correlates of quantity of care that emerged in this study. On the other hand, it is also possible that classrooms characterized by poor management and instructional practices could amplify these associations with more time in nonmaternal care through the infant, toddler, and preschool years. Finally, the detected relations of time in nonmaternal care to more negative socioemotional adjustment may simply disappear as children get older, regardless of their classroom experiences. Evidence consistent with the latter possibility comes from some earlier research (Egeland & Heister, 1995; Harvey, 1999), though even if effects detected at 4.5 years and in kindergarten disappear, it may be problematical to assume that they are gone forever. After all, significant relations between time spent in child care and socioemotional adjustment evident when children were 2 years of age in the NICHD sample were absent a year later (NICHD Early Child Care

Research Network, 1998), only to emerge once again a year and a half later and remain evident when children were in kindergarten.

Despite the fact that there remains healthy debate about the size and meaningfulness of virtually all child care effects (Scarr, 1998), it must be remembered that more and more children are spending more and more time at younger and younger ages in nonmaternal care arrangements in the United States. Even small effects, when experienced by many children, may have broad-scale implications for larger policy discussions (Fabes, Martin, Hanish, & Updergraff, 2000; Jeffrey, 1989). Indeed, the detected effects may have no implications for how any individual child should be cared for or how any individual family functions, but could have implications at broader levels concerning how classrooms, communities, and even societies operate. Clearly, it will be important to continue to evaluate the extent to which this is the case for amount of child care and time in center care, and for low-quality child care and, thus, whether the findings that emerged from this inquiry remain throughout the early years of school or whether they prove limited to the period surrounding the transition to school.

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