Published in final edited form as:
J Marriage Fam. 2013 October 1; 75(5): 1203–1217. doi:10.1111/jomf.12055.

Does Child Care Quality Mediate Associations Between Type of Care and Development?

Kristin S. Abner,
University of Illinois at Chicago

Rachel A. Gordon*,
University of Illinois at Chicago

Robert Kaestner*, and
University of Illinois at Chicago

Sanders Korenman**
Baruch College, City University of New York

Abstract

Studies document that, on average, children cared for in centers, as compared to homes, have higher cognitive test scores but worse socioemotional and health outcomes. The authors assessed whether the quality of care received explains these associations. They considered multiple domains of child development—cognitive, socioemotional, and health—and examined whether mediation is greater when quality measures are better aligned with outcome domains. Using the Early Childhood Longitudinal Study Birth Cohort, they found that children in centers have better cognitive skills and behavioral regulation than children in homes, but worse social competence and generally equivalent health (N = 1,550). They found little evidence that quality of child care, as measured by standard instruments (e.g., the Early Childhood Environment Rating Scale—Revised), accounts for associations between type of care and child developmental outcomes.

Keywords

child care arrangements; child development; child care quality

Nearly half of 2-year-olds, and 80% of 4-year-olds, in the United States are in some regular form of nonparental care (U.S. Department of Education, 2008). A substantial body of research has considered how characteristics of child care influence child development and has demonstrated that children cared for in centers have better cognitive outcomes, but (often) worse behavior and health, than children in home care (Haskins & Kotch, 1986; Vandell, 2004; Vermeer & IJzendoorn, 2006). Whether such differences by type of care depend on the amount of time that a child spends in care is less well established. In addition, researchers have hypothesized that differences in developmental outcomes by type of care may be partly due to differences in child care quality between homes and centers (Blau, 1999; Magnuson, Meyers, Ruhm, & Waldfogel, 2004; Peisner-Feinberg et al., 2001). There has been little formal investigation of this hypothesis.

815 West Van Buren St., Suite 525, Chicago, IL 60607 (kabner2@uic.edu).
*815 West Van Buren St., Suite 525, Chicago, IL 60607.
**School of Public Affairs, Baruch College, City University of New York, One Bernard Baruch Way, Box D-0901, New York, NY 10010.

Our research extends prior studies in several important ways. Prior studies have generally examined one or two developmental domains, but we examined three domains (cognition, behavior, and health) using similar methods and a common sample from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B). Across these outcomes, we also tested whether associations between the type of care and child outcomes were moderated by the time spent in care and mediated by the quality of care, both overall and within developmental domains, using the Early Childhood Environment Rating Scale—Revised Edition (ECERS–R; Harms, Clifford, & Dyer, 1998), Family Day Care Rating Scale (FDCRS; Harms & Clifford, 1989), and Arnett Caregiver Interaction Scale (Arnett CIS; Arnett, 1989).

To our knowledge, our study is the first to examine mediation by aligned quality measures. This contribution is notable because previous studies have typically adjusted for broad aspects of quality rather than quality specific to the outcome domain (Loeb, Fuller, Kagan, & Carrol, 2004; NICHD Early Care Child Research Network, 2004; NICHD Early Care Child Research Network & Duncan, 2003; Votruba-Drzal, Coley, & Chase-Lansdale, 2004). Other researchers have noted limitations with broad measures of quality, specifically that they are not adequately aligned with outcomes (Lamb, 2000; Layzer & Goodson, 2006; Vandell & Wolfe, 2000; Zaslow et al., 2006). In our study, we used subscale scores, which are presumed to better align with different aspects of child development than total scores. The potential importance of better aligning quality with developmental outcomes is suggested by intervention studies that showed, for example, that child literacy could be raised by caregivers' greater language stimulation (Dickinson & Caswell, 2007; Wasik, Bond, & Hindman, 2006). Consistent with this evidence, we hypothesized that better aligned quality measures might reveal larger associations with child outcomes than those found in prior studies that relied on global measures of quality. On the other hand, recent psychometric evidence suggests that even subscales, such as those we used, may be less aligned with outcomes than previously thought, because more finely grained analyses have shown that items in these subscales actually mix various aspects of quality (Clifford, Sideris, Neitzel, & Abuchaim, 2012; Gordon, Fujimoto, Kaestner, Korenman, & Abner, 2013). For example, instructions for the ECERS–R/FDCRS require observers rating personal care items to attend not only to health constructs but also to whether the teacher sat with and engaged in conversations with children during meals. This study extends these recent critiques of quality measures because we examined whether the subscale scores sometimes presumed to be better align with child outcomes are indeed better mediators of the association between child care type and child development than are nonaligned measures.

Background

A large literature has examined associations between child care and outcomes, and we highlight the prior research that is of greatest relevance for our study. It is important to note that numerous studies have reported that, compared to children cared for in homes, children in centers score higher on cognitive assessments and lower on socioemotional assessments, but effect sizes are modest (Dmitrieva, Steinberg, & Belsky, 2007; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007). Studies using the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K) have reported associations between centers and cognitive assessments (ECLS-K reading and math scores) of 0.10 to 0.30 *SD* (Loeb et al., 2007; Magnuson et al., 2004; Magnuson, Ruhm, & Waldfogel, 2007). Studies have also documented more behavioral and self-control problems among children in center care for long hours with small to modest effect sizes in samples drawn from the ECLS-K (Dmitrieva et al., 2007; Loeb et al., 2007; Magnuson et al., 2007) and the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD; Belsky et al., 2007; NICHD Early Care Child Research Network, 2002,

2006). Finally, studies have reported that children cared for in centers are more likely to catch illnesses such as the flu and develop ear infections than children cared for in homes (Haskins & Kotch, 1986; Rovers, Zielhuis, Ingels, & van der Wilt, 1999).

Second, researchers have documented significant correlations between developmental outcomes and the number of hours per week that children spend in care, especially large group care (Belsky, 2002; NICHD Early Care Child Research Network, 2007). For example, Loeb et al. (2007) found that children in centers for more than 30 hours per week gain more in pre-reading skills, but have worse behavior, than children in care part time. Belsky (2002) reported that children averaging 30 hours/week in child care (vs. fewer than 10) have greater externalizing problems (effect size of .38). Later analyses of the same data (NICHD SECCYD) revealed that the elevated behavior problems associated with more time in care are specific to centers (NICHD Early Care Child Research Network, 2007). Studies have also shown that long hours in centers, but not in homes, increase respiratory problems and ear infections (Gordon, Kaestner, & Korenman, 2007).

Our examination of the potential mediating role of quality was informed by small effect sizes found in child care quality studies (Burchinal, Kainz, & Cai, 2011; Keys et al., 2013). Burchinal and colleagues' (2011) recent meta-analysis comprehensively synthesized results from 20 different published studies that used a wide range of global measures, including the ECERS, the NICHD SECCYD's Observational Record of the Caregiving Environment, and composites, adding additional measures such as the Arnett CIS; the authors concluded that the association of higher global quality with higher cognition and fewer behavior problems is small (average effect size of .11). Poor alignment between aspects of quality and domains of child development may partly explain the small effect sizes. For example, higher average cognition among children cared for in centers (vs. homes) may reflect a better quality of centers with respect to learning; overall quality may be an imperfect signal of this specific aspect. Few studies have aligned quality measures with child outcomes, although a notable exception using the NICHD SECCYD demonstrated that language stimulation is more strongly associated with cognition (i.e., language comprehension, applied problem solving; NICHD Early Care Child Research Network, 2003) than the composite measure. Burchinal and colleagues conducted new analyses to test for the possibility that aligned quality subscales from the ECERS and Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008) are more strongly associated with child outcomes than global quality (using different data sources than we did in the current study). They found that the ECERS Language-Reasoning and Interaction subscales and CLASS Instructional and Emotional Support subscales had more consistent, yet still modest, partial correlations with children's language, reading, math, social skills, and behavioral problems than did composite quality (some aligned correlations were as high as .19, with 19% of correlations at .10 or above, as opposed to global correlations, which had a high of .24, but only 13% of correlations were at .10 or above; Burchinal et al., 2011). A few studies have examined whether quality mediates associations between the type of care and outcomes but relied on global rather than aligned measures (Loeb et al., 2004; NICHD Early Care Child Research Network, 2004; NICHD Early Care Child Research Network & Duncan, 2003; Schwebel, Brezausek, & Belsky, 2006). For example, Schwebel and colleagues (2006) studied the mediating role of the NICHD SECCYD composite quality measure on child injury rates; the association was not significant, but they did not examine the role of supervision or other specific aspects of quality that potentially could be more closely associated with injuries.

Building on these earlier analyses, we examined whether aligned quality mediates the relationship between type of care and outcomes using the subscale scores of the ECERS–R/FDCRS. We also tested for another previously unexamined possibility: moderated

mediation, which would imply that the mediating effect of quality is greatest for children in care for the most hours (Preacher, Rucker, & Hayes, 2007).

Hypotheses

As our brief review suggests, much of the literature has focused on overall associations between child outcomes and child care type, intensity, and quality. Less frequently examined are whether quality mediates associations between child care type and outcomes, and whether intensity of care moderates these associations. We examined these possibilities using the ECLS-B. It is important to note that we considered child outcomes across the cognitive, socioemotional, and health domains, and we attempted to align aspects of quality with these domains to examine the following hypotheses:

Hypothesis 1 Children will have better cognitive outcomes, but poorer behavior and health outcomes, on average, when they are cared for in center-based versus home-based settings.

Hypothesis 2 Associations between type of care and outcomes will be larger for children who spend more hours in care. The cognitive benefit of centers versus homes (and health and behavioral disadvantages) will be greatest for children in care full time and smaller for those in care part time.

Hypothesis 3 Associations between type of care and outcomes will be mediated by the quality of care received. Specifically, the hypothesized positive association between preschoolers' cognitive scores and center care (vs. homes) will be reduced in magnitude after adjusting for quality. The hypothesized negative association between preschoolers' behavioral and health outcomes and center care will also decrease (toward 0) after adjusting for quality.

Hypothesis 4 Mediation through quality will be greater for children who spend more hours in the setting.

Hypothesis 5 Mediation through quality will be greater when quality is better aligned with child outcomes.

METHOD

Sample

We used data for 4-year-olds for whom a child care setting was observed as part of the ECLS-B. The age range in our analytic sample was 44 to 64 months. We selected the 4-year follow-up because at this age many children are in child care of both types (centers and homes). In initial analyses, we replicated the association between type of care and outcomes in the full sample, including children in exclusive parental care; results are available on request.

The ECLS-B initially sampled newborns from vital statistics birth records in 46 states for the year 2001. The sample size was 10,700 at the initial 9-month interview (response rate of 74%) and 8,950 at the 4-year follow-up. (We rounded sample sizes to the nearest 50 to conform to the ECLS-B restricted-use requirements). We used data from the portion of the study at which the setting was observed for quality. To reduce costs, the investigators randomly selected a subsample of 1,550 four-year olds who had been randomly selected from children in care 10 or more hours per week, with oversampling based on child poverty and type of care (home based, Head Start, and non–Head Start centers; Snow et al., 2007, p.

127). All children observed in child care at age 2 and still in care for at least 10 hours at age 4 were also included in the observation sample (Snow et al., 2007). We imposed no further selection criteria. We lost approximately 6% of cases due to item-level missing data. Our analytic sample sizes ranged from 1,500 to 1,550, depending on item-level missing data for each outcome. We used sampling weights that ECLS-B statisticians created to adjust for the initial and subsequent (for the child care observation) oversampling, initial nonresponse, and differential nonresponse over time (including participation rates for child care providers). Analyses also adjusted for the study's primary sampling units.

Measures

Child developmental outcomes—We constructed all child outcome measures so that higher values indicated more desirable developmental outcomes (e.g., a higher behavior score indicated less problematic behavior). We used two cognitive achievement scores created by ECLS-B staff for reading and math achievement (Najarian, Snow, Lennon, & Kinsey, 2010; Snow et al., 2007, 2009). We did this because the ECLS-B drew items from a variety of sources rather than using all items from a single standardized measure, and the individual items were not publically released. The reading composite score is a measure of emergent early literacy, including letter sounds, early reading, phonological awareness, knowledge of print conventions, and matching words (Snow et al., 2007, 2009). The mathematics composite score measures number sense, geometry, counting, operations, and patterns (Najarian et al., 2010; Snow et al., 2007, 2009). We created socioemotional measures from caregiver- and parent-reported items the ECLS-B selected from the Preschool and Kindergarten Behavior Scales—Second Edition (Merrell, 2003), the Social Skills Rating System (Gresham & Elliott, 1990), and the ECLS-K cohort survey (Snow et al., 2007). Because the ECLS-B did not provide psychometrically constructed subscales for the socioemotional items (Najarian et al., 2010), we generated subscales based on confirmatory factor analyses and item response theory models (Gordon et al., 2013). Our analyses yielded three scales that we refer to as (a) *social competence* (e.g., how well the child plays with others, is liked by others, is accepted by others), (b) *emotional and behavioral regulation* (e.g., lack of aggression, anger, and worry; expressions of happiness), and (c) *attention and concentration* (e.g., pays attention well, does not disrupt class, is not overly active). With regard to health outcomes, we created a dummy indicator from the parent's overall rating of the child's health: excellent or very good (1), or good, fair, or poor (0), a common specification in the health literature (Case, Lubotsky, & Paxson, 2001; Case & Paxson, 2006; Newacheck, Hung, Park, Brindis, & Irwin, 2003). We also created dummy variables to indicate the absence of illness or injury based on parents' reports of whether the child had a doctor-confirmed respiratory illness, gastrointestinal flu, ear infection, or injury since the last interview.

Child care type and intensity—Providers reported the type of care at the preschool wave. *Home care* was defined as nonparental care by a relative (grandparents, brother, sisters, or any other relatives) or nonrelative (family child care providers, regular sitters, or neighbors). *Center care* included day care centers, nursery schools, preschools, or prekindergarten programs. To facilitate interpretation, we trichotomized hours in care into 15 hours or less, 16 to 34 hours, and 35 or more hours per week, based on prior studies that have shown that associations between child outcomes and hours in care were nonlinear (especially for many hours in care; i.e., Loeb et al., 2007; Magnuson et al., 2004) and to reflect approximate tertiles in the sample. In sensitivity analyses, we found a similar pattern of results using a continuous-hours measure (results available on request).

Child care quality—Observers completed the ECERS–R, FDCRS, and Arnett CIS as part of the ECLS-B child care observation at the preschool wave (Arnett, 1989; Harms &

Clifford, 1989; Harms et al., 1998; Snow et al., 2007). In addition to total scores, we used subscale scores aligned as closely as possible with outcome domains. Raters scored the ECERS–R and FDCRS items on a scale that ranged from 1 (*inadequate*) to 7 (*excellent*) based on numerous indicators. Although the format of the two scales is similar, they differ in the number and content of items. The ECERS–R has 43 items (37 of which were included in the ECLS-B), and the FDCRS has 40 items (33 of which were included in the ECLS-B). Each scale includes items about space and furnishings, personal care routines, language, learning activities, and social interactions. Following standard practice, ECLS-B staff calculated total scores by averaging the ECERS–R or FDCRS items. The Arnett CIS includes 26 items focused on the quality of the caregiver's interactions with the children. Modeled on four well-established parenting styles (authoritarian, authoritative, permissive, and uninvolved; Arnett, 1989; Maccoby & Martin, 1983), the items encompass the caregivers' warmth, enthusiasm, involvement, and interest in the children as well as the extent of their hostility, criticism, and laxness. Items are scored on a scale of 1 (*not at all*) to 4 (*very much*). ECLS-B staff created a total score by summing items after reverse scoring negatively oriented items. Arnett CIS content and scoring are the same in centers and homes.

In an effort to better align aspects of quality with child outcomes, we selected ECERS–R and FDCRS subscales. For cognitive outcomes, we used the Language-Reasoning subscales, which cover constructs such as having a wide selection of books and the caregiver helping children learn concepts of size, shape, and number. For socioemotional outcomes, we used the ECERS–R Interaction and FDCRS Social Development subscales to capture supervision, discipline, and interactions between staff and children. For health outcomes, the ECERS–R Personal Care and FDCRS Basic Care subscales encompass mealtime sanitation and safety, nap or rest time, and toileting/diapering. To simplify interpretation and to allow for possible threshold effects (Burchinal et al., 2011), we classified quality into approximate tertiles of the distribution (low, medium, and high), separately for the total and subscale score. (Table 1 includes the thresholds for each specification). We did not include the Arnett CIS in aligned quality because it is plausibly associated with each domain, not only in socioemotional outcomes (social development, child aggression, and lack of negative affect) but also in complexity of child play and academic achievement (Brown & Iyengar, 2008; Downer, Sabol, & Hamre, 2010; Lagacé-Séguin & d'Entremont, 2006; Underwood, Beron, Gentsch, Galperin, & Risser, 2008).

Other covariates—We used several covariates to address nonrandom selection into child care (Blau, 1999; Duncan & Gibson-Davis, 2006; NICHD Early Child Care Research Network, 2004) including the mother's education, employment status, marital status, health status, and age, as well as the family's income relative to the federal poverty level. We controlled for child characteristics such as race, gender, age (in months), low birth weight, and whether the child was ever breast fed. To adjust for unmeasured child-specific factors that may be correlated with both type of care and developmental outcomes, we included lagged (Age 2) cognition, social skills, and health status: the Bayley Short Form—Research Edition mental health, motor, and behavior scores (National Center for Education Statistics, 2001); whether the child had a doctor-confirmed respiratory illness, gastrointestinal flu, ear infection, or injury; an assessment of the child's temperament (measured with the Infant/Toddler Symptom Checklist; DeGangi, Poisson, Sickel, & Wiener, 1995); and the child's overall health, reported by the mother. We controlled for the geographic region or state of residence (if the sample included 25 or more cases from the state), whether the family resided in an urban area, and whether the mother was the respondent in the parent interview (99% of cases). The weighted descriptive statistics for all covariates are presented in Table 1.

Empirical Approach

We started our empirical analyses with regression models similar to those found in the literature. To test Hypothesis 1, we regressed a measure of child development at age 4 onto a dummy indicator for whether the child was cared for in a center (vs. a home) at age 4, adjusting for Age 2 lagged outcomes and family and child characteristics, including hours spent in care at age 4 (Model 1). We used weighted least squares regression models for all outcomes. For the dichotomous health outcomes, these were linear probability models, which simplified interpretation (Wooldridge, 2009). We verified the pattern of significant results with logit specifications (available on request).

To test Hypothesis 2—whether intensity moderates associations between the type of care and developmental outcomes—we added interactions between hours in care and type of care. Specifically, two dummy indicators of (a) 35 or more hours per week and (b) 16 to 34 hours per week (vs. 15 hours or less) were interacted with the dummy indicator of center care (Model 2). We used *F* statistics to test whether the two interactions were jointly significant. To assess Hypothesis 3—whether child care quality mediates associations between center care and outcomes—we added to Model 1 dummy indicators for medium and high (vs. low) quality on the ECERS–R/FDCRS and Arnett CIS total scores (Model 3). If child care quality mediates associations between type of care and outcomes, estimates of associations between center care and child outcomes from Model 3 should be smaller (closer to 0) than corresponding estimates from Model 1. We conducted a formal test of the significance of the mediation effects using the PRODCLIN program (MacKinnon, Fritz, Williams, & Lockwood, 2007). We include results from the formal test of mediation in Online Appendix A, which is available on the *Journal of Marriage and Family* website, http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1741-3737). Because the ECERS–R/FDCRS and Arnett CIS measures were correlated, we used *F* statistics to jointly test whether the set of dummy variables indicating moderate or high quality on each measure explained significant variation in each outcome.

Model 4 tested for moderated mediation by adding interactions to Model 3 between the dummy indicators of medium and high hours per week in care and the dummy indicators of medium and high quality on the ECERS–R/FDCRS and Arnett CIS to test whether mediation through quality is greater for children in care more hours per week. We used *F* statistics for the set of interaction terms to test Hypothesis 4. To test Hypothesis 5 (mediation when quality is better aligned with outcomes), we reestimated Models 3 and 4 but substituted for total quality a set of dummy indicators of the ECERS–R/FDCRS quality subscales that were better aligned with each outcome. We used *F* statistics for the dummy indicators of medium and high (vs. low) subscale quality (Model 5) and the sets of interactions (Model 6) to test Hypothesis 5. We used the PRODCLIN program to formally test the significance of mediation effects through aligned quality.

Results

Hypotheses 1 and 2: Replicating Associations Between Type/Intensity and Child Outcomes

Table 2 includes results from Model 1 and Model 3. Estimates of associations between child care type and outcomes (Model 1) are presented in the top panel of Table 2. Consistent with Hypothesis 1, 4-year-olds in center care averaged higher math and reading scores than children cared for in homes; center care was associated with a 0.14-unit increase in the math score and a 0.16-unit increase in the reading score, adjusting for covariates including lagged child outcomes. Both estimates were statistically significant and represented approximately 0.2 *SD* of the dependent variables, similar to effects reported in previous studies (e.g., Loeb

et al., 2007). Estimates of the association between type of care and socioemotional outcomes were mixed, with some results consistent with our expectations, some not, and differences between caregivers and parent reports. As expected, center teachers reported that children in their care demonstrated less skillful social interactions than did home-based caregivers; however, center teachers also rated children's emotional and behavioral regulation better than did home-based caregivers, contrary to Hypothesis 1. Effects for both of these caregiver-reported socioemotional outcomes represented approximately 0.3-*SD* differences for the dependent variables. In contrast, when parents' reports were used to construct the dependent variables (results available on request), attention and concentration scores were higher for children in center care than in home care (about 0.15 *SD*). This parent-reported result is also in the opposite direction of our expectations. Regarding health outcomes, estimates indicated that, with one exception, center care was negatively associated with health (as expected), but only one of the estimates was statistically significant (ear infections), and all associations were small (less than 10% of the mean). In short, Hypothesis 1 was partially confirmed, with the most consistent evidence for the cognitive advantage of attending center-based care.

We do not present results for Model 2 because only one of the 20 interactions between hours and type of care was significant (results available on request). Thus, Hypothesis 2 was not confirmed: Hours in care does not appear to moderate the association between type of care and outcomes for preschoolers in the ECLS-B.

Hypotheses 3 and 4: Mediation Through Total Scores of Child Care Quality

We next assessed whether the quality of child care mediated associations between center care and child outcomes. Estimates from Model 3, presented in the bottom panel of Table 2, suggested two main conclusions. First, a comparison of estimates of associations between center care and child outcomes in the top and bottom panels of Table 2 suggests that quality of care, as measured by the ECERS–R/FDCRS and Arnett CIS, generally did not mediate the associations between center care and child outcomes. The five significant associations in the top panel remained significant in the bottom panel, and four were unexpectedly larger in magnitude in the bottom versus the top panel. Our formal tests of mediation confirmed these results: Only four of 40 tests were statistically significant (details available on request). Reading was the only outcome with a significant mediation test in the expected direction (the coefficient was 13% smaller in Model 3 than Model 1). The modest level of mediation is reflected in the fact that measures of quality were, for the majority of cases, not significantly related to outcomes: All but one of our *F* tests did not reject the null hypothesis that there is no association between quality and outcomes. (The exception was that children in middle- vs. low-quality settings on the ECERS–R/FDCRS were more likely to be free from ear infections.) *F* tests showed that associations between quality and parents' reports of socioemotional outcomes were also not statistically significant (results available on request). Thus, Hypothesis 3 was generally not confirmed: There is little evidence that total child care quality mediates the association between type of care and child outcomes, the exception being children's reading scores.

We next considered whether associations between child outcomes and quality are moderated by hours in care. Doing so allowed us to investigate whether the apparent lack of mediation found in Model 3 resulted from constraining the association between quality and outcomes to be the same no matter how many hours a child is in care (no moderated mediation). Estimates related to Hypothesis 4 are included in Online Appendix B on the *Journal of Marriage and Family* website. The *F* tests indicated that it is not possible to reject the null hypothesis of no relationship between hours and type of care. Thus, Hypothesis 4 was not confirmed: We did not find evidence of moderated mediation (the association between total child care quality and child outcomes does not appear to depend on hours spent in care).

Hypothesis 5: Mediation Through Better Aligned Measures of Child Care Quality

Estimates of Model 5, which uses subscales of quality aligned with child outcomes, are presented in Table 3. For cognitive outcomes, the quality of child care, as measured by the Language-Reasoning subscale of the ECERS–R/FDCRS, was positively and significantly associated with reading achievement, as indicated by the significant *F* test. Both dummy indicators were individually significant, indicating that children in child care settings of middle and of high quality have higher reading scores than children in low-quality child care settings. The contrast between average math scores for children in settings of middle versus low quality was also statistically significant, but the contrast for children in high- versus low-quality settings was not, and the *F* statistic was not significant. Of note is that the addition of the aligned measures of quality demonstrated a slight mediating effect on associations between center care and math and reading achievement (the coefficients were 15% and 21% smaller in Table 3 than in Table 2, respectively, for math and reading). Our formal test of mediation confirmed significant mediation for both outcomes (mediation through both middle and high vs. low quality for reading; mediation through middle to low quality for math). In contrast, results reported in the remaining columns of Table 3 reveal that none of the *F* tests were statistically significant for the aligned subscale scores in predicting children's socioemotional and health outcomes, and formal tests of mediation were also not significant for these outcomes.

Our final set of results (Model 6; results available on request) revealed that there was little evidence of moderated mediation. Only six of the 40 interactions between intensity and aligned quality were significant; joint hypothesis tests for sets of interactions were significant for only two of the 10 outcomes; and graphs of the significant interactions were not consistent with conceptual expectations, suggesting that they should be interpreted with caution (among children in care at moderate intensity levels [16–34 hours/week], higher quality was unexpectedly associated with poorer attention/concentration and more respiratory illness). Most important to the focal interest of our study, the coefficients for center care were nearly identical for the outcomes with significant interactions in Model 6 as they were in Model 1 (for attention/concentration, .136 and .137, respectively; for lack of respiratory illness, −.038 and −.034, respectively).

Conclusion

We extended prior research concerned with the relationship between child care type and child development by examining whether child care quality is a mediating factor and whether the extent of mediation, if any, differs by whether quality is measured by global or more aligned measures. Like previous research, children in our sample who were cared for in centers had higher cognitive achievement than children cared for in homes (Dmitrieva et al., 2007; Loeb et al., 2007). This association was partially mediated by aligned quality subscales specific to language and reasoning. Thus, some of the center advantage appears to be linked to centers' better support of children's language and reasoning skills compared to home-based child care. This finding suggests that efforts to improve support in home-based care for children's language and reasoning skills might reduce the disadvantage for children enrolled in such care.

It is important to note that the aligned quality measure of language/reasoning explained only a modest amount of the cognitive advantage associated with centers, however. We highlight two possible explanations for this result. The first explanation is that our measures of quality may not have been sufficiently aligned to this outcome and thus may have missed aspects of quality relevant for cognition. Given that quality (as measured by the ECERS–R/FDCRS and the Arnett CIS in the ECLS-B) is largely not predictive of child outcomes, our evidence supports recent concerns regarding measurement problems in child care quality measures

(Clifford et al., 2012; Gordon et al., 2013; Zaslow, Martinez-Bock, Tout, & Halle, 2011). Zaslow et al. (2011) suggested that associations between child care quality and developmental outcomes might be stronger with more psychometrically sound measures of quality. Although the ECERS–R/FDCRS subscales we used as measures of aligned quality may be an improvement over total scores, recent research raises concerns about the psychometric properties and validity of the ECERS–R subscales as well as the ECERS–R total score (Gordon et al., 2013). Improved measures of quality may be more strongly associated with child outcomes and therefore be stronger mediators of associations between child care type and outcomes. One measure that researchers are increasingly turning to is the CLASS, but it was not used in the ECLS-B. Our outcome data also provided information about only one child in each care setting, whereas our quality measures assessed materials, activities, and interactions at the classroom level. Ideally future studies would also better align the level of assessment of quality and outcomes.

The second explanation is that, despite our adjustment for numerous potentially confounding factors—including lagged measures of child development—the effect of setting type may continue to be attributed in part to the selection into centers of more cognitively advantaged children. In short, the ECLS-B's strength is its nationally representative frame. An important weakness is that its observational design does not allow for causal estimates. Future studies might exploit experiments or quasi-experiments (e.g., from policy changes) that sort children into care settings exogenously in order to better identify causal impacts of center care (e.g., Levine & Zimmerman, 2010).

In addition, it is important to note that our findings generally do not confirm the center behavioral and health disadvantages identified in prior research (e.g., Dmitrieva et al., 2007; Haskins & Kotch, 1986; Loeb et al., 2007; Magnuson et al., 2007; Rovers et al., 1999). Our findings for health are in the expected direction, but generally nonsignificant, which might be explained by our focus on 4-year-olds given prior research showing the largest health detriments of large group care for infants and toddlers (Haskins & Kotch, 1986). Our findings for socioemotional outcomes are harder to explain. Some results are consistent with prior research (poorer social competence for children in centers; Dmitrieva et al., 2007; Loeb et al., 2007), but others are not (better attention and regulation of children in centers). One explanation is that the short form socioemotional battery developed for the ECLS-B may be less reliable and valid than the full versions used in prior studies such as the NICHD SECCYD. Whatever the explanation, our results reinforce calls to improve the reliability and validity of social and behavioral development measures for use in child care research (Zaslow et al., 2006).

In sum, we found evidence for a cognitive advantage associated with center care for preschoolers, an advantage that was evident for children who attend centers part and full time, and robust to numerous controls, including lagged development. Our findings support the continued study of strategies to reduce disparities in preschool (center) enrollment and in children's school readiness.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A090065, and by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, through Grant R01HD060711. The opinions expressed are those of the authors and do not represent views of the Institute of Education Sciences or the U.S. Department of Education.

References

Arnett, J. Caregiver Interaction Scale. Princeton, NJ: Educational Testing Service; 1989.

Belsky J. Quantity counts: Amount of child care and children's social-emotional development. Developmental and Behavioral Pediatrics. 2002; 23:167–170.

Belsky J, Vandell DL, Burchinal M, Clarke-Stewart KA, McCartney K, Owen MT. NICHD Early Child Care Research Network. Are there long-term effects of early child care? Child Development. 2007; 78:681–701. [PubMed: 17381797]

Blau D. The effect of child care characteristics on child development. The Journal of Human Resources. 1999; 34:786–822.

Brown L, Iyengar S. Parenting styles: The impact on student achievement. Marriage & Family Review. 2008; 43:14–38.

Burchinal, M.; Kainz, K.; Cai, Y. How well do our measures of quality predict child outcomes?. In: Zaslow, M.; Martinez-Bock, I.; Tout, K.; Halle, T., editors. Quality measurement in early childhood settings. Baltimore: Paul H. Brookes; 2011. p. 11-31.

Case, A.; Lubotsky, D.; Paxson, C. Working Paper No W8344. National Bureau of Economic Research; Cambridge, MA: 2001. Economic status and health in childhood: The origins of the gradient.

Case A, Paxson CH. Children's health and social mobility. The Future of Children. 2006; 16:151–173. [PubMed: 17036550]

Clifford, R.; Sideris, J.; Neitzel, J.; Abuchaim, B. A new scoring approach for ECERS–R [PowerPoint slides]. 2012. Retrieved from http://ers.fpg.unc.edu/presentations

DeGangi, GA.; Poisson, S.; Sickel, RZ.; Wiener, AS. Infant/Toddler Symptom Checklist. San Antonio, TX: Psychological Corporation; 1995.

Dickinson DK, Caswell L. Building support for language and early literacy in preschool classrooms through in-service professional development: Effects of the Literacy Environment Enrichment Program (LEEP). Early Childhood Research Quarterly. 2007; 22:243–260.

Dmitrieva J, Steinberg L, Belsky J. Child-care history, classroom composition, and children's functioning in kindergarten. Psychological Science. 2007; 18:1032–1039. [PubMed: 18031408]

Downer J, Sabol TJ, Hamre B. Teacher–child interactions in the classroom: Toward a theory of within- and cross-domain links to children's developmental outcomes. Early Education and Development. 2010; 21:699–723.

Duncan GJ, Gibson-Davis CM. Connecting child care quality to child outcomes: drawing policy lessons from nonexperimental data. Evaluation Review. 2006; 30:611–630. [PubMed: 16966678]

Gordon RA, Fujimoto K, Colwell N, Abner KS, Kaestner R, Wakschlag LS, Korenman S. Measuring socio-emotional development in a large scale survey. 2013 Unpublished manuscript.

Gordon RA, Fujimoto K, Kaestner R, Korenman S, Abner K. An assessment of the validity of the ECERS–R with implications for measures of child care quality and relations to child development. Developmental Psychology. 2013; 49:146–160. [PubMed: 22468567]

Gordon RA, Kaestner R, Korenman S. The effects of maternal employment on child injuries and infectious disease. Demography. 2007; 44:307–333. [PubMed: 17583307]

Gresham, FM.; Elliott, SN. Social Skills Rating System manual. Circle Pines, MN: American Guidance Service; 1990.

Harms, T.; Clifford, RM. The Family Day Care Rating Scale. New York: Teachers College Press; 1989.

Harms, T.; Clifford, RM.; Cryer, D. Early Childhood Environment Rating Scale, Revised Edition. New York: Teachers College Press; 1998.

Haskins R, Kotch J. Day-care and illness—Evidence, costs, and public policy. Pediatrics. 1986; 77:951–982. [PubMed: 3012455]

Keys TD, Farkas G, Burchinal MR, Duncan GJ, Vandell D, Li W, Ruzek EA, Howes C. Preschool center quality and school readiness: Quality effects and variation by demographic and child characteristics. Child Development. 2013 Advance online publication. 10.1111/cdev.12048

Lagacé-Séguin DG, d'Entremont MR. The role of child negative affect in the relations between parenting styles and non-adaptive play. Early Child Development and Care. 2006; 176:461–477.

Lamb ME. The effects of quality of care on child development. Applied Developmental Science. 2000; 4:112–115.

Layzer J, Goodson BD. The "quality" of early care and education settings: Definitional and measurement issues. Evaluation Review. 2006; 30:556–576. [PubMed: 16966676]

Levine, PB.; Zimmerman, DJ., editors. Targeting investments in children: Fighting poverty when resources are limited. Chicago: University of Chicago Press; 2010.

Loeb S, Bridges M, Bassok D, Fuller B, Rumberger RW. How much is too much? The influence of preschool centers on children's social and cognitive development. Economics of Education Review. 2007; 26:52–66.

Loeb S, Fuller B, Kagan SL, Carrol B. Child care in poor communities: Early learning effects of type, quality, and stability. Child Development. 2004; 75:47–65. [PubMed: 15015674]

MacKinnon DP, Fritz MS, Williams J, Lockwood CM. Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. Behavior Research Methods. 2007; 39:384–389. [PubMed: 17958149]

Maccoby, EE.; Martin, JA. Socialization in the context of the family: Parent–child interaction. In: Mussen, PH.; Hetherington, EM., editors. Handbook of child psychology: Vol. 4. Socialization, personality, and social development. 4. New York: Wiley; 1983. p. 1-101.

Magnuson KA, Meyers MK, Ruhm CJ, Waldfogel J. Inequality in preschool education and school readiness. American Educational Research Journal. 2004; 41:115–157.

Magnuson KA, Ruhm C, Waldfogel J. Does prekindergarten improve school preparation and performance? Economics of Education Review. 2007; 26:33–51.

Merrell, KM. Preschool and Kindergarten Behavior Scales. 2. Austin, TX: Pro-Ed; 2003.

Najarian, M.; Snow, K.; Lennon, J.; Kinsey, S. Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), preschool–kindergarten 2007 psychometric report (Report No 2010-009). Washington, DC: National Center for Education Statistics; 2010.

National Center for Education Statistics. Bayley Short Form—Research Edition. Washington, DC: Author; 2001.

Newacheck PW, Hung YY, Park M, Brindis CD, Irwin CE. Disparities in adolescent health and health care: Does socioeconomic status matter? Health Services Research. 2003; 38:1235–1252. [PubMed: 14596388]

NICHD Early Child Care Research Network. Early child care and children's development prior to school entry: Results from the NICHD Study of Early Child Care. American Educational Research Journal. 2002; 39:133–164.

NICHD Early Child Care Research Network. Does quality of child care affect child outcomes at age 4(1/2)? Developmental Psychology. 2003; 39:451–469. [PubMed: 12760515]

NICHD Early Child Care Research Network. Type of child care and children's development at 54 months. Early Childhood Research Quarterly. 2004; 19:203–230.

NICHD Early Child Care Research Network. Child-care effect sizes for the NICHD Study of Early Child Care and Youth Development. American Psychologist. 2006; 61:99–116. [PubMed: 16478355]

NICHD Early Child Care Research Network. Are there long-term effects of early child care? Child Development. 2007; 78:681–701. [PubMed: 17381797]

Duncan GJ. NICHD Early Child Care Research Network. Modeling the impacts of child care quality on children's preschool cognitive development. Child Development. 2003; 74:1454–1475. [PubMed: 14552408]

Peisner-Feinberg ES, Burchinal MR, Clifford RM, Culkin ML, Howes C, Kagan SL, Yazejian N. The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. Child Development. 2001; 72:1534–1553. [PubMed: 11699686]

Pianta, RC.; La Paro, KM.; Hamre, BK. Classroom Assessment Scoring System—PreK manual. Baltimore: Brookes; 2008.

Preacher KJ, Rucker DD, Hayes AF. Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. Multivariate Behavioral Research. 2007; 42:185–227.

Rovers MM, Zielhuis GA, Ingels K, van der Wilt GJ. Day-care and otitis media in young children: A critical overview. European Journal of Pediatrics. 1999; 158:1–6. [PubMed: 9950299]

Schwebel DC, Brezausek CM, Belsky J. Does time spent in child care influence risk for unintentional injury? Journal of Pediatric Psychology. 2006; 31:184–193. [PubMed: 16467318]

Snow, K.; Derecho, A.; Wheeless, S.; Lennon, J.; Rosen, J.; Rogers, J.; Kinsey, S.; Morgan, K.; Enaudi, P. Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), Kindergarten 2006 and 2007 data file user's manual (Report No 2010-010). Washington, DC: National Center for Education Statistics; 2009.

Snow, K.; Thalji, L.; Derecho, A.; Wheeless, S.; Lennon, J.; Kinsey, S.; Park, J. Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), Preschool year data file user's manual (Report No 2008-024). Washington, DC: National Center for Education Statistics; 2007.

Underwood MK, Beron KJ, Gentsch JK, Galperin MB, Risser SD. Interparental conflict resolution strategies, parenting styles, and children's social and physical aggression with peers. International Journal of Behavioral Development. 2008; 32:566–579.

U.S. Department of Education. Table 46. Percentage distribution of children at about 2 and 4 years of age, by type of child care arrangement and selected child and family characteristics: 2003–04 and 2005–06. Digest of Educational Statistics. 2008. Retrieved from http://nces.ed.gov/pubs2012/2012001.pdf

Vandell DL. Early child care: The known and the unknown. Merrill–Palmer Quarterly. 2004; 50:387–414.

Vandell, DL.; Wolfe, B. Child care quality: Does it matter and does it need to be improved?. Washington, DC: U.S. Department of Health and Human Services; 2000.

Vermeer HJ, van IJzendoorn MH. Children's elevated cortisol levels at daycare: A review and meta-analysis. Early Childhood Research Quarterly. 2006; 21:390–401.

Votruba-Drzal E, Coley RL, Chase-Lansdale PL. Child care and low-income children's development: Direct and moderated effects. Child Development. 2004; 75:296–312. [PubMed: 15015691]

Wasik BA, Bond MA, Hindman A. The effects of a language and literacy intervention on Head Start children and teachers. Journal of Educational Psychology. 2006; 98:63–74.

Wooldridge, JM. Introductory econometrics: A modern approach. 4. Mason, OH: South-Western Thomson Learning; 2009.

Zaslow M, Halle T, Martin L, Cabrera N, Calkins J, Pitzer L, Margie NG. Child outcome measures in the study of child care quality. Evaluation Review. 2006; 30:577–610. [PubMed: 16966677]

Zaslow, M.; Martinez-Bock, I.; Tout, K.; Halle, T. Quality measurement in early childhood settings. Baltimore: Brookes; 2011.

Table 1

Weighted Descriptive Statistics (N = 1,550)

Variable	*M* or %	*SD*	Min	Max
Outcomes (4 years)				
Cognition				
Math composite (θ)	−0.42	0.77	−2.83	2.38
Reading composite (θ)	−0.42	0.75	−2.38	2.60
Socioemotional				
Caregiver-reported social competence	1.31	1.03	−2.53	4.22
Caregiver-reported attention/concentration	1.13	1.52	−4.91	4.63
Caregiver-reported emotional/behavioral regulation	1.62	1.02	−1.70	3.86
Parent-reported social competence	1.46	0.97	−1.61	3.90
Parent-reported attention/concentration	0.72	0.85	−2.57	3.33
Parent-reported emotional/behavioral regulation	0.98	0.61	−1.40	2.75
Health				
Child excellent or very good health	88%			
No doctor-verified respiratory illness	87%			
No doctor-verified gastrointestinal illness	97%			
No doctor-verified ear infection	59%			
No injury that required a doctor visit	77%			
Type of care arrangement (4 years)				
Child in center care	75%			
Child in home care	25%			
Intensity (4 years)				
Child in care 15 or fewer hours/week	32%			
Child in care 16–34 hours/week	35%			
Child in care 35+ hours/week	33%			
Quality (4 years)				
Overall				
Arnett CIS total score				
Low Arnett CIS (<61)	31%			
Middle Arnett CIS (61 to <71)	36%			
High Arnett CIS (71+)	34%			
ECERS–R/FDCRS total score				
Low ECERS–R/FDCRS (<4)	40%			
Middle ECERS–R/FDCRS (4 to <5)	32%			
High ECERS–R/FDCRS (5+)	28%			
Aligned				
Language/reasoning				
Low language ECERS–R/FDCRS (<4.17)	37%			

Variable	*M* or %	*SD*	Min	Max
Middle language ECERS–R/FDCRS (4.17 to <5.67)	33%			
High language ECERS–R/FDCRS (5.67+)	30%			
Interactions/social development				
Low interaction ECERS–R/FDCRS (<5)	35%			
Middle interaction ECERS–R/FDCRS (5 to <6.2)	37%			
High interaction ECERS–R/FDCRS (6.2+)	28%			
Personal care				
Low care ECERS–R/FDCRS (<2.83)	37%			
Middle care ECERS–R/FDCRS (2.83 to <4.43)	32%			
High care ECERS–R/FDCRS (4.43+)	31%			
Family covariates (4 years)				
Mother employment status				
Not employed	30%			
Part-time (<35 hours)	22%			
Full-time (35+ hours)	48%			
Mother education level				
Less than high school education	23%			
High school graduate	17%			
Some college or associate's degree	32%			
Bachelor's degree and some graduate work	18%			
Graduate degree	10%			
Income-to-needs ratio	3.16	2.91	0.00	16.05
Mother married	66%			
Mother very good/excellent health	67%			
Mother age				
<25	13%			
25–29	24%			
30–34	26%			
35–39	23%			
40+	14%			
Ever breast fed child	68%			
Child covariates (birth)				
Child low birth weight	7%			
Child race				
White	55%			
Black	16%			
Hispanic	23%			
Other race	7%			
Child is female	49%			

Variable	*M* or %	*SD*	Min	Max
Lagged outcomes (2 years)				
Bayley Mental Scale score[a]	127.66	10.86	92.61	158.88
Bayley Motor Scale score[a]	81.56	5.08	59.66	99.56
Bayley Behavior Scale score[a]	40.04	8.25	11.00	55
Infant Toddler Symptom sum score	8.85	4.28	0	21
Doctor-verified respiratory illness	11%			
Doctor-verified gastrointestinal illness	5%			
Doctor-verified ear infection	50%			
Any injury that required doctor visit	17%			
Child very good/excellent health	87%			
Contextual variables				
Young child poverty in ZIP code				
0%–10%	37%			
10%–19%	23%			
20% or more	40%			
Urbanicity				
Urban—inside urban area	72%			
Urban—outside urban cluster	13%			
Rural	15%			

Note: Statistics are weighted. Controls that are not included in this table are the child's age in months (dummies), region and state, whether the mother was the respondent, and dummy indicators for cases missing the Bayley scale scores. Min = minimum; Max = maximum; Arnett CIS = Arnett Caregiver Interaction Scale; ECERS–R = Early Childhood Environment Rating Scale—Revised; FDCRS = Family Day Care Rating Scale.

[a]Bayley scores conditioned on valid responses.

Table 2

Weighted Least Squares Regressions (Bs) Associating Child Care Type and Quality with Child Outcomes (Model 1 and Model 3)

	Cognitive outcomes		Caregiver-reported socioemotional outcomes			Health outcomes				
Predictor	**Math**	**Reading**	**Social competence**	**Attention and concentration**	**motional and behavioral regulation**	**Child excellent/very good health**	**No respiratory Illness**	**No gastrointestinal illness**	**No ear infections**	**No injury**
Model 1										
Type of care (ref.: Home)										
Center	0.136*	0.162*	−0.385*	0.137	0.206*	0.033	−0.034	−0.011	−0.088*	−0.023
	(0.048)	(0.049)	(0.088)	(0.122)	(0.085)	(0.035)	(0.025)	(0.012)	(0.040)	(0.032)
Model 3										
Type of care (ref.: Home)										
Center	0.155*	0.141*	−0.448*	0.172	0.242*	0.039	−0.037	−0.018	−0.109*	−0.029
	(0.050)	(0.053)	(0.087)	(0.129)	(0.091)	(0.038)	(0.028)	(0.016)	(0.042)	(0.034)
ECERS–R/FDCRS middle quality	−0.094	0.002	0.171*	−0.079	−0.103	0.017	−0.025	0.013	0.096*	0.009
	(0.063)	(0.054)	(0.079)	(0.131)	(0.082)	(0.029)	(0.029)	(0.027)	(0.044)	(0.043)
ECERS–R/FDCRS high quality	−0.063	0.020	0.212	−0.043	−0.079	0.018	−0.008	0.015	−0.017	−0.003
	(0.063)	(0.062)	(0.116)	(0.129)	(0.091)	(0.039)	(0.031)	(0.031)	(0.050)	(0.041)
Arnett CIS middle quality	0.071	0.149*	−0.011	0.028	0.106	−0.084*	0.029	0.009	−0.024	0.100*
	(0.060)	(0.063)	(0.085)	(0.127)	(0.083)	(0.029)	(0.032)	(0.024)	(0.038)	(0.039)
Arnett CIS high quality	0.090	0.127*	−0.126	−0.102	−0.019	−0.097*	0.069	0.016	0.070	0.031
	(0.056)	(0.059)	(0.112)	(0.158)	(0.107)	(0.040)	(0.035)	(0.027)	(0.048)	(0.046)
Joint hypothesis test $F(4, 50)$[a]	0.93	1.84	1.37	0.65	1.05	2.45	1.45	0.63	3.64*	1.81
Observations	1,500	1,500	1,550	1,550	1,550	1,550	1,550	1,550	1,550	1,550
Outcome: *M*/*SD* or %						88%	87%	97%	59%	77%
	−0.42/0.77	−0.42/0.75	1.31/1.03	1.13/1.52	1.62/1.02					

Note: Numbers in parentheses are standard errors. Analyses are weighted and adjust for the sample primary sampling units. Controls include child's race, gender, age in months, whether the child was low birth weight, and was ever breast fed; hours in care, mother's education, employment status, marital status, health status, age, and the family's income to needs relative to the federal poverty level; geographic region or the state of residence if the state had 25 or more cases, and whether the family resides in an urban area; lagged development when the child was 2 years old, including the Bayley Short Form mental health, motor, and behavior scores; whether the child had a doctor-confirmed respiratory illness, gastrointestinal flu, ear infection, or injury; the child's temperament composite, and the child's overall health as reported by the mother. ref. = reference category; ECERS–R = Early Childhood Environment Rating Scale—Revised; FDCRS = Family Day Care Rating Scale; Arnett CIS = Arnett Caregiver Interaction Scale.

[a]The denominator degrees of freedom are based on the number of primary sampling units.

* $p < .05$.

Table 3

Weighted Least Squares Regressions (Bs) Associating Child Care Type and Aligned Child Care Quality With Child Outcomes (Model 5)

	Cognitive outcomes		Caregiver-reported socioemotional outcomes			Health outcomes				
Predictor	**Math**	**Reading**	**Social competence**	**Attention and concentration**	**Emotional and behavioral regulation**	**Child excellent/ very good health**	**No respiratory illness**	**No gastrointestinal illness**	**No ear infections**	**No injury**
Type of care (ref.: Home)										
Center	0.116*	0.130*	−0.440*	0.130	0.210*	0.035	−0.041	−0.008	−0.100*	−0.014
	(0.051)	(0.051)	(0.094)	(0.132)	(0.092)	(0.035)	(0.026)	(0.014)	(0.039)	(0.032)
Aligned quality[a] (ref.: ECERS–R/FDCRS low quality)										
ECERS–R/FDCRS middle quality	0.127*	0.129*	0.061	0.134	0.089	0.004	0.042	−0.000	0.063	−0.024
	(0.053)	(0.053)	(0.066)	(0.132)	(0.075)	(0.032)	(0.022)	(0.013)	(0.037)	(0.032)
ECERS–R/FDCRS high quality	0.043	0.117*	0.178	0.033	−0.004	−0.014	0.037	−0.017	0.060	−0.045
	(0.056)	(0.051)	(0.099)	(0.133)	(0.082)	(0.034)	(0.025)	(0.016)	(0.039)	(0.037)
Joint hypothesis test for quality $F(2, 52)$[b]	2.94	3.33*	1.64	0.52	0.79	0.18	2.20	0.53	1.88	0.72
Observations	1,500	1,500	1,550	1,550	1,550	1,550	1,550	1,550	1,550	1,550
Outcome: *M*/*SD* or %	−0.42/0.77	−0.42/0.75	1.31/1.03	1.13/1.52	1.62/1.02	88%	87%	97%	59%	77%

Note: Numbers in parentheses are standard errors. Analyses are weighted and adjust for the sample primary sampling units. Controls include child's race, gender, age in months, whether the child was low birth weight, and was ever breast fed; hours in care, mother's education, employment status, marital status, health status, age, and the family's income to needs relative to the federal poverty level; geographic region or the state of residence if the state had 25 or more cases, and whether the family resides in an urban area; lagged development when the child was 2 years old, including the Bayley Short Form mental health, motor, and behavior scores; whether the child had a doctor-confirmed respiratory illness, gastrointestinal flu, ear infection, or injury; the child's temperament composite, and the child's overall health as reported by the mother. ref. = reference category; ECERS–R = Early Childhood Environment Rating Scale—Revised; FDCRS = Family Day Care Rating Scale.

[a]Aligned measures are subscale scores from the ECERS–R and FDCRS. For cognitive outcomes, we used the ECERS–R and FDCRS Language-Reasoning subscale. The ECERS–R Interaction subscale and FDCRS Social Development subscale were used for socioemotional outcomes. For health, we used the ECERS–R Personal Care subscale and the FDCRS Basic Care subscale.

[b]The denominator degrees of freedom are based on the number of primary sampling units.

*$p < .05$.