Published in final edited form as:

Early Child Res Q. 2017 ; 41: 161–173. doi:10.1016/j.ecresq.2017.05.005.

Rural Families' Use of Multiple Child Care Arrangements from 6 to 58 Months and Children's Kindergarten Behavioral and Academic Outcomes

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Abstract

Non-parental child care prior to kindergarten is a normative experience for the majority of children in the United States, with children commonly experiencing multiple arrangements, or more than one concurrent child care arrangement. The experience of multiple arrangements has predominantly been shown to be negatively related to young children's health and behavioral outcomes. The present study examined the use of multiple concurrent arrangements for children in the Family Life Project, a representative sample of families living in six high-poverty rural counties. Using the full sample of 1,292 children who were followed from six months to kindergarten, this study examined the associations between the number of child care arrangements averaged across six time points and children's behavioral and academic outcomes in kindergarten. After including a number of control variables, regression results suggested that a greater number of arrangements prior to kindergarten were related to higher levels of teacher-reported negative behaviors, but not positive behaviors, and letter-word decoding skills, but not mathematics skills, though effect sizes were small. Moderation analyses by child care type and quality were conducted, with no evidence emerging that findings varied by type or quality of care.

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Keywords

child care; multiple arrangements; academic outcomes; positive and negative behaviors; rural families

Non-parental child care for young children has expanded dramatically over the last forty years, becoming an increasingly normative experience for children in the United States. Children's experiences with child care have been shown to be related to their long-term social and academic trajectories (Curenton, Dong, & Shen, 2015; Pungello et al., 2010; Vandell et al., 2006). Important characteristics of child care, such as quantity, type, and quality, have been explored by child care researchers to understand how children in child care learn, grow, and prepare for school entry in their first five years. Recently, work has focused on the understudied relationship between participation in more than one child care arrangement and children's development. Children commonly experience sequential transitions among child care arrangements (termed child care instability or child care changes) or participate in two or more concurrent child care arrangements (termed multiplicity or multiple arrangements). In this study, we focused on the associations between multiple arrangements – defined as the average number of non-parental child care arrangements experienced over the period from 6–58 months – and school readiness in a sample of children living in the rural US.

Existing research suggests that approximately 20% of families both in the US and internationally use multiple concurrent arrangements prior to age five (Claessens & Chen, 2013; Morrissey, 2013). Piecing together multiple child care arrangements is related to a number of factors, including parental nonstandard work hours, fluctuating incomes, and limited access to child care subsidies (Chaudry, 2004; Danziger, Ananat, & Browning, 2004; Enchautegui, Johnson, & Gelatt, 2015; Folk & Yi, 1994; Han, 2004; Scott, London, & Hurst, 2005). For families living in rural areas marked by high poverty, these challenges may be especially prevalent (Forry & Walker, 2011; Grace et al., 2006). Rural poverty has been fueled by the disappearance of family farms (Dimitri, Effland, & Conklin, 2005) and railroad, steel, textile, and furniture manufacturing jobs (Smith & Tickamyer, 2011; Vernon-Feagans, Burchinal, & Mokrova, 2015). Rural adults are more likely to work in service-industry jobs (e.g., retail, fast food, and home health), which are characterized by lower wages, poorer benefits, and nonstandard work hours (including evening, overnight, rotating, and weekend shifts; Smith & Tickamyer, 2011). Thus, rural families' ability to access child care arrangements that best meet their needs is limited, potentially leading to a stronger need for using concurrent multiple arrangements (Grace, Zaslow, Brown, Aufseeser, & Bell, 2011).

Above and beyond demographic risks, the use of multiple arrangements has generally been associated with poorer outcomes for children, including negative health outcomes (Chen, 2012; Morrissey, 2013) and behavioral problems (Bacharach & Baumeister, 2003; Claessens & Chen, 2013; Morrissey, 2009), with only a handful of studies predicting to academic outcomes (Votruba-Drzal, Coley, Koury, & Miller, 2013). Although some of these studies used nationally-representative samples that included rural and low-income families in the

US (i.e., Early Childhood Longitudinal Study [ECLS] samples; Bacharach & Baumeister, 2003; Chen, 2012; Votruba-Drzal et al., 2013), other studies have used more middle-income samples (i.e., NICHD Study of Early Child Care and Youth Development [SECCYD]; Morrissey, 2009; Tran & Weinraub, 2006), and still others have used international samples (i.e., from Australia; Claessens & Chen, 2013). Because work on multiple arrangements has generally failed to disaggregate data by rurality, we focused on a rural sample.

Thus, this study contributes to the growing literature on multiple arrangements in a number of ways, including the use of data from the Family Life Project (FLP), a representative sample of families living in the rural US and, in particular, piedmont areas in the Southeast and Appalachian areas in the Northeast (Vernon-Feagans, Cox, & Family Life Project Key Investigators, 2013). Longitudinal FLP data included parental reports of concurrent arrangements across six distinct time points (6, 15, 24, 36, 48, and 58 months). Unique to this study, child care quantity and type (although not quality) were available for all arrangements and were included in analyses. Recent studies have explored how multiple arrangement usage at age four was linked to kindergarten outcomes (Forry, Davis, & Welti, 2013; Gordon, Colaner, Usdansky, & Melgar, 2013). In this study, we sought to broaden the literature by examining the links between children's average number of non-parental child care arrangements between 6–58 months (termed throughout the paper as *multiple arrangements*) and children's behavioral and academic skills at kindergarten. We also examined two important follow-up questions. First, we examined whether the relations between multiple arrangements and children's behavioral and academic skills at kindergarten varied as a function of child care type and quality. Second, we examined whether the average number of multiple arrangements experienced during infancy/toddlerhood (6–24 months) was differentially associated with kindergarten outcomes as compared to multiple arrangements experienced during preschool years (36–58 months).

Multiple Child Care Arrangements

Construct and prevalence rates

The use of multiple arrangements is defined as children attending two or more concurrent non-parental child care arrangements on a regular basis (Adams & Rohacek, 2010). Multiple child care arrangements may include an array of settings regularly experienced by children, such as child care centers, family child care settings, and home settings with relative or babysitter care. Current research indicates that the prevalence rate of multiple child care arrangements in the US during early childhood is estimated to be around 20–30% (Morrissey, 2013), which translates to roughly 5 to 7 million children who experience more than one concurrent non-parental child care arrangement. Specifically, researchers reported that 14% of the full sample of NICHD SECCYD participants were in multiple arrangements at 15 months (Tran & Weinraub, 2006), 18% across 24 and 36 months (Morrissey, 2009), and 29% at 54 months (Morrissey, 2013). Specific to low-income families, U.S. census data revealed that nearly 26% of children of working mothers living below the federal poverty threshold used multiple child care arrangements for their children ages birth through five (Laughlin, 2013).

Rural poverty and multiple arrangements

The prevalence of rural families' use of multiple arrangements, however, is largely unknown. In one known example, baseline data from ECLS-K and ECLS-B revealed that 56% of African American children living in the rural US were in multiple arrangements the year prior to kindergarten (Grace et al., 2011). On the one hand and as discussed above, families may have a strong need to use multiple arrangements due in part to economic restructuring and high poverty rates in the rural United States, with rural families facing challenges such as irregular and shift employment and the need to work multiple jobs (O'Hare, 2009). Rural locations also have fewer center-based care options, longer driving distances to child care (Walker & Reschke, 2004), and higher child care costs (Smith & Gozjolko, 2010), which present challenges for families in poverty who also frequently have limited access to reliable transportation (Bratsch, 2011). Consequently, families often create patchworks of child care, including the use of multiple concurrent arrangements, in order to meet structural constraints such as employment insecurity, transportation demands, and limited child care options (Usdansky & Wolf, 2008; Vernon-Feagans, Garrett-Peters, De Marco, & Bratsch-Hines, 2012).

On the other hand, one frequently-cited benefit of living in rural areas is the availability of a wider social support system and increased access to extended family (Bauer, Dyk, Son, & Dolan, 2011; Simmons, Braun, Wright, & Miller, 2007), which may provide rural families with friends and family members who can provide regular concurrent child care for their children. Ultimately, however, families living in low-income areas, as represented in the current study, tend to find it more difficult than middle-income families to maintain consistent child care arrangements (Chaudry, 2004; London, Scott, Edin, & Hunter, 2004). In this study, we used the full FLP sample to provide a detailed description of child care use among families living in areas of rural poverty.

Theoretical framework

To frame our study, we relied on bioecological theory (Bronfenbrenner & Morris, 2006), which posits that *proximal processes* – sustained, reciprocal interactions that occur between the developing child and adults, other children, and objects in his or her immediate environments and that last long enough for optimal development to occur – are the process mechanisms through which development occurs and by which the child's potential is realized. In the original framework posited by Bronfenbrenner (1979), the child is placed at the center of a network of environmental systems. Applicable to the current study, the child directly participates in *microsystems* (e.g., the child's home, each child care setting), with the *mesosystem* linking microsystems together (e.g., child care to home, child care to child care). The child is the stable core element of the mesosystem, which thereby represents the multiple contexts providing the child with opportunities to learn, refine, and adapt his or her behavioral and academic skills. Further, if skills are nascent or insufficiently developed in one context, other contexts may benefit the child. Below we review empirical evidence that supports potential advantages and disadvantages of multiple arrangements, a complex mesosystem of child care settings.

Potential advantages of multiple arrangements

Potential benefits of multiple arrangements include increased exposure to a variety of peers and adults, linguistic and social interactions, objects for manipulation, and general academic opportunities (Bronfenbrenner & Morris, 2006; Howes, 2010; Johnson et al., 2003). Because children actively participate within each child care environment, they have the potential to learn from and respond to the strengths of each setting, thereby enhancing their development. However, these proposed developmental benefits are potentially more prevalent for higher-income families, who may have a greater ability to intentionally arrange child care settings or provide children with stable, long-term concurrent arrangements (Pilarz & Hill, 2014), or for urban and suburban families, who may have a larger number of available child care options. For example, families may choose a range of concurrent child care options to capitalize on perceived benefits, such as positive social skills from a home-based setting and higher academic skills from a center-based setting (Bratsch, 2011; Gordon et al., 2013; Howes, 2010; Morrissey, 2009).

Limited empirical findings support the developmental benefits of multiple arrangements, and primarily for children's academic rather than behavioral skills. Regarding behavioral skills, children may experience increased exposure to a variety of peers and adults, which can allow children to expand their behavioral repertoire and learn how to adjust their behaviors according to the expectations of each particular setting. This relationship is not supported empirically; at best, no relationship between multiple arrangements and social outcomes have been found (Forry et al., 2013). Regarding academic skills, positive associations of multiple child care arrangements with academic outcomes may stem from the exposure they receive in more than one environment. Children who interact with more literacy and mathematics inputs (such as book reading, print, writing utensils, and manipulatives) and hear a variety of linguistic inputs across arrangements may have an increased likelihood of higher early academic skills. Multiple child care providers may have different strengths in their preferred ways of teaching and sharing information, such as storytelling, reading books to children, or playing educational games. Children may come in contact with a variety of peers who serve as source of direct or vicariously-acquired knowledge. Recent studies found that using particular combinations of multiple arrangements in the year prior to kindergarten, such as prekindergarten (pre-K) in combination with other center-based care, was positively associated with pre-K or kindergarten language and literacy outcomes (Forry et al., 2013; Gordon et al., 2013). Therefore, theoretically speaking, a more complex and supportive mesosystem could present greater developmental opportunities to the developing child.

Potential disadvantages of multiple arrangements

However, bioecological theory proposes that in order for children to benefit from a complex mesosystem, the child's interactions within each microsystem should be consistent and long enough for optimal development to occur (Bronfenbrenner & Morris, 2006). With a higher number of child care settings experienced by the developing child on a regular basis, the proximal processes taking place in each of these settings may not optimally engage the child in order for positive behavioral and academic skills to develop.

Empirical findings generally support negative associations of multiple arrangements and behavioral skills. Multiple child care contexts, potentially with different rules and expectations in each setting, may be difficult for young children to navigate and to accordingly adjust their behaviors (Claessens & Chen, 2013). Furthermore, disruptions in the emotional ties that young children develop with others across multiple arrangements may prevent children from fully engaging within that environment (Howes, Hamilton, & Philipsen, 1998), particularly if children lack the flexibility needed to adjust to each additional setting (Morrissey, 2009). Empirically, in the urban Fragile Families and Child Well-Being Study (FFCWS), three-year-old children who experienced multiple arrangements scored higher on mother-reported internalizing and externalizing behavior problems at three years (Pilarz & Hill, 2014). For children in the nationally-representative ECLS-K sample, more arrangements prior to kindergarten was associated with an increase in externalizing behavior problems at 68 months (Bacharach & Baumeister, 2003). In a mixed-income sample of Dutch children ages 6–30 months, children showed less well-being in their primary child care arrangement when they had multiple care arrangements (De Schipper, Tavecchio, Van IJzendoorn, & Linting, 2003). Finally, in a representative Australian sample for children aged 4.5 years, transitioning from one arrangement to multiple arrangements was negatively associated with social skills (Claessens & Chen, 2013).

Participation in multiple child care arrangements, despite potentially offering children more opportunities to learn, may have negative associations with academic outcomes as well. Optimal child care providers are those who view themselves as integral to children's academic learning, respond to individual children's needs, and engage children by drawing on their interests to promote ideal learning environments (Burchinal, Magnuson, Powell, & Hong, 2015). Such care providers use their relationships with and knowledge of children to draw them into learning social and academic skills and reinforce that learning in a progressive scaffolded way over time (Bodrova & Leong, 2006; Vygotsky, 2001). If children have multiple care providers for a short period of time during a typical week, those providers may not have enough knowledge about or investment in children to promote their learning, which could impede children's academic development and ability to take advantage of multiple learning environments. However, limited empirical research on this topic has not been able to support whether multiple arrangements are detrimentally associated with young children's academic outcomes, and more research is needed. In the current study, we extended the literature by examining multiple arrangements from 6–58 months in relation not only to kindergarten behavioral outcomes (positive and negative behaviors) but also to academic outcomes (letter-word identification and mathematics skills).

Moderation by Type and Quality

In the existing literature on multiple arrangements, multiple arrangements have generally been empirically measured as a binary variable capturing whether or not children were in two or more concurrent child care arrangements or as a continuous variable capturing the average number of concurrent child care arrangements. Therefore, the actual proximal processes that occur within each microsystem (i.e., each child care setting) and across the mesosystem have rarely been directly captured. Thus, researchers need to rely on the known

characteristics of each microsystem, when available, to approximate the quality of proximal processes experienced by the child. These known characteristics of child care arrangements may have differential associations with children's development of academic and behavioral skills; in the current paper, we examined moderation by child care type and quality.

Child care type

Several studies have explored how the use of particular types of multiple arrangements influence children's outcomes. Multiple arrangements have been shown to provide benefits to children if certain types of care are combined, such as center-based care for enhanced school readiness and home-based care for reduced behavioral problems (Gordon et al., 2013). Gordon and colleagues (2013) used ECLS-B data to show that four-year-olds who scored highest on a reading composite were those who were enrolled in two or more concurrent center-based child care arrangements. Children who were simultaneously enrolled in home-based and center-based child care arrangements scored higher on social competence than children who were enrolled in multiple center-based arrangements. No type patterns of multiple arrangements predicted to problem behaviors (Gordon et al., 2013). Rather than creating a variable capturing each type of care for every arrangement, which would create numerous patterns of care from 6–58 months, this study explored whether children's participation in multiple arrangements prior to kindergarten was moderated by the proportion of their formal arrangements across all arrangements.

Child care quality

Child care quality may play a moderating role between children's participation in multiple arrangements and their developmental outcomes. Higher-quality child care has been consistently linked to children's school readiness skills (Burchinal et al., 2015; Li, Farkas, Duncan, Burchinal, & Vandell, 2013). In the only known study examining moderation of multiple arrangements and quality, Tran and Weinraub (2006) found that when children experienced lower-quality care in their primary arrangements, children who were in fewer arrangements had higher language scores. Yet, when quality was high, children had higher language scores when they were in a greater number of child care arrangements. This study will extend this examination by predicting to kindergarten outcomes and exploring potential moderation by child care quality from 6–36 months (measured as child care provider-child positive interactions) as well as at pre-K (measured as classroom environment quality).

Timing of Multiple Arrangements

Finally, we explored whether the use of multiple arrangements at younger versus older ages may be differentially related to kindergarten outcomes. From a bioecological perspective, as children grow older, the proximal processes that sustain child development become increasingly sophisticated (Bronfenbrenner & Morris, 2006). Children begin to engage in problem solving and interactive play with peers, they build more complex relationships with child care providers and teachers, and their abilities to regulate behavior and emotions increase (Bulotsky-Shearer et al., 2012). Thus, we might expect that children's interactions across multiple child care arrangements when they are older (closer in proximity to children's entry to kindergarten) may have a stronger relation to kindergarten skills.

To date, studies have provided inconsistent evidence on the relationships among multiple arrangements, child age, and behavioral outcomes. For example, in the mixed-income NICHD SECCYD sample, multiple arrangements were associated with decreases in child care provider-reported disruptive behaviors (measured at three years) for 36-versus 24-month-old children (Morrissey, 2009). In contrast, for the primarily low-income FFCWS sample, multiple arrangements were associated with increases in mother-reported behavior problems (measured at three years) for 36-versus 12-month-old children (Pilarz & Hill, 2014). Similarly, little is known about the timing of multiple arrangements through early childhood and children's academic skills in kindergarten. Limited evidence suggests that the use of multiple arrangements closer to kindergarten may be more likely to have an association with children's academic skills. For example, children who experienced multiple arrangements in the 4-year wave of ECLS-B, but not the 9-month or the 2-year wave, had higher reading scores at age five (Votruba-Drzal et al., 2013). Our study aimed at providing additional information on the timing of multiple arrangements as related to children's behavioral and academic skills to continue to build this knowledge base.

Family Selection and Multiple Arrangements

Because children cannot be randomly assigned to the experience of multiple arrangements, we recognized the importance of accounting for factors that are related to selection into child care as well as child outcomes. Selection effects have been defined as characteristics of children and families related to entrance into non-parental child care as well as the degree to which children experience higher or lower quality care, more or fewer hours in care, formal or informal care, and single or multiple arrangements (Bratsch-Hines, Mokrova, Vernon-Feagans, & Family Life Project Key Investigators, 2015; Burchinal & Nelson, 2000; Dearing, McCartney, & Taylor, 2009). Selection effects often include characteristics such as race, household income, home environment quality, and maternal depression (Liang, Fuller, & Singer, 2000; Morrissey, 2008, 2009). To partially account for, albeit not to eliminate, potential selection bias associated with family characteristics, we included a number of control variables measured at or prior to six months.

Current Study

The present study included the following research questions: (1) For a sample of families living in high-poverty rural counties in the US, what were the prevalence rates and patterns of multiple concurrent child care arrangement usage for children ages 6–58 months? (2) What was the association of multiple child care arrangements (measured as the average number of arrangements across six time points from 6–58 months) with teacher-reported positive and negative behaviors and children's assessed letter-word identification and mathematics skills in kindergarten? Based on our theoretical framework, we hypothesized that the greater average number of child care arrangements children experienced between 6 and 58 months, the more learning opportunities they would have, thereby providing them with higher academic skills. However, given empirical evidence of a negative relationship between multiple arrangements and behavioral outcomes, we hypothesized this would also be true for our sample. We asked additional questions that had a limited empirical evidence and for which we did not offer hypotheses: (3) Did child care type and quality moderate the

relationship between multiple child care arrangements and kindergarten outcomes? (4) Was the timing of multiple arrangements (infancy/toddlerhood, 6–24 months; preschool aged, 36–58 months) differentially associated with outcomes under consideration?

Method

Participants

Data for the current study were drawn from the Family Life Project (FLP), a longitudinal examination of families living in six high-poverty counties in the US. Eastern North Carolina (NC) was selected to be indicative of the Black South and Central Pennsylvania (PA) represented an Appalachian region (Dill, 1999). FLP used a developmental epidemiological design, recruiting a representative sample of 1,292 families through complex sampling procedures aimed to identify all families in target counties who gave birth to a child during the enrollment year. To ensure adequate representation of African American and low-income families in these geographic areas, FLP oversampled for African American families in North Carolina and low-income families in both regions (for a detailed description of the recruitment strategy, see Vernon-Feagans et al., 2013). The current study used the full sample of FLP children recruited at two months ($N = 1,292$).

Procedures

FLP data were collected through home, child care, and school visits. Home visits with the parent(s) were completed at 6, 15, 24, 36, 48, and 58 months of child age by research assistants who conducted interviews, parent and child assessments, and administered questionnaires. Child care visits with the primary child care provider or pre-K teacher were completed at 6, 15, 24, 36, and pre-K time points by research assistants who administered questionnaires and conducted interviews and classroom observations. Children's primary care arrangement was classified as the arrangement where they were cared for a minimum of ten hours per week by a child care provider other than the child's mother and spouse/partner or secondary caregiver living in the home. The primary child care location for each child, regardless of type (informal/formal), was observed to assess child care or classroom quality. All child care providers and pre-K teachers filled out questionnaires related to the classroom as well as to individual target children. Once children transitioned to school, kindergarten visits were conducted, with trained research assistants administering child assessments. Kindergarten teachers were asked to complete online questionnaires regarding target FLP children and classroom and teacher demographics. Data from interviews, questionnaires, assessments, and observations were computerized at the time of collection.

Measures

Multiple child care arrangements—Families' use of *multiple arrangements* was calculated using parent-reported data at 6, 15, 24, 36, 48, and 58 months. During the home visit interview at each time point, parents were asked to include information (e.g., hours in care, type of care) for each child care arrangement where children regularly, rather than occasionally, received care by a provider other than the mother and her spouse/partner or secondary caregiver. Child care arrangement data were considered missing at a particular time point if the parent was not interviewed due to non-response or refusal. A total number

of non-parental child care arrangements regularly experienced by the target child was calculated for each time point. The analytic variable of *multiple arrangements* was calculated as the average number of non-parental child care arrangements across all six time points ($\alpha = 0.80$). Children in parent-only care were included in analyses, and their value on this variable was zero. To examine the issue of timing of non-parental child care arrangements, we created two additional analytic variables: (1) for the infant/toddler period, we calculated the average number of non-parental child care arrangements across 6, 15, and 24 months ($\alpha = 0.78$); and (2) for the preschool period, we calculated the average number of non-parental child care arrangements across 36, 48, and 58 months ($\alpha = 0.73$).

Behavioral outcomes—Kindergarten teachers completed questionnaires rating FLP children's behaviors during interactions with peers and adults. For this study, we included two outcomes, *positive behaviors* and *negative behaviors*, captured through teachers' report on the *Social Competence Scale* (SCS; Conduct Problems Prevention Research Group [CPPRG], 1995) and the *Teacher Observation of Child Adaptation-Revised* (TOCA-R; Werthamer-Larsson, Kellam, & Wheeler, 1991). Together, these scales comprised a 14-item measure with three subscales: emotion regulation skills, prosocial skills, and aggressive-oppositional behaviors. Each item was scored on a scale of one to six (*almost never*, *rarely*, *sometimes*, *often*, *very often*, and *almost always*). *Positive behaviors* were measured by combining the subscales of emotion regulation (5 items; e.g., *cope well with disappointment or frustration*, $\alpha = 0.86$) and prosocial skills (4 items; e.g., *resolves problems with other children on his or her own*, $\alpha = 0.87$), with a combined $\alpha = 0.92$. *Negative behaviors* were measured by the aggressive-oppositional behaviors subscale (5 items; e.g., *knowingly breaks rules*, $\alpha = 0.87$).

Academic outcomes—Research assistants assessed letter-word decoding skills and mathematics skills of FLP children in kindergarten using the *Letter-Word Identification* and *Applied Problems* subtests of the Woodcock Johnson (Woodcock, McGrew, & Mather, 2001). *Letter-Word Identification* measured children's ability to distinguish letter sounds and words correctly. Initial items required the child to identify letters that appeared in large type. Remaining items required the child to pronounce words correctly, with items becoming increasingly difficult as the selected words appear less frequently in written English ($\alpha = 0.90$). *Applied Problems* measured children's ability to solve mathematics problems by answering pictorially-presented questions about counting and basic arithmetic operations ($\alpha = 0.78$). The *w* scores were used in analyses.

Child care moderators—Two moderators, *child care type* and *child care quality*, were tested in analytic models. *Child care type* was measured as the proportion of all formal settings experienced by children. For every arrangement at each time point, if the target child was reported to be cared for in a home environment, including relative care or a family child care home, that arrangement was considered to be informal care (coded as 0). If the target child was reported to be cared for in a non-home, center-based environment, that arrangement was considered to be center-based care (coded as 1). The final variable was the proportion of formal care across all arrangements from 6–58 months ($\alpha = 0.81$).

Child care quality was captured as two separate variables based on the time points of measurement: (1) child care provider-child positive interactions at 6, 15, 24, and 36 months using the Child Care Observational Coding System (CVI; Vernon-Feagans, Manlove, & Volling, 1996; Vernon-Feagans & Manlove, 2005) and (2) classroom environment quality at pre-K using the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008). Two CVI observations were conducted at each child care visit, with each observation lasting 10 minutes. Coders used continuous coding to identify behaviors in each 10-second block. We included two types of child-provider initiations: positive target child verbal and nonverbal initiations to the child care provider and positive child care provider verbal and nonverbal initiations to the target child. Internal consistency estimates for these items were $\alpha = .81$ at 6 months, $\alpha = .89$ at 15 months, $\alpha = .89$ at 24 months, and $\alpha = .91$ at 36 months. The final CVI variable was the average of provider-child positive interactions across 6–36 months ($\alpha = .88$). Because the CVI was not captured during pre-K, pre-K classroom quality was measured as the average of three domains from the CLASS: *Instructional Support* ($\alpha = .86$), *Classroom Organization* ($\alpha = .80$) and *Classroom Emotional Support* ($\alpha = .78$), with a combined $\alpha = .79$.

Control variables—A number of child, family, and child care variables were included as controls to account for potential selection bias and other confounding factors. Because the predictor of interest, multiple child care arrangements, was collected starting at six months, we included covariates at or prior to six months that may have influenced families' initial use of multiple arrangements as well as children's subsequent entry into child care and behavioral and academic outcomes in kindergarten. Control variables included the following: *child gender*, *race*, and *temperament*; *state*, poverty status as indexed by the *income-to-needs ratio*, *maternal weekly work hours*, *maternal nonstandard work hours*, *home environment quality*, *maternal education*, *maternal literacy*, *marital status*, *maternal depression*, and *maternal positive parenting*; and *child care quantity* and *length of arrangements*.

Child-level control variables: Child gender (0 = girls; 1 = boys) and race (0 = non-African American [predominantly European American]; 1 = African American) were reported by the child's parent upon entry into the study. Child temperament was measured using the Infant Behavior Questionnaire (IBQ; Rothbart, 1981), which was reported by the child's parent at 6 months. Each item was scored on a scale of one to eight (*never*, *very rarely*, *less than half the time*, *about half the time*, *more than half the time*, *almost always*, *always*, or *does not apply*). We averaged the IBQ subscales of distress to novelty (16 items; e.g., *when visiting a new place*, *how often did the baby show distress for the first few minutes*, $\alpha = .87$) and distress to limitations (11 items; e.g., *how often did the baby cry or fuss before going to sleep for naps*, $\alpha = .74$), with a combined $\alpha = .86$.

Family-level control variables: State (0 = PA; 1 = NC) and poverty status were included to account for the oversampling strategy employed by FLP. Poverty status at six months was reported as the total annual household income for the family divided by the federal poverty threshold for a family of that size and composition to create an income-to-needs ratio. Maternal weekly work hours at six months was reported as the total number of hours the

mother worked at all jobs. Maternal nonstandard work hours at six months was measured as a binary variable in which 0 = fixed day shift (work hours between 8 am and 5 pm) and 1 = nonstandard work shifts (including fixed evening shift, fixed night shift, rotating shift, or irregular work).

Home environment quality was measured using the infant-toddler version of the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984), which was collected at 6 months. Each scale item was scored in a yes/no fashion by trained research assistants, with an overall average considered as the proportion of items scored as present. The HOME scale (28 items) included three subscales of responsiveness (e.g., *provider responds verbally to child's vocalizations or verbalizations*), acceptance of the child (e.g., *provider slaps or spansks child during visit*, reverse-scored), and learning materials (e.g., *presence of complex eye-hand coordination toys*). The internal consistency estimate for the HOME score at 6 months was $\alpha = .77$.

Maternal education was measured at six months as the number of years of education. Maternal literacy was measured at two months using the reading subtest of the Kaufman Functional Academic Skills Test (K-FAST; Kaufman & Kaufman, 1994). The reading subtest included 29 items designed to determine parents' literacy levels at study entry ($\alpha = .72$). Marital status was measured at six months as the percentage of mothers reporting a spouse or romantic partner living in the household. Maternal depression was measured at six months using the Brief Symptom Inventory 18 (BSI; Derogatis, 2000). Each item was scored on a scale of zero to four (*not at all*, *a little bit*, *moderately*, *quite a bit*, or *extremely*). We included the BSI subscale of depression (6 items; e.g., *feeling hopeless about the future*, $\alpha = .80$). Maternal positive parenting was measured during an activity at six months in which mothers engaged in a free-play interaction that was recorded for 10 minutes (Cox, Paley, Burchinal, & Payne, 1999; NICHD ECCRN, 1999). The free-play interaction involved asking caregivers to use a standardized set of toys and to play with their infant as they normally would if they had a little free time during the day. Positive parenting included five ratings: sensitivity (level of responsiveness to child's needs, gestures, and expressions), detachment (emotional unavailability, reverse scored), positive regard (e.g., positive feelings expressed toward child), animation (level of energy), and stimulation of development (appropriate level of scaffolding of activities with child). Ratings for each code were made on a scale ranging from 1 to 5 (*not at all characteristic* to *highly characteristic*). Inter-rater reliability was determined by calculating the intraclass correlation coefficients for ratings made by pairs of trained coders. A minimum of 30% of all observations were double coded throughout the coding period, with coders required to maintain reliability estimates at or greater than $\alpha = .80$ (Vernon-Feagans et al., 2013).

Child care-level control variables: Child care quantity at each time point was measured as the total number of hours for all reported child care arrangements each week; the final variable was calculated as an average number of weekly hours in all arrangements across 6–58 months ($\alpha = .82$). Length of child care arrangements was measured as the mean age of entry (in months) subtracted from the child age at reporting at each time point for all child care arrangements; the final variable was calculated as the average number of months in all arrangements across 6–58 months ($\alpha = .94$).

Analytic Plan

All analyses were conducted using SAS 9.3. To account for missing data within the sample (18–24% of outcome variables and 0–29% of predictor variables), to minimize selection bias due to attrition, and to aid in model estimation, we conducted multiple imputation to create 20 datasets with imputed values for missing data. All analyses were conducted based on these 20 datasets. The multiple imputation procedure used an iterative method to estimate multivariate relationships among variables for observations with available data. These observed relationships were then used to approximate reasonable values for missing data. Multiple imputation has been shown to be the best estimating option to alternative ways of addressing missing data issues, such as listwise deletion or mean substitution (Graham, Olchowski, & Gilreath, 2007; Shafer & Graham, 2002). Our imputation model included all kindergarten outcomes, child and family control variables at 2 or 6 months, child care variables at each time point (6, 15, 24, 36, 48, and 58 months or pre-K), and auxiliary variables to improve imputation estimation. For children in parent-only care, we replaced child care variables (quantity, length of arrangements, type, and multiple arrangements) with values of zero if children were not in child care, rather than treating these variables as missing. For child care quality values (CVI, CLASS) for children in parent-only care, we replaced them with the mean values at each time point to prevent these cases from being excluded from analyses (Aiken & West, 1991). Post-imputation, child care variables were averaged across all time points. Continuous control variables and variables of interest were mean-centered prior to regression analyses. We calculated effect size as Cohen's *d*.

To answer our first research question (*What were the prevalence rates and patterns of multiple concurrent child care arrangement usage for children ages 6–58 months?*), we examined the means and frequency of parent-only and child care arrangement usage separately at each time point and across the six time points. We also explored children's experiences of informal and formal care across arrangements at each time point. Results for question 1 are presented in Tables 1–2 and Figures 1–2.

To answer our second research question (What was the association of multiple child care arrangements with teacher-reported positive and negative behaviors and children's assessed letter-word identification and mathematics skills in kindergarten?), we conducted four separate multiple regression analyses, one for each outcome (kindergarten teacher-reported positive behaviors and negative behaviors; Woodcock Johnson Letter-Word Identification and Applied Problems) using the surveyreg procedure. By using the SAS surveyreg procedure, we accounted for FLP's complex sampling design (i.e., stratification on income and race; individual probability weights associated with over-sampling of low-income and African American families), thereby allowing the results to be generalizable to a larger rural population. In Model 1, we included child, family, and child care control variables, as well as the predictor of interest, multiple arrangements from 6–58 months.

To answer our third research question (*Did child care type and quality moderate the relationship between multiple child care arrangements and kindergarten outcomes?*), in Model 2, we added three interaction terms exploring moderation by child care type (measured as proportion formal care, 6–58 months) and child care quality (measured separately from 6–36 months as provider-child positive interactions from the CVI and at pre-

K as classroom environment quality from the CLASS). (Note these analyses reduced the sample to children who had experienced at least one time point in care, $n = 1,139$).

To answer our fourth research question (*Was the timing of multiple arrangements differentially associated with outcomes under consideration?*), in Model 3, we replaced multiple arrangements from 6–58 months with two variables reflecting different timing of multiple arrangements: infancy/toddlerhood (6–24 months) and preschool age (36–58 months). All other control variables remained in the models. Results for questions 2–4 are presented in Table 3.

Results

Descriptive analyses and results

Descriptive information for study variables is presented in Table 1. The full sample was evenly split between boys and girls, and nearly half of the sample (42%) were African American children. By study design, FLP families had low income-to-needs ratios, averaging 180% of the federal poverty threshold. Across all arrangements from 6 and 58 months, children in child care (column 2) averaged approximately nineteen hours per week in care and sixteen months in care arrangements. Nearly 30% of children in child care experienced at least one center-based arrangement. We retained the full FLP sample in our analyses and some of the children ($n = 153$) did not experience non-parental child care. Therefore, we used logistic regression to examine the odds that children would experience at least one non-parental child care setting between 6 and 58 months of age. Significant associations were as follows: African American (Odds Ratio = 1.98, $p < .001$), residence in NC (Odds Ratio = 1.78, $p < .001$), higher home environment quality (Odds Ratio = 3.74, $p = 0.008$), lower maternal education (Odds Ratio = 0.92, $p = 0.006$), single-parent household (Odds Ratio = 0.41, $p < .001$), higher maternal depression (Odds Ratio = 1.31, $p = 0.003$), less positive parenting (Odds Ratio = 0.82, $p = 0.01$), more maternal weekly work hours (Odds Ratio = 1.12, $p < .001$), and fewer maternal nonstandard work hours (Odds Ratio = 0.46, $p < .001$).

We found that for this sample of rural families living in high-poverty areas, approximately half of the children were in at least one child care arrangement at a given time point (i.e., 48% at 6 months and 53% at 58 months). The average number of arrangements from 6–58 months for children in child care was 1.06 ($SD = 0.68$), with a range of up to 6 concurrent arrangements. The percentages of children who were in two or more concurrent arrangements at each time point were as follows: 20% at 6 months of age; 23% at 15 months; 21% at 24 months; 24% at 36 months; 27% at 48 months; and 30% at 58 months, with 23% of children experiencing two or more concurrent arrangements at least once during the span of early childhood. To answer our question about the timing of families' use of multiple arrangements, we also calculated the mean number of arrangements during infancy/toddlerhood (6–24 months) and during preschool age (36–58 months). The average number of multiple arrangements from 6–24 months for children in child care was 0.96 ($SD = 0.80$), with 15% of children experiencing two or more arrangements across the three time points. The average number of arrangements from 36–58 months was 1.22 ($SD = 0.96$), with 18% of children experiencing two or more arrangements across the three time points. For the

full sample, we ran correlations among kindergarten outcomes, child care moderators, and multiple arrangements (Table 2). The variable of multiple arrangements was significantly positively correlated with negative behaviors and letter-word decoding skills as well as formal child care type.

To understand families' patterns of multiple arrangement usage, we calculated the child care arrangement variables at each time point as parent-only, 1, 2, or 3+ arrangements. As seen in Figure 1, the percentage of children in parent-only care decreased across the six time points (from nearly 50% to just under 40%). The number of children in just one arrangement remained stable, at approximately 30%. The number of children in two arrangements or three+ arrangements rose slightly across the six time points. The highest frequency of two or more concurrent arrangements was at 58 months, with 35% of children reported to be in multiple child care arrangements.

In addition to frequency, we explored the type of care experienced by children within multiple arrangements over time. As seen in Figure 2, we reduced the sample to children who were in one or more arrangements at each time point and calculated the number of children in informal and formal care types. The percentage of children whose mothers reported their first arrangement as informal care declined across the six time points, from nearly 70% at 6 months to 30% at 58 months, with a corresponding increase in formal care. This pattern continued for the second arrangement (informal care frequency of 36% at 6 months to 25% at 58 months). For children who were in three+ arrangements, informal care held steady around 15% and formal care usage increased from 0% to 8%. Thus, across all arrangements, children experienced more formal care arrangements as they aged from 6–58 months. Finally, we explored the quality of children's first child care arrangement as a function of whether they were in 1, 2, or 3+ concurrent arrangements, with no discernible patterns or significant differences in quality among these groups.

Multiple regression analyses and results

Table 3 presents results from regression analyses predicting to kindergarten outcomes.

Behavioral outcomes—For children's positive behaviors, the results indicated that multiple arrangements from 6–58 months (Model 1) were not statistically significantly associated with kindergarten teacher-reported positive behaviors ($B = -0.14$, $p = 0.06$). In addition, interaction terms (Model 2) were not significant (type, $B = 0.19$, $p = 0.52$; 6–36 month quality, $B = -0.05$, $p = 0.69$; pre-K quality, $B = -0.06$, $p = 0.51$). Timing of multiple arrangements (Model 3) from 6–24 months ($B = -0.12$, $p = 0.06$) and 36–58 months ($B = -0.03$, $p = 0.54$) were also not significant.

For children's negative behaviors, the results indicated that multiple arrangements from 6–58 months (Model 1) was positively associated with teacher-reported negative behaviors in kindergarten ($B = 0.14$, $p = .03$), with an effect size of $d = 0.14$. Interaction terms (Model 2) were not significant (type, $B = -0.22$, $p = 0.37$; 6–36 month quality, $B = 0.03$, $p = 0.78$; pre-K quality, $B = 0.02$, $p = 0.78$). Timing of multiple arrangements (Model 3) from 6–24 months ($B = 0.06$, $p = 0.20$) and 36–58 months ($B = 0.07$, $p = 0.08$) were also not significant.

Academic outcomes—For letter-word decoding skills, the results indicated that multiple arrangements from 6–58 months (Model 1) was positively associated with children's assessed letter-word identification scores in kindergarten ($B = 4.58$, $p = .02$), with an effect size of $d = 0.17$. Interaction terms (Model 2) were not significant (type, $B = -7.97$, $p = 0.27$; 6–36 month quality, $B = -2.35$, $p = 0.39$; pre-K quality, $B = -1.62$, $p = 0.52$). For timing of multiple arrangements (Model 3), multiple arrangements from 6–24 months was not statistically significant ($B = 1.31$, $p = 0.41$), but multiple arrangements from 36–58 months was positively associated with letter-word decoding ($B = 2.96$, $p = .006$), with an effect size of $d = 0.11$.

For mathematics skills, the results indicated that multiple arrangements from 6–58 months (Model 1) were not statistically significantly associated with kindergarten teacher-reported positive behaviors ($B = 1.61$, $p = 0.20$). In addition, interaction terms (Model 2) were not significant (type, $B = 0.91$, $p = 0.85$; 6–36 month quality, $B = 0.76$, $p = 0.70$; pre-K quality, $B = -1.20$, $p = 0.39$). Timing of multiple arrangements (Model 3) from 6–24 months ($B = 0.81$, $p = 0.43$) and 36–58 months ($B = 0.94$, $p = 0.19$) were also not significant.

Discussion

The primary aims of this study were to describe child care usage for a representative sample of children living in rural high-poverty communities and to examine whether the use of multiple concurrent arrangements from 6–58 months was associated with their behavioral and academic outcomes in kindergarten, controlling for a range of child, family, and child care characteristics. Analytically, we found that multiple arrangements were positively associated with teacher-reported negative behaviors, but not positive behaviors, and letter-word decoding skills, but not mathematics skills. For letter-word decoding skills, results were significant for children with a higher average number of arrangements from 36–58 months rather than 6–24 months. No evidence emerged that the use of multiple arrangements was moderated by the proportion of formal child care arrangements or the quality of care of children's primary arrangements. Together, these findings offer additional insights into the common phenomenon of multiple child care arrangement usage.

This study supports the findings of several other studies (e.g., Claessens & Chen, 2013; Pilarz & Hill, 2014) that multiple arrangements were positively associated with negative behaviors, such that more arrangements were related to higher kindergarten teacher ratings of negative behaviors. From a bioecological perspective, children may have had difficulty negotiating the complex mesosystem of multiple child care environments. Navigating concurrent child care settings may have been difficult for children as they were learning how to optimally adapt their behaviors to the expectations and peer groups of each setting. If participation in each setting did not occur for a long enough period of time, child care providers may have had difficulty learning about and engaging children in appropriate proximal processes related to social and emotional development (Bronfenbrenner & Morris, 2006). Children appeared to be susceptible to the effects of interacting with a number of different care providers and peers over their first five years, which may have led to the exhibition of teacher-perceived negative behaviors in kindergarten.

In contrast, a growing body of work has shown that experiences with multiple arrangements can benefit children's academic skills, generally through the combination of child care types (Forry et al., 2013; Gordon et al., 2013). In this study, multiple arrangements were not associated with mathematics skills, potentially because few mathematics-related activities generally take place in child care settings (Chien et al., 2010). However, a positive association existed between multiple arrangements and letter-word decoding, particularly when arrangements occurred from 36–58 months. Although an increased number of adults and peers with whom to interact may have led to the development of negative behaviors, nonetheless these interactions may have provided an early foundation for literacy that served children once they reached kindergarten. Across arrangements, children may have interacted with more inputs (e.g., book reading, print, writing utensils) and heard more complexity of language, which aided in their development of early literacy skills.

Because the relationship between multiple arrangement and letter-word decoding was significant from 36–58 months but not 6–24 months, these opportunities appeared to be more important for children as they approached kindergarten. Children ages three to five and their providers theoretically engage in more sophisticated and reciprocal interactions, especially as children are able to communicate with providers and peers and engage more readily with academic-oriented materials (Bronfenbrenner & Morris, 2006). Together, these findings implied that even the same set of child care arrangements can have differing relationships with varying developmental processes of the developing child (i.e., behavioral and academic skills), which is in line with the bioecological framework and deserves replication and extension with other samples.

For FLP children who had experienced at least one time point in child care, we also sought to understand if any main associations between multiple arrangements and behavioral and academic outcomes would be moderated by two important characteristics of the child care environments: type and quality of care. Our study was unique in that we captured type of care for all arrangements experienced by children (not just primary arrangements), classifying type as informal (i.e., family, relative, child care home) and formal (i.e., center-based care). Our results mirrored those from other studies, as more formal care was associated with higher teacher ratings of negative behaviors and, conversely, lower teacher ratings of positive behaviors (Coley, Votruba-Drzal, Miller, & Koury, 2013). In connection with multiple arrangements, prior work has found that the combination of particular types of care has been associated with child outcomes, such as two center-based care arrangements associated with reading skills and a home-center arrangement combination associated with higher social competence (Gordon et al., 2013). However, no evidence emerged that our type of care variable, the proportion of center-based care across all arrangements from 6–58 months, moderated the number of arrangements in relation to behavioral or academic outcomes.

Child care quality can be considered the most important aspect in capturing the proximal processes occurring within children's child care microsystems (Burchinal, et al., 2015). In this study, we measured quality from 6–36 months as provider-child positive interactions and at pre-K as global classroom quality. Only the latter was significant as positively related to teacher ratings of positive behaviors and negatively related to teacher ratings of negative

behaviors. Although we might have expected that higher-quality primary care arrangements would be beneficial for children experiencing a higher number of concurrent arrangements, moderation analyses were not significant.

Limitations and Future Work

This study had a number of limitations, primarily due to its observational design and lack of measurement of characteristics of all child care arrangements. Because multiple arrangements cannot be randomly assigned, available empirical evidence is from observational studies, which cannot fully account for selection bias. Families who tend to use a greater number of multiple arrangements are likely to be different from families who use multiple arrangements less frequently. Our study, also observational in nature, aimed to provide additional empirical evidence on the issue but, like others, was only able to examine descriptive and associative relationships between multiple arrangements and child outcomes. Thus, a number of factors remain to be unpacked in the relations between multiple child care arrangements and children's outcomes.

Studies that explicitly include in-depth examinations of child care quality and other measurable proximal processes within all child care arrangements at every time point are greatly needed. In our study, for example, child care quality was only measured for primary care arrangements at 6, 15, 24, and 36 months and pre-K. Because child care quality is an important determinant of children's outcomes, capturing quality across each setting (regardless of who provides that care or how much time is spent in care) is an important task. This shortcoming could be rectified in future studies by including a study design that explicitly captures a wide range of family factors and characteristics of all child care settings. In order to accurately capture all child care arrangements experienced by children (both stable and/or unstable), such studies would need to include continual contact with child care providers and parents when any change or addition in care occurs, and solicit reasons for the changes and additions. Further, because this study found that the average number of arrangements from 6–58 months was significantly related to negative behaviors, future studies would best span the entire duration of early childhood, starting at birth and continuing into early elementary years.

Analyzing the construct of multiple arrangements when using longitudinal studies is important but also raises complications, particularly when children experience highly-fluctuating child care arrangements over time. As an example, a child may have experienced multiple child care arrangements at one time point, only one non-parental child care arrangement at another time point, and no child care at a third time point. In our study, we included children in non-parental care in order to allow results to be generalize to a larger rural population, albeit still limited to two geographic regions in the US and not applicable to the growing Latino population in rural areas. With six time points of data collected from a sample that had a high level of instability in child care use (Bratsch-Hines, Vernon-Feagans, & Family Life Project Key Investigators, 2013; Bratsch-Hines et al., 2015), we thus defined our central construct of interest as the average number of concurrent non-parental child care arrangements experienced by the study children over the period from 6–58 months. Future work could build upon our definition of multiple arrangements and employ additional

strategies to understand the implications of families' longitudinal use of multiple arrangements.

Despite evidence of the relationship between multiple arrangements and negative behaviors, studies to date have not been able to understand the characteristics of multiple arrangements that lead to subsequent negative behaviors. Our study, like most others, did not explore if children who experienced the highest number of arrangements were themselves a driver of needing multiple child care placements (Bacharach & Baumeister, 2003). If children appeared happy and highly functioning within a child care setting, their families may have perceived that setting as supporting their child, removing the need to add additional care arrangements. However, if children did not appear to be successful in one child care environment, or if the child displayed maladaptive behaviors within one setting, families may have been compelled to increase the number of arrangements to "spread out" children's negative behaviors rather than "burn out" one provider (Bradley, 2010).

Conclusion

As compared to children living in urban and suburban areas, children in the rural United States have higher poverty rates, with a growing gap between urban and rural child poverty rates, especially since the 2008 recession (U.S. Department of Agriculture, 2016; Vernon-Feagans, et al., 2015). Even though 80% of rural households have a full-time working adult, many of the available jobs pay low wages, provide few benefits, and frequently require nonstandard work hours, all of which strain families' resources (Lichter, Roscigno, & Condrón, 2003). An increasing number of rural adults work evening, overnight, weekends, and rotating and variable shifts. In FLP, for example, over 40% of the working mothers living in rural North Carolina and Pennsylvania were employed in jobs with nonstandard work hours (Vernon-Feagans, et al., 2015). These economic realities have changed the structure of family life, leaving families struggling to spend quality time with each other (Enchautegui, 2013; Presser, 1999, 2004).

Employment variability and economic insecurity directly impact families' use of child care. By using the representative FLP sample, this study provided a unique window into rural children's child care experiences. We found that at each time point, families reported using up to 4–6 concurrent arrangements for their children, with roughly 20–30% of children experiencing two or more concurrent arrangements at a given time point. The use of formal care increased over time for all arrangements. Together, descriptive FLP data showed similarities in multiple arrangement usage as compared to other samples, including representative national and international samples and more-advantaged US samples. Assisting families in rural communities to find and maintain stable care; providing publicly-funded transportation options to make child care options viable for geographically-isolated families; and ensuring the availability of high-quality care, particularly in the preschool years, are important objectives for local, state, and federal lawmakers.

For FLP children, multiple child care arrangements had complex relationships with their school readiness skills in kindergarten. If multiple arrangements can serve as a positive factor for children, particularly with respect to their early academic skills, then this phenomenon is important to explore as a recommendation for families looking to boost their

children's school readiness skills. Yet, because multiple arrangements are consistently associated with negative behaviors, recommending that families seek out supplemental concurrent care for their children can be considered problematic. Families and child care providers may need assistance and training in recognizing signs of poor social adjustment in child care environments and work across environments to provide needed supports for children. To best prepare children for the social and academic challenges of formal schooling, additional research is needed to investigate the relationship of multiple child care arrangements with children's development.

Acknowledgments

This research was supported by a grant from the National Institute of Child Health and Human Development (1PO1HD39667 and 2PO1HD039667). Co-funding was provided by the National Institute of Drug Abuse, NIH Office of Minority Health, NIH-Office of the Director, National Center on Minority Health and Health Disparities, and the Office of Behavioral and Social Sciences Research. We would like to express our gratitude to all of the families, children, and teachers who participated in this research and to the Family Life Project research assistants for their hard work and dedication to the FLP.

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Research Highlights

- Multiple arrangement usage was prevalent for rural sample from high-poverty areas.
- Multiple arrangements were positively related to letter-word identification.
- Multiple arrangements were positively related to negative behaviors.

Figure 1. Percentage of children in parent-only care and child care at each time point

Figure 2. Number of children in one or more child care arrangements who experienced informal and formal care types

Table 1

Descriptive data

Variable	Full Sample <i>N</i> = 1292		Child Care Sample <i>n</i> = 1139		Parent-Only Sample <i>n</i> = 153	
	<i>M</i> or %	<i>SD</i>	<i>M</i> or %	<i>SD</i>	<i>M</i> or %	<i>SD</i>
Outcomes, kindergarten						
Positive behaviors (SCS)	4.34	1.08	4.31	1.09	4.63	1.02
Negative behaviors (SCS)	1.90	0.96	1.94	0.98	1.55	0.72
Letter-word Identification (WJ)	394.42	27.04	394.34	26.96	395.19	27.97
Applied Problems (WJ)	431.51	19.89	431.05	19.74	436.01	20.89
Child characteristics						
Gender (male)	0.51	0.50	0.51	0.50	0.51	0.50
Race (African American)	0.42	0.49	0.46	0.50	0.22	0.42
Temperament (IBQ)	3.14	0.76	3.16	0.77	3.02	0.70
Family characteristics						
State (NC)	0.60	0.49	0.62	0.49	0.44	0.50
Income-to-needs ratio	1.81	1.68	1.83	1.72	1.66	1.33
Maternal weekly work hours	17.13	18.72	19.15	18.91	2.56	7.77
Maternal nonstandard work hours	0.20	0.40	0.22	0.41	0.10	0.29
Home environment quality (HOME)	0.82	0.14	0.82	0.14	0.83	0.15
Maternal education (years)	12.66	2.06	12.64	2.04	12.80	2.21
Maternal literacy (K-FAST), 2 mos	95.55	11.90	95.41	11.82	96.63	12.89
Marital status (married/partnered)	0.70	0.46	0.67	0.47	0.86	0.34
Maternal depression (BSI)	0.38	0.55	0.38	0.55	0.38	0.56
Maternal positive parenting	2.90	0.79	2.88	0.79	3.01	0.79
Child care characteristics, 6–58 mos						
Quantity (weekly hours in care)	17.04	12.92	19.44	12.00	–	–
Length of arrangements (months)	14.19	9.84	16.20	8.83	–	–
Child care moderators, 6–58 mos						
Type (proportion formal)	0.25	0.27	0.29	0.27	–	–
Quality (CVI), 6–36 mos	1.42	0.68	1.42	0.75	–	–

Variable	Full Sample N = 1292		Child Care Sample n = 1139		Parent-Only Sample n = 153	
	M or %	SD	M or %	SD	M or %	SD
Quality (CLASS), pre-K	4.24	0.66	4.24	0.72	–	–
Predictor of interest						
Multiple arrangements, 6–58 months	0.93	0.72	1.06	0.68	0.00	0.00
Multiple arrangements, 6–24 months	0.84	0.81	0.96	0.80	0.00	0.00
Multiple arrangements, 36–58 months	1.10	0.98	1.22	0.96	0.00	0.00

Notes: SCS = Social Competence Scale, WJ = Woodcock Johnson, IBQ = Infant Behavior Questionnaire, NC = North Carolina, HOME = Home Observation for Measurement of the Environment, K-FAST = Kaufman Functional Academic Skills Test, BSI = Brief Symptom Inventory, CVI = Child Care Observational Coding System, CLASS = Classroom Assessment Scoring System. Variables were measured at 6 months unless noted.

Table 2
Correlations among outcomes, moderators, and multiple arrangement variable

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Outcomes, kindergarten							
1. Positive behaviors (SCS)	–						
2. Negative behaviors (SCS)	–0.70 [*]	–					
3. Letter-word Identification (WJ)	0.27 [*]	–0.18 [*]	–				
4. Applied Problems (WJ)	0.25 [*]	–0.19 [*]	0.55 [*]	–			
Child care moderators							
5. Type (proportion formal), 6–58 mos	–0.08 [*]	0.14 [*]	0.06	0.00	–		
6. Quality (CVI), 6–36 mos	0.08 [*]	–0.09 [*]	0.03	0.03	–0.26 [*]	–	
7. Quality (CLASS), pre-K	0.12 [*]	–0.12 [*]	0.06	–0.02	–0.02	0.08 [*]	
Predictor of interest, 6–58 months							
8. Multiple arrangements	–0.04	0.07 [*]	0.11 [*]	0.01	0.35 [*]	0.00	–0.02

Notes:

^{*} $p < .05$. SCS = Social Competence Scale. WJ = Woodcock Johnson. CVI = Child Care Observational Coding System. CLASS = Classroom Assessment Scoring System.

Table 3

Regression results for kindergarten student outcomes

Variable	Positive Behaviors (SCS)			Negative Behaviors (SCS)			Letter-Word Identification (WJ)			Applied Problems (WJ)		
	B	SE		B	SE		B	SE		B	SE	
<i>Model 1, main associations</i>												
Child characteristics												
Gender (male)	-0.16*	0.08		0.15*	0.07		-0.49	1.68		0.37	1.19	
Race (African American)	-0.16	0.11		0.14	0.11		1.55	2.78		6.09**	1.90	
Temperament (IBQ)	0.16**	0.06		-0.10*	0.05		0.99	1.44		1.19	0.90	
Family characteristics												
State (NC)	0.25**	0.10		-0.10	0.09		3.52	2.49		-2.96	1.56	
Income-to-needs ratio	0.01	0.03		-0.02	0.02		1.61*	0.63		0.19**	0.42	
Maternal weekly work hours	0.00	0.00		0.00	0.00		-0.07	0.06		-0.03	0.04	
Maternal nonstandard work hours	-0.03	0.11		0.00	0.09		0.99	2.42		-1.37	1.68	
Home environment quality (HOME)	0.65	0.35		-0.40	0.32		12.08	8.23		6.90	5.54	
Maternal education (years)	0.01	0.02		-0.04	0.02		1.66**	0.55		1.03***	0.37	
Maternal literacy (K-FAST), 2 mos	0.01***	0.00		0.00	0.00		0.53***	0.10		0.39	0.06	
Marital status (married/partnered)	0.04	0.11		-0.04	0.10		1.29	2.48		1.17	1.70	
Maternal depression (BSI)	-0.05	0.07		0.05	0.07		-0.88	1.62		2.43*	1.20	
Maternal positive parenting	0.01	0.06		-0.03	0.05		1.73	1.12		1.26	0.95	
Child care characteristics, 6–58 mos												
Quantity (weekly hours in care)	-0.01	0.01		0.01	0.00		-0.02	0.13		-0.02	0.10	
Length of arrangements (months)	0.02**	0.01		-0.02***	0.01		-0.19	0.14		-0.16	0.10	
Child care moderators, 6–58 mos												
Type (proportion formal)	-0.43*	0.18		0.44**	0.17		2.30	4.78		4.96	3.63	
Quality (CVI), 6–36 mos	0.04	0.08		-0.10	0.08		2.06	2.27		2.90	1.64	
Quality (CLASS), pre-K	0.14*	0.06		-0.13**	0.05		2.26	1.56		-0.95	0.97	
Predictor of interest, 6–58 mos												
Multiple arrangements	-0.14	0.07		0.14*	0.06		4.58*	1.94		1.61	1.26	

Variable	Positive Behaviors (SCS)			Negative Behaviors (SCS)			Letter-Word Identification (WJ)			Applied Problems (WJ)		
	B	SE		B	SE		B	SE		B	SE	
<i>Model 2, child care moderation analysis, 6–58 mos</i>												
Multiple arrangements* type	0.19	0.29		–0.22	0.24		–7.97	7.16		0.91	4.66	
Multiple arrangements* quality (CVD), 6–36 mos	–0.05	0.12		0.03	0.10		–2.35	2.75		0.76	1.99	
Multiple arrangements* quality (CLASS), pre-K	–0.06	0.09		0.02	0.07		–1.62	2.52		–1.20	1.38	
<i>Model 3, timing</i>												
Multiple arrangements, 6–24 months	–0.12	0.06		0.06	0.05		1.31	1.59		0.81	1.02	
Multiple arrangements, 36–58 months	–0.03	0.05		0.07	0.04		2.96**	1.08		0.94	0.72	

Notes:

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

$p < .001$. SCS = Social Competence Scale. WJ = Woodcock Johnson. IBQ = Infant Behavior Questionnaire. NC = North Carolina. HOME = Home Observation for Measurement of the Environment. K-FAST = Kaufman Functional Academic Skills Test. BSI = Brief Symptom Inventory. CVI = Child Care Observational Coding System. CLASS = Classroom Assessment Scoring System. Variables were measured at 6 months unless noted. In Model 2, interaction terms were added to Model 1. In Model 3, multiple arrangements from 6–24 months and 36–58 months replaced the variable of multiple arrangements from 6–58 months.