

RESEARCH REPORT



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Reviewing the Research Base from 1985-2020: Infant and Toddler Child Care and At-Risk Children's School Readiness

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About ITC@NIEER

The National Institute for Early Education Research (NIEER) at the Graduate School of Education, Rutgers University, New Brunswick, NJ, conducts and disseminates independent research and analysis to inform early childhood education policy. ITC@NIEER is a unit within NIEER focused on early care and education policies that influence the learning and development of infants and toddlers.

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About the Author

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Abstract

Policymakers, child care providers, and parents face tradeoffs in determining how much to spend on child care, including how many hours to purchase, and the features of programs that might influence quality. Given these tradeoffs, it is useful to understand what constitutes quality, the cost of care features associated with quality, the effects of quality on child development, and the links between policies, program features, and quality. To address these issues this report reviews more than 60 studies of infant and toddler child care conducted since 1985. The report concludes with a summary of key policy relevant findings, limitations of the research for informing policy, and recommendations for filling in knowledge gaps.

Introduction

As the U.S. economy emerges from the effects of the COVID-19 pandemic, one topic receiving heightened attention is access to non-parental child care for children who are not yet old enough for K-12 schooling (Banghart & Bedrick, 2020; Committee for Economic Development of The Conference Board, 2020). This concern reflects an interrelated set of public policy-relevant issues. Young children need care that benefits their learning and development, particularly in light of research demonstrating the importance of early experiences for their short- and long-term outcomes (Horm et al., 2016; Lally & Mangione, 2017; Marshall, 2011). Public funding for child care can decrease inequality in early learning opportunities (Donoghue & AAP Council on Early Childhood, 2017). Public funding for child care also can provide a critical workforce support for parents (Hatfield et al., 2014; The Council of Economic Advisors, 2019). Yet, child care in the United States is often of low and unequal quality that could exacerbate inequalities (Bassok et al., 2015; Ruzek et al., 2014; Vogel et al., 2011). Policymakers face difficult decisions regarding how much public money to spend on child care, including who should be eligible and the quantity and features of programs believed to indicate quality (Hotz & Wiswall, 2019).

Given these potential tradeoffs, it is useful to understand what constitutes quality, the cost of quality, the effects of quality on child development, and the degree to which child care policies are bringing about their intended goals for improving child development (Almond et al., 2018; Currie & Rossin-Slater, 2016; Duncan & Gibson-Davis, 2006). To address these questions, this report reviews research on infant (ages 0–12 months) and toddler (ages 12–35 months) child care conducted in the U.S. and developed countries since roughly 1985. Of particular interest were studies highlighting the roles subsidized care, child care quality, and different programmatic inputs can play in supporting the school readiness of young children considered to be at-risk for poor developmental outcomes.

The report is organized into five sections. Section 1 provides an overview of how child care quality is conceptualized, as well as the link between high-quality programmatic inputs and a provider's operating costs. Section 2 explores research examining the role infant-toddler child care can play in at-risk children's learning and development. Section 3 turns to research on the relationship between federally funded Child Care and Development Fund (CCDF) subsidies and infant and toddler child care quality. Section 4 highlights rigorous studies, including randomized trials, that investigated the child development impacts of infant-toddler child care interventions. Finally, Section 5 summarizes key findings and discusses gaps in the research base and implications for a policy-focused infant-toddler child care research agenda.

1. Infant-Toddler Child Care Quality and Related Costs

Child care quality can be defined in a variety of ways, but in the U.S. is typically operationalized as a multidimensional construct comprised of structural and process features or inputs. These inputs can be further characterized in terms of meeting professional or organizational standards of quality. In turn, the degree to which a child care provider strives to meet these standards by incorporating particular levels of inputs has implications for both their operating costs and the quality of the experiences offered to infants and toddlers (Allen & Backes, 2018).

Structural and Process Quality Inputs

Structural inputs are the features of a child care setting that support process quality and include classroom size and outdoor play space, supplies and equipment (e.g., cribs, push-pull toys), caregiver-child ratios, caregiver qualifications, compensation, administrator qualifications, and such other elements of program infrastructure as professional development (Huston, 2015; Phillipson et al., 1997). In the U.S., these inputs are regulated by state departments of child care licensing and typically can be easily counted or documented. However, these regulations also tend to be set at levels that ensure minimum health and safety standards as opposed to ensuring high quality practices for the purpose of supporting learning and development (Maxwell & Starr, 2019). For example, most states' child care licensing rules require caregivers to attain no more than a high school diploma or equivalent, rather than a 2- or 4-year degree focused on early childhood or child development and the minimum credential in the majority of state-funded PreK programs (Whitebook et al., 2018). Some states allow center-based toddler classrooms to have staff-child ratios of 1 to 9 and a maximum group size of 20 children per room (National Center on Early Childhood Quality Assurance, 2015), which is a common practice for classrooms serving 3- and 4-year-olds (Friedman-Krauss et al., 2020). In comparison, the National Association for the Education of Young Children (NAEYC, 2018) advises that classroom standards for toddlers require at least a 1 to 6 ratio and no more than 12 per room.

The process aspects of child care quality are more challenging to measure and regulate, as they comprise the day-to-day learning and development experiences of children, including the ways in which they interact with their teachers and peers (Hotz & Xiao, 2011; Slot, 2018). In settings serving infants and toddlers, optimal interactions are warm, sensitive, and responsive to young children's needs as a means for promoting their secure attachment, social-emotional development, and early language skills. Such interactions also will ideally consist of high-quality language, personalized feedback, and a focus on higher order thinking, as opposed to simple directives or "yes" and "no" responses. Caregivers also need to be attuned to infants' and toddlers' development and interests so that they can provide appropriate activities to build on their knowledge and skills (Benoit, 2004; Dean & Gillespie, 2015; Duncan et al., 2019; Mortensen & Barnett, 2015; Nguyen et al., 2020; Norris & Horm, 2015; Pianta et al., 2016; Recchia & Fincham, 2019; Sosinsky et al., 2016).

Measures of Infant-Toddler Child Care Quality

Researchers, public policymakers, and child care providers frequently rely on observational rubrics to measure the degree to which child care settings incorporate structural and process quality. These observational measures are used in research, to guide program improvement efforts and professional development, provide quality ratings to parents, and for accountability purposes (Mangione et al., 2016; Quality Compendium, 2020; Vermeer et al., 2016). One widely used instrument in center-based classrooms serving children under the age of 3 is the Infant-Toddler Environment Rating Scale-Revised (ITERS-R; Harms et al., 2006), which has been updated as the ITERS-3 (Harms et al., 2017). It focuses on six domains: Space and Furnishings, Personal Care Routines, Language and Books, Activities, Interaction, and Program Structure. Observers use a 7-point Likert-type scale, with a 1 indicating Inadequate and a 7 indicating Excellent, to score the measure's 33 items over a roughly 3-hour period. The Family Child Care Environment Rating Scale-Third Edition

(FCCERS-3; Harms et al., 2019) is used in family child care settings. It focuses on the same 33 items as the ITERS-3 and uses the same 7-point rubric, but due to the nature of this type of care, the age range is not limited to infants and toddlers.

Another measure used in infant-toddler settings is the Caregiver Interaction Scale (CIS; Arnett, 1989), which has 26 items focused on caregiver Sensitivity, Harshness, Detachment, and Permissiveness and rated on a scale of 1 (not at all) to 4 (very much). Two additional process-focused measures are the CLASS-Infant (Hamre et al., 2014) and CLASS-Toddler (La Paro et al., 2011). The CLASS-Infant focuses on four different items (referred to as dimensions) within the domain of Responsive Caregiving, whereas the CLASS-Toddler has eight dimensions within the domains of Emotional and Behavioral Support and Engaged Support for Learning. These dimensions also are scored using a 7-point scale, with a score of 1 to 2 meaning the quality of teacher-child interactions is low over four 20-minute cycles within a 2- or 3-hour period, versus a 6 or 7 indicating that effective interactions were consistently observed.

Although the research has limitations (Epstein et al., 2016), there is substantial evidence that higher structural quality increases the likelihood of more advantageous interactions and educational experiences, and that higher process quality is in turn linked to better child outcomes. For example, the extent to which a caregiver effectively interacts with the children in her care can be related to her training and experience (Castle et al., 2016). However, also critical are the activities in which the interactions take place, and the amount of time devoted to, and classroom resources available for those activities (Barros et al., 2016, 2017; Chan, 2019; Degotardi, 2010; Degotardi, Han, & Torr, 2018; Degotardi, Torr, & Han, 2018; Farran, 2017; Guedes et al., 2020; Han & Degotardi, 2020; Hooper & Hallam, 2017; King et al., 2016; Pessanha et al., 2017; Vu et al., 2012; Wysłowska & Slot, 2020). Adult-child ratios, group sizes, and caregiver education may be especially salient in supporting positive caregiver behavior in settings serving infants and toddlers (Clarke-Stewart et al., 2002; NICHD Early Child Care Research Network, 1996, 2000a, 2010; Ruprecht et al., 2015). Finally, work climate, provider satisfaction and turnover, salary and benefits, and program policies and funding also can play a role in facilitating the interaction between structural and process inputs (Cassidy et al., 2016; Roberts et al., 2018; Slot, 2018; Thomason & La Paro, 2013).

Programmatic Inputs and Child Care Operating Costs

Combined with a provider's facility-related expenses, structural inputs related to staffing are the main source of a child care provider's operating costs. This is particularly the case in settings serving infants and toddlers due to state-mandated caregiver-child ratios, which generally are smaller as compared to the ratios in settings serving preschoolers (i.e., one caregiver for every 3 or 4 infants versus one caregiver for every 6 to 10 preschoolers). Additional costs in higher quality settings include greater salaries and benefits for staff, higher costs for training, support, and supervision as well as greater child access to developmentally appropriate learning materials and classroom equipment (Allen & Backes, 2018; Greenberg et al., 2018; Morris et al., 1995; Stoney, 2015; Workman, 2018).

Although not a large percentage of their operating budget, adequate staff professional development is not a trivial expense (Allen & Backes, 2018). This is because the mode, intensity, and duration of the training needs to be aligned with staff's prior skills,

knowledge, and experience and the content of what is being learned. One-time workshops may be appropriate for stand-alone health and safety topics. In comparison, continuously improving their interactions to enhance young children’s learning and development requires expert, intensive, ongoing training and other professional supports that are embedded in the care setting and individualized to the caregiver, such as coaching (Bleses et al., 2020, 2021; Early et al., 2017; Gardner-Neblett et al., 2020).

Not surprisingly – and as Whitebook et al. (2018) have aptly noted – “money does not guarantee high-quality child care or education, [but] better-quality services often cost more” (p. xii). Researchers have estimated the per-child annual costs of high quality center-based and family child care to highlight the discrepancy between the cost of high quality that might be offered and typical care available (e.g., Allen & Backes, 2018; Workman & Jessen-Howard, 2018). As a rough approximation, the per child costs of high quality infant and toddler care are roughly \$30,000 per year, about three times the current average child care subsidy rates (Allen & Backes, 2018, Table 6-4; Swenson, 2019).

Quality Guidance for School Readiness-Focused Child Care

Although child care quality has received considerable attention from researchers and policymakers, the field does not yet possess a clear inputs “recipe” that can produce a specific school readiness outcome. This lack of explicit guidance is due, in part, to inputs that are complex, interdependent, and must be skillfully employed. Furthermore, their effective use together depends on collective capacity, including leadership (Elicker & Ruprecht, 2019; Slot, 2018). In addition, even when research can identify relationships between structural features and process quality or outcomes, it rarely has the power to clearly identify the optimal thresholds for policymakers at which costs and benefits equate. Finally, there is considerable evidence that quality effects vary with the characteristics of children served; most often this has been found for risk factors associated with income or home language, but children with disabilities also deserve consideration (Baker et al., 2019; Burchinal et al., 2014; Keys et al., 2013; Meloy et al., 2019).

Also contributing to the lack of explicit guidance are the many limitations of research evidence that might be used to inform child care quality policies. First, there is a wide range of policy considerations to be balanced and quality features may be differentially relevant depending on the outcome. For example, some features may be relevant to health and safety, others to meeting parents’ concerns, some to support social and emotional development, others to support language and general cognitive abilities. Added to this is the likelihood that the relationships of quality features to outcomes varies with contexts and a sample’s demographics, which increases the difficulties of generalization from a modest number of studies (Duncan & Gibson-Davis, 2006; Hungerford & Cox, 2006). Measurement issues also create difficulties by attenuating estimated relationships. Researchers may collect data via teacher, parent, or organization self-report, which can decrease the accuracy of information of program participation and child outcomes (Johnson & Herbst, 2013; Krafft et al., 2015; Stone et al., 2009). The quality measures used, as well as their scoring processes, have limited accuracy, and the costs of observational data can lead researchers to represent an entire year of experiences with observations of just one or two days out of the year (Boo et al., 2016; Burchinal, 2017; Caronongan et al., 2019; Colwell et al., 2013; Figueras-Daniel & Li, 2021; Jamison et al., 2014; Karoly, 2014; Mangione et al., 2016; Setodji et al., 2013;

Vermeer et al., 2016). As the population and its contexts change over time, the implications of older research for policy must be re-evaluated based on the changes, for example, in linguistic and cultural diversity (Child Trends, 2019; Love et al., 2003; Tseng, 2012). When using research to inform child care quality policies, it is likely to be more useful to derive principles that explain the “why” behind a study’s results than to generalize specific findings to current policies and programs.

2. Research on Infant-Toddler Child Care and Children’s Outcomes

Twenty years ago, there were already a good many summaries of research on the effects of child care on infants and toddlers that explored the role of quality (e.g., Lamb, 1998; Love et al., 1996; Vandell, 2004; Vandell & Wolf, 2000). As this review is largely designed to pick up from there, is useful to briefly summarize their major conclusions with respect to infants and toddlers. First, child care’s effects on child development are neither positive nor negative *per se* but depend on quality and on the child’s relationship with parents and the quality of parental care. Second, effects are not necessarily stable over time; both negative and positive effects of early care experiences may subsequently dissipate. Third, both structural and process quality features are associated with child development (though effects are small), and the structural features of care provide the basis for process quality. Fourth, limitations of the research create difficulties for translating it into policy recommendations: experimental studies of variations in structural and process quality were rare, the vast majority of studies were correlational; and, studies have not been designed to have samples that are large and diverse enough to fully address the complexity of person, process, and context interactions.

This new literature review asks to what extent more recent research confirms and adds to those major conclusions. It includes 25 comparison studies from the U.S. – 12 of which relied on longitudinal data from the National Institute of Child Health and Human Development (NICHD) Study of Early Childhood Care (see Table 1) – and an additional 11 studies that were based in Europe (see Table 2). These 36 studies mostly relied on analyses of large-scale databases but in a few cases emanated from smaller field studies. They also vary in terms of the degree to which they incorporated data on child care quality and relied on samples of children considered to be at-risk. Across the U.S. studies that included measures of quality, one overall takeaway is its positive relationship with children’s short- and long-term outcomes. In comparison, the results of the 11 European studies have more mixed findings, perhaps because of differences in study designs and the child care policy contexts in which these studies took place.

U.S.-Based Studies of Parent-Selected Infant-Toddler Child Care and Child Outcomes

NICHD Study of Early Child Care. When arranged chronologically based on the sample’s age, 12 analyses of NICHD longitudinal study data – which followed children with a wide range of parental education and income levels – are instructive for examining the additive effects of child care quality experienced during the infant-toddler and preschool time periods. The first of these analyses was conducted by Tran & Weinraub (2006) and is cited later in this section as an example of the negative association between child care instability from ages 1–15 months and children’s language comprehension at 15 months. However, another key takeaway from their analysis was that a combination of multiple arrangements

and a low-quality primary child care setting was negatively correlated with both language comprehension and production. In comparison, multiple arrangements with a high-quality primary child care setting predicted higher language performance results.

The next relevant analysis continued the focus on quality but explored the relationship between child care type (i.e., center, child care home, or relative/in-home care) and children's cognitive and language skills at 15 ($n=595$), 24 ($n=739$), and 36 months ($n=856$). Researchers also gathered data on the quality of children's primary child care environment at these three time points via the Observational Record of the Caregiving Environment (ORCE; NICHD Early Child Care Research Network, 1996), which focuses on a caregiver's behaviors (e.g., laughing, holding, encouraging a skill, providing physical care) with a specific child. After controlling for family income, quality of the home environment, and mothers' vocabulary scores, child care quality – especially regarding language stimulation – was modestly associated with children's cognitive and language outcomes at all three time points. The benefits of enrollment in a center versus family child care home were less clear cut. Two-year-olds enrolled in centers and family child care homes had better outcomes than children receiving relative or in-home care. At age 3, center enrollees had higher cognitive and language scores in comparison to both other types. Enrollment in child care homes up to age 2 also was related to better scores at age 3 (NICHD Early Child Care Research Network, 2000b).

Similarly, a third analyses of NICHD data by McCartney et al. (2007) explored low-income children's ($n=890$) cognitive and language skills at 36 months and included ORCE data regarding child care quality at 6 months. The researchers also differentiated the results by whether care settings were higher versus lower quality. Their analyses found that higher quality child care was most strongly and positively associated with children's language skills and school readiness. However, one drawback of this analysis was that “higher quality” was defined merely as being in the upper half of the distribution of quality scores, as opposed to meeting a particular ORCE or other type of metric.

To shed light on the contributors to center quality, a fourth analysis of NICHD data used a sub-sample of 2- ($n=163$) and 3-year-old ($n=250$) children enrolled in child care centers and examined the association between their cognitive development, mother-reported behavior problems and positive social behavior, and the degree to which center standards for staff-child ratios, group sizes, caregiver training (i.e., formal training in child development, early childhood education, or a related field), and caregiver education (i.e., some college) were aligned with those of the American Public Health Association and the American Academy of Pediatrics. Across the 163 classrooms serving 2-year-olds, roughly 25 percent met the recommended standards for staff-child ratio, group size, and caregiver education, and 35 percent met the recommended caregiver training standard. In comparison, between 56 and 80 percent of the 250 classrooms serving 3-year-olds met the recommended standards for each of the four criteria. The researchers also found an association between enrollment in classrooms that met more standards and fewer mother-reported behavior problems at 24 months, as well as an association between higher levels of caregiver training and education with fewer behavior problems and higher school readiness and receptive language scores at 36 months (NICHD Early Child Care Research Network, 1999).

In a subsequent analysis of NICHD data, the NICHD Early Child Care Research Network (2002) examined the relationship between 54-month-olds' ($n=1,075$) pre-academic and

language skills, short-term memory, and social competence and the quantity, quality, and type of early child care in which they had been enrolled up to that point. In this study, enrollment in higher quality care, as well as a center (versus other types of care) was associated with better scores on tests of language and pre-academic skills. Also notable is that when the quality of children's care increased over time, children also experienced better pre-academic skill scores, whereas a decrease in quality over time was associated with lower pre-academic skills. These analyses also found that being in care for more than 30 hours per week during the first 4 ½ years of life was correlated with higher levels of mother- or caregiver reported behavior problems as compared to children in care for less than 10 hours per week. However, in a separate analysis, McCartney et al. (2010) found that such externalizing behavior was related to more hours spent in low-quality care, including the proportion of time spent in large group of children.

Similarly, a seventh analysis of the full NICHD dataset found that 54-month-old children who experienced high-quality child care as both infants, toddlers, and preschoolers had better school readiness skills than children who experienced high quality care during none or only one of those periods. In addition, high-quality child care as an infant or toddler was associated with better cognitive development scores at 24 months, as well as higher memory scores when children were 54-months-old (Li et al., 2013). However, NICHD Early Child Care Research Network and Duncan (2003) caution that the significance of the relationship between child care quality and children's outcomes at 54 months can vary based on the analysis approach used.

The NICHD Early Child Care Research Network (2004) subsequently investigated the relationship between First Graders' ($n=1,095$) reading and mathematics scores and previous enrollment in child care, parenting style, and the school context (i.e., instructional support for student learning and emotional support). Parenting had the strongest relationship with children's outcomes overall. Their reading scores were associated with the quality of the literacy instruction and teacher feedback received in their First Grade classrooms. However, the sample's prior child care also played a role in that children who had experienced better quality child care also had higher language scores at age 4½. In turn, these higher language scores predicted better First Grade reading and mathematics scores.

These same researchers then examined the relationship between Third Graders' ($n=872$) standardized mathematics and reading scores, their memory, and teacher-reported externalizing behavior and the quality, quantity, and type of child care up to age 4½. Higher-quality child care continued to be associated with better scores on tests of children's mathematics, reading, and memory skills. The findings related to quantity of center-based care were mixed: more time was related with better memory scores, but also with worse work habits in terms of using time wisely and working independently. Yet, time in child care was no longer found to be related to teacher-reported externalizing behavior problems (NICHD Early Child Care Research Network, 2005).

Belsky et al. (2007) subsequently turned their attention to the association between the samples' (mean $n=1,047$) Fifth Grade language, literacy, mathematics scores and Sixth Grade social skills and the quality and quantity of infant, toddler, and preschool child care. Once again, parenting had the strongest relationship with all outcomes, but higher quality of children's child care also was associated with better Fifth Grade vocabulary scores. As was

the case when children were in Third Grade, hours enrolled in center-based care no longer was significantly associated with teacher reports of externalizing behavior.

The final two NICHD analyses focused on the relationship between the sample's outcomes while enrolled in high school and the quality and quantity of their child care up to age 4½. In the first of these studies, Vandell et al. (2010) found that higher scores on standardized mathematics, language, and literacy assessments at age 15 ($n=1,002$) were associated with child care quality. Higher quality care also was inversely related with the sample's self-reports of externalizing behavior. Vandell et al. (2016) also examined the 18-year-old samples' outcomes as they graduated from high school ($n=779$). These analyses showed a relationship between higher quality child care and the sample's academic standing in terms of their class rank, grades, and advanced coursework.

Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) and ECLS-Kindergarten (K). Four additional investigations analyzed the large-scale, nationally representative ECLS-B or ECLS-K datasets to compare children's outcomes after participation in child care as an infant or toddler, and due to the measures used in three of these studies, also suggest the potential contributions of quality. Ruzek et al. (2014) analyzed ECLS-B data to examine the relationship between observed child care quality as measured by the ITERS (Harms et al., 1990) and Family Day Care Rating Scale (FDCRS; Harms & Clifford, 1989) and children's ($n=8,900$) cognitive skills at 24 months of age. These researchers found that the cognitive scores of 2-year-olds attending medium (mean score of 3.0-4.9) or high quality care (mean score ≥ 5) were better than for children in low quality care (mean score < 3.0). Another critical finding was that when differentiating child care quality by family income, 43 percent of settings that low-income children attended had low-quality scores and an additional 48 percent of these settings had medium quality scores, whereas only 16 percent of medium- and upper-income children attended low-quality care.

A second analysis of ECLS-B data by Colwell et al. (2013) investigated the relationship between children's cognitive and social-emotional outcomes at ages 2 and 4 and the quality of their family child care settings at age 2 and center-based settings at age 4 as measured solely by the CIS (Arnett, 1989). Relatedly, this study's focus was on the validity of the CIS itself as a measure of the quality of caregiver interactions with children. Their analyses found small associations between family child care CIS scores and 2-year-olds' social-emotional outcomes and emerging cognitive skills. However, they did not find any significant association between CIS scores and 4-year-old's cognitive or social-emotional outcomes. Another interesting finding was that most caregivers displayed positive interactions as measured by the CIS, and therefore it was difficult to distinguish between high versus moderately high quality. In addition to relying solely on CIS data, one limitation of this study for the purposes of the current report is that the researchers did not differentiate their findings based on children's family income levels.

In a third ECLS-B study, Coley et al. (2013) examined the at-kindergarten-entry, teacher- and parent-reported behavior problems of approximately 6,000 children and the parent-, home-, or center-based child care in which they were enrolled at 2- and 4-years-old. Given that the child assessments only took place at kindergarten entry, this study mainly focused on the cumulative effects of care type. They found that in comparison to children who had been cared for at home, enrollment in centers at 9 months was associated with greater amounts of kindergarten teacher-reported learning behaviors. Teachers also reported higher

externalizing behaviors for children enrolled full-time in center-based child care at age 2 as compared to their home-based peers. Similarly, part-time enrollment at age 4 in lower-quality care was more likely to be associated with kindergarten teacher-reported externalizing behaviors as compared to part-time enrollment in moderate-quality settings. However, the authors did not provide any details regarding how they defined low, moderate, or high quality. In addition, the weighted infant and toddler center-based sample was small, with 91 percent of 9-month-old infants and 85 percent of 2-year-old toddlers instead categorized as receiving parent- or home-based care.

Finally, Loeb et al. (2007) analyzed ECLS-K data to explore the relationship between entering kindergartners' ($n=14,162$) reading and math scores and their previous type of child care and length of enrollment. These analyses found that reading and mathematics scores were higher when children received center care as opposed to being cared for by their parents. The largest effects were found for children who were first enrolled in a center between the ages of 2 and 3, rather than as infants or at age 4. The researchers also examined whether these center-based child care outcomes differed by children's racial groups. They found that the effect on English-speaking Hispanic students' reading scores was roughly three times as large as the effect size for White children and twice as large as the effect on Black children. However, more years and time per week enrolled in centers was related to increased teacher-reported behavioral problems, particularly for middle- and high-income children, as well as White and Black kindergartners. One limitation of this study is that roughly 25 percent of the sample was low-income and child assessments could not be administered to children with limited English skills. In addition, the study did not include any measures of child care quality.

Three-City Study. Another U.S.-based study began in 1999 and focused on the relationship of child care quality in three urban cities and low-income 2- to 4-year-olds' ($n=204$) cognitive and social-emotional development over a roughly 16-month timespan. In this study, the majority of children were cared for in centers, Head Start programs, or at home, with less than 10 percent in regulated family child care homes. Child care quality was assessed via the Early Childhood Environment Rating Scale – Revised (ECERS-R; Harms et al., 1998)¹ or FDCRS (Harms & Clifford, 1989) and the CIS (Arnett, 1989). Although analyses of the study's data suggested that most children received sensitive care as measured by the CIS, 24 percent of the settings had inadequate ECERS-R or FDCRS scores and another 36 percent received minimally adequate ratings. Only 10 percent of the settings receiving excellent ratings. Examination of the child outcomes data found no association between child care quality and children's early mathematics and literacy skills. When controlling for quality, there was no association between type of care and these outcomes, either. However – and echoing one of the findings cited above in McCartney et al.'s (2010) analysis of NICHD data – more hours in higher quality care was related to reductions in children's behavior problems, whereas more hours in lower quality care was related to increased levels of externalizing behavior problems (Votruba-Drzal et al., 2004).

Carolina Otitis Media Project. Two additional studies used data from a health-focused field study to examine the relationship between the quality of the child care centers in which African American children were enrolled and their cognitive and language development.

¹ The ECERS-R is a preschool age-focused “sibling” of the ITERS-R and ITERS-3 mentioned in Section 1.

The first study used a sample of 79 12-month-old infants who were enrolled in nine community-based child care centers. Sixty-seven percent of the children were in families with incomes below the poverty line. The quality of the sample's centers was poor to mediocre in that the average ITERS (Harms et al., 1990) score was a 3 out of 7. In addition, caregivers were responsible for 4.5 infants on average and the group sizes ranged from 3 to 16. The majority of caregivers had a high school diploma as their highest level of education. Analyses of the study's data found that infants' scores on measures of cognitive and language development and communication skills were modestly related to classroom quality. Children in classrooms with smaller staff-child ratios had better communication skills, as well. Importantly, child and family factors were not found to moderate the association between child care quality and infant development. However, in addition to the small number of children with little variation in family background, the range of ITERS scores across the sample classrooms was very limited, as were teachers' formal education levels (Burchinal et al., 1996).

The second Otitis Media Project study focused on the association between classroom quality and children's cognitive and language development at 12-, 24-, and 36-months-old in a sample of 89 low-income African American children enrolled in 27 child care centers. Given the expanded age range, classroom quality was assessed using the ITERS (Harms et al., 1990) and ECERS (Harms & Clifford, 1980). The average ITERS scores were 3.1 in infant classrooms, 3.4 in toddler classrooms, and 3.1 in 2-year-old classrooms. Classrooms serving 3-year-olds had average ECERS scores of 4.0. In addition, infant and toddler classrooms had an average group size of 7 or 8, whereas there were 12.8 children on average in the 2-year-old classrooms and 13.7 on average in the 3-year-old classrooms. Higher quality child care was associated with better cognitive and language development and communication skills across time, even after adjusting for selected child and family characteristics. These analyses also suggested that smaller staff-child ratios were related to better language and communication skills (Burchinal et al., 2000).

Fragile Families and Child Well-Being Study (FFCWS). This 1998–2000 study did not include measures of quality, but because the majority of sample families were headed by low-income single mothers, Peng and Robins' (2010) secondary analyses of these data are useful for considering the relationship between children's ($n=4,898$) receptive vocabulary and social development skills at age 3 and in which type of setting they received care up to age 1. Their analysis found that the highest language development scores were correlated with relative-provided infant care, whereas children's social development was strongest when they had received center-based infant care. An additional study limitation is the lack of information regarding the child care children received since age 1.

U.S.-based Research on the Effects of Infant-Toddler Child Care Stability

Child care stability can be considered an aspect of its quality, as research demonstrates that a secure, predictable relationship between a child and caregiver contributes to children's social-emotional development (Howes & Hamilton, 1993; Mortensen & Barnett, 2015). For young children, that relationship is rooted in attachment with a caregiver, which develops over time (Benoit, 2004). Indeed, Raikes' (1993) found that 91 percent of infants and toddlers who received over 25 hours per week of care from a "high ability" caregiver (i.e., empathetic, receives satisfaction from children's development, sees children as individuals, believes in the importance of early childhood education, and values communication with

parents) for more than one year were measured as having secure attachments. In comparison, only 67 percent of infants who had been with their high-ability caregivers for nine to eleven months and 50 percent of infants with a caregiver relationship of five to eight months were similarly attached.

FFCWS. Several large-scale U.S. studies suggest that instability may be detrimental for low-income infants' and toddlers' development. For example, in the FFCWS study, researchers analyzed survey, questionnaire, and calendar data from 1,637 families who lived in 14 cities in the late 1990s and participated in the FFCWS highlighted above. As previously noted, most of the families were headed by low-income single mothers. The data also included information about whether mothers needed to switch providers. Their analyses found that long-term child care instability and the use of back-up arrangements for low-income children between birth and age 3 was associated with reported behavior problems at age 3. Researchers did not find a similar association if children experienced stable multiplicity over time (Pilarz & Hill, 2014).

Family Life Project. Similarly, researchers analyzed data from the U.S.-based Family Life Project taking place in six rural counties with high rates of child poverty to examine the relationship between instability and outcomes for a sample of 1,292 children born in 2003-2004. Their analyses found that a greater number of changes across settings between the ages of 6- and 36-months-old was negatively associated with children's social adjustment at age 3. In comparison, fewer changes were positively associated with better social adjustment. The researchers did not find social adjustment problems if the changes instead occurred within a setting (Bratsch-Hines, Mokrova, et al., 2015). In a follow-on study of the same sample of children in the spring of their kindergarten year, researchers asked teachers to rate children's social skills during their interactions with adults and fellow kindergartners. They also assessed children's early mathematics and letter-identification and word pronunciation skills. These analyses once again showed a relationship between child care stability and children's social skills (Bratsch-Hines, Carr et al., 2020; Bratsch-Hines, Mokrova et al., 2017).

One strength of these stability studies is their large samples of low-income mothers and children. However, they did not examine why children's care changed. Child care instability might result from children's behavior problems rather than the reverse. However, the Family Life Project researchers noted that there was an inverse relationship between number of changes and family income, home environment quality, and maternal education levels, suggesting that instability was more prevalent in lower-resourced families.

In addition, these studies did not provide information on the quality of the child care children experienced as infants and toddlers, which additional research suggests is a potential contributor to instability's association with adverse child outcomes. Research on 419 families who participated in the NICHD Study of Early Child Care found that child care instability from ages 1–15 months was negatively related to children's language comprehension at 15 months. The combination of multiple arrangements and a low-quality primary child care setting – and as measured by the ORCE (NICHD Early Child Care Research Network, 1996) – was negatively correlated with both language comprehension and production. In comparison, multiple arrangements with a high-quality primary child care setting predicted higher language performance results (Tran & Weinraub, 2006).

Continuity of Care. In a final small stability-relevant study, Ruprecht et al. (2015) investigated differences in caregiver-reported behavior problems for 12- to 24-month-old toddlers enrolled in continuity of care (COC) ($n=57$) versus noncontinuity ($n=58$) classrooms. COC involves children remaining with the same caregiver over a longer period than would normally be the case in an age-specific classroom. Similar to the argument for child care stability, the theoretical basis of this approach is that a consistent relationship between a child and a caregiver promotes attachment and security. In this study quality was measured only in terms of teachers' formal educational levels, hours of training received over the previous 12 months, and the center's state Quality Rating and Improvement System (QRIS) rating. Across the sample, 77 percent of the COC classrooms had attained the highest QRIS ratings of 3 or 4 versus 64 percent of the non-COC classrooms. The COC classrooms also had caregiver-child ratios of 1 to 4 versus 1 to 5 and 1 to 6 in the non-COC classrooms. Analyses of the study's data found no relationship between COC status and toddler's social competence. However, as compared to the non-COC-enrolled classrooms, caregivers in the COC classrooms were less likely to report that toddlers experienced problem behaviors. Limitations of this study include: classrooms were not randomly assigned to implement a COC approach, process quality was not measured, and less than 25 percent of the small sample was low-income.

European Studies of Parent-Selected Infant-Toddler Child Care and Child Outcomes

Family, Children, and Child-Care (FCCC). Three of the European studies reviewed (see Table 2) were part of a 1999–2003 project that followed the development of a large, demographically diverse sample of children living in England from birth to age 4½. The quality measures had a strong focus on caregiver sensitivity, but not on the degree to which caregivers engaged in cognitively or linguistically stimulating activities. In addition, no information was provided about the programmatic inputs used in nursery/group care, and the findings were not differentiated by family socioeconomic status. The first study focused on the association between 18-month-old children's ($n=1,049$) cognition, language, and task-related behaviors and their in- and out-of-home child care settings at 10 and 18 months. These settings were characterized as either individual (i.e., parent, relative, babysitter) or group care (i.e., nurseries). In addition, the quality of a subset of non-maternal care at 10- ($n=320$) and 18-months ($n=345$) was evaluated using the CIS (Arnett, 1989); five of the six subscales contained in the infant version of the HOME (Bradley & Caldwell, 1988), a "yes/no" measure of children's social and physical environment; and the NICHD's ORCE measure (NICHD Early Child Care Research Network, 1996). These analyses found a positive relationship between group care and children's cognition, but not their language skills. The quality of care, especially related to opportunities for stimulation, was positively associated with children's cognition. Amount of time in group care also predicted higher levels of children's cognitive functioning, whereas time in individual care predicted lower orientation and engagement behavior (Sylva et al., 2011).

In a second FCCC study, Barnes et al. (2010) examined the relationship between children's ($n=1,1016$) behavior problems and social competence at 36 months and childcare at 3, 10, 18, and 36 months. Child care quality at 36 months was assessed with the CIS (Arnett, 1989), the HOME (Bradley & Caldwell, 1988), and the ORCE (NICHD Early Child Care Research Network, 1996), as well as the safety scale of the Assessment Profile for Homes with Young Children (Abbott-Shim & Sibley, 1993). Age of entry into non-maternal care,

and amount, type, and quality of child care were not associated with disruptive behavior at 36 months. However, there was a positive association between full-time (35 hours per week or more) child care from 19 – 36 months and maternal report of children’s confidence in expressing themselves, joining activities, and displaying sympathy for peers. One additional limitation of this particular set of analyses was that only 18 percent of the sample experienced full-time, non-maternal child care.

A third FCCC study conducted by Alan Stein et al. (2013) focused on the association between children’s emotional and behavioral functioning at 51 months as measured by a mother ($n=911$)- and teacher ($n=996$)-completed questionnaire and the type, quantity, and quality of child care (as measured by the ORCE, CIS, and HOME) experienced at 10, 18, and 36 months. Their analyses found that quality of care was not significantly related to children’s emotional and behavioral development. Instead, the largest and most consistent contributor was their home environment. In addition, children who had experienced more time in nursery school – which was free for families beginning at age 3 – were more likely to demonstrate behavior problems, whereas more time in a playgroup was associated with fewer peer problems.

Effective Provision of Pre-School Education (EPPE). One additional late 1990s study relevant to the infant and toddler child care and outcomes research base was part of the UK-based EPPE investigation. EPPE’s focus was the relationship between preschool attendance at ages 3 and 4 and children’s ($n=2,793$) outcomes at school entry and the end of “Key Stage 1,” which is equivalent to Second Grade in the U.S. However, researchers also gathered baseline data on the sample’s social, behavioral, and cognitive development and their child care history prior to enrolling in the study. The most common form of care was provided by grandparents. Analyses of these baseline data found that that care by a relative prior to enrolling in the study was related to better cooperation/conformity scores and lower antisocial (e.g., teasing) scores at baseline. In comparison, more time in “group care” (e.g., private day nurseries) was related to higher levels of antisocial behavior, but also better scores on the cognitive measure. Similarly, preschoolers who were already enrolled as a toddler in their current nursery or center had higher cognitive development scores, and peer sociability, confidence, and cooperation ratings, but also displayed more instances of antisocial and worried/upset behavior. One strength of the study was its large sample size of children from a wide range of socio-economic and cultural backgrounds. However, there was no differentiation among the baseline sample’s results by family income or at-risk status. There also was no information about the child care settings children attended prior to age 3 (much less the quality of these settings) or the percentage of infants or toddlers who had experienced any type of non-maternal care (Melhuish et al., 2001).

Neighbourhood Nursery Initiative. Mathers & Sylva (2007) evaluated the Neighbourhood Nursery Initiative, which in the early 2000s developed new child care slots in England’s most disadvantaged neighborhoods. Researchers examined the relationship between the ITERS-R (Harms et al., 2003)-measured quality of a random sample of 103 of these nurseries and the behavior of a sample of 810 enrollees with an average age of 33 months. The research team also collected data on children’s family characteristics and their child care history. The average age at which children enrolled in their local neighbourhood nursery was 18 months, and at the time of the study children had attended an average of 15 months. There was no significant relationship between their behavior and age of initial

enrollment in a nursery or overall ITERS-R scores. However, younger children in mixed-age classrooms (infants, toddlers, and 3- and 4-year-old preschoolers) were slightly more apt to display worries about receiving sufficient attention, access to toys, or food or drink. In addition, higher Space and Furnishings domain scores were related to fewer worried behaviors. One potential limitation of this study is reliance solely on the ITERS-R to measure setting quality despite the mean age of the child sample (i.e., 33 months) and inclusion of children over the age of 4.

Norwegian Mother and Child Cohort Study. Dearing et al. (2018) analyzed data from the 1998-2008 Norwegian Mother and Child Cohort Study to investigate the relationship between children's ($n=63,350$) language skills at age 3 and enrollment at age 1½ in Norway's universal child care program. In 2002 Norway scaled up its universal child care program for children ages 1 – 6, and classrooms were encouraged to incorporate high quality inputs, including adult-child ratios of 1 to 3 when serving 1- and 2-year olds and 1 to 6 when serving preschoolers. One-third of teachers in each center were required to have three-year early childhood-focused degrees, as well. Centers also used a national curriculum plan with an emphasis on language development and a learning-rich environment. In comparison to children who did not enroll in Norway's universal child care program at 18 months, low-income children language skills benefitted the most, whereas the differences for enrolled and not-enrolled high-income children were not significant. However, one cautionary aspect of this study was that the study's language measure relied on maternal reports.

Zachrisson et al. (2013) used this same dataset to examine the correlation between hours in child care and mothers' reports of children's ($n=75,271$) externalizing behavior at 18 and 36 months. They did not find a relationship between child care enrollment and externalizing problems at either time point. However, Norway's parental leave guarantee for the entire first year of life and its infant-toddler child care regulations provide a context for these results.

Oslo Universal Child Care Assignment Lottery and Municipal Primary School Test Data. In a third Norway-based study, Drange & Havnes (2015) analyzed data from Oslo to determine the effects of randomized lottery enrollment into the city's universal child care for toddlers on children's ($n=2,010$) age 7 language and mathematics outcomes. The city used the lottery because it did not have sufficient slots for toddlers who were born between 2004 and 2006. The lottery therefore acted as a type of random assignment, with 585 of the children receiving an offer to enroll. These analyses found a benefit for "offer received" on children's language and math test scores at age 7. However, when differentiated by household income, these findings held only for low-income families. The researchers hypothesized that this finding is likely due to the quality of care that higher-income families obtained while waiting for a slot in the universal program.

Porto Transition to Child Care Study. Another European comparison study took place in Portugal between 2013 and 2014 and investigated the association between the quality of teacher-child interactions in infants' ($n=90$ classrooms) first month of enrollment in their respective child care centers and children's adaptive behavior (i.e., daily living competencies, such as motor, communication, and autonomy skills) six months after enrolling. Quality was measured via the ITERS-R (Harms et al., 2006), CIS (Arnett, 1989), and CLASS-Infant (Hamre et al., 2014), as well as a fourth measure in which observers

simply noted whether an infant was actively engaged (e.g., appropriately playing with an object) or actively non-engaged (interacting with an object in an inappropriate manner). Adaptive behavior was based on a teacher-administered rubric. No data were provided on the actual quality scores or specific programmatic inputs across the 90 centers in which the study took place, but an earlier report from this study (Pessanha et al., 2017) indicated that the average group size in these infant classrooms was 6.44 and the mean CLASS-Infant and ITERS-R scores were just 3.50, suggesting mediocre quality. After taking children's developmental ages into account, higher quality infant classrooms were modestly associated with children's levels of adaptive behavior and active engagement. Note that the families in the study were relatively advantaged, as 59 percent of the infants' mothers had a university degree (Pinto et al., 2019).

Basale Invloeden op de Baby Ontwikkeling (BIBO; Basal Influences on Baby Development). The final European-based study was based in the Dutch province of Gelderland and focused on the relationship between type and amount of non-maternal care and infant and toddlers' behavioral and physical development. The majority of the sample's mothers were well-educated and considered to have high socioeconomic levels. No data on group sizes or ratios and no measures of quality were provided. In an initial study, researchers explored whether infants' ($n=168$) illnesses were related to the number of concurrent child care arrangements and amount of time in those arrangements. Their analyses found that infant placement in two or more arrangements was related to more skin illnesses, but fewer respiratory issues or general illnesses. In comparison, more hours in center-based care was related to more respiratory issues and general illnesses, whereas there was no relationship between amount of time in family child care or family, friend, and neighbor (FFN) settings and infants' health. The researchers attributed these findings to the fact that centers enroll more children than non-center-based settings and therefore increased the chance that an infant would be exposed to some type of infection (Beijers et al., 2011).

A follow-on BIBO study examined the association between children's ($n=193$) behavior at 30 months, whether they were enrolled in center-based child care, and the average number of hours of child care in which they were enrolled on a weekly basis. The research team gathered information on children's out-of-home child care settings via monthly maternal interviews. In addition, children's inhibitory control was measured at 30 months. Analyses of the study's data failed to demonstrate a correlation between non-parental care and mother- or caregiver-reported behavior problems (Beijers et al., 2013).

3. Research on Subsidy-Supported Infant-Toddler Child Care

Research on the effects of public subsidy programs provides another source of information relating to child care quality and child development. Such studies ask a different question than research directly focused on child care *per se*. The offer of public subsidies for care induces some parents to make different choices about care hours, type, and quality, and alters families' disposable incomes. The result is that the child care selection process and counterfactuals in subsidy studies differ from those in studies focused on child care arrangements *per se*. Particularly relevant to the quality of infant-toddler child care for low-income families in the U.S. is the federal-state CCDF subsidy program that began in 1990 as part of the Child Care and Development Block Grant Act. These subsidies became even more important when the 1996 Personal Responsibility and Work Opportunity

Reconciliation Act expanded work requirements for adults receiving Aid to Families with Dependent Children (Long et al., 1998).

Research is clear that subsidies positively impact parental employment, though impacts vary with context (including labor market conditions) and family characteristics (Burgess et al., 2016; Davis et al., 2018). Low-income, single mothers who receive a subsidy are less likely to experience a child care-related work disruption (Forry & Hofferth, 2011). There also is evidence that subsidies increased educational attainment of mothers of 2-year-olds who were high school dropouts (Schochet & Johnson, 2019). In short, CCDF can serve as a useful work or school attendance support.

CCDF subsidies are provided to parents in the form of a voucher, or in a limited number of states, through contracts with providers for a specific quantity of subsidized slots.

Depending on a parent's income and their state's co-pay rules, parents use these vouchers in lieu of some or all of the tuition that they otherwise would pay. Currently CCDF subsidies serve roughly 17 percent of eligible parents nationally. Each state has their own subsidy eligibility criteria, but typically a parent must meet a maximum income threshold (e.g., up to 200 percent of the federal poverty level for a family of three) and work a minimum number of hours or attend school. Parents also must reapply to establish their eligibility every 12 months (Dwyer et al., 2019).

Child care providers that wish to participate in the subsidy program must be licensed, regulated, or non-licensed/registered under the laws of the state in which they are located. They also must allow monitoring and annual inspections by their state's CCDF state administrative office, have their staff undergo criminal background checks, and participate in the state's child care training system. The focus of these trainings is mainly on health and safety topics, including the prevention of infectious diseases and sudden infant death syndrome, emergency preparedness, pediatric first aid and CPR, and recognition and reporting of child abuse and neglect. Child development topics also are to be addressed. However, other than mandating ongoing training, CCDF regulations do not specify the minimum number of training hours for any of these topics. They also do not impose additional minimum quality standards on subsidy-accepting providers. For example, there is no federal minimum credential (e.g., a high school diploma versus a college degree) necessary to work as a child care provider in a subsidy-receiving setting (Child Care State Capacity Building Center, 2017; Dwyer et al., 2019).

Research on Subsidized CCDF Child Care and Young Children's Outcomes

Subsidies have the potential to impact children's development through multiple pathways: increasing parental employment and earnings, changing the stability of child care arrangements, and changing the quality of care. Yet, despite researchers (e.g., Adams & Rohacek, 2002; Raikes, 1998) posing queries 20 years ago regarding the degree to which subsidized child care is related to young children's short-term outcomes, I could not identify any studies on this topic with infants or toddlers. Instead, research on the relationship between parental receipt of CCDF subsidies and children's kindergarten readiness appears to be limited to studies using samples of 4-year-olds.

Furthermore, the results of this research are mixed. For example, five studies relied on analyses of the ECLS-B dataset, which followed children born in 2001 from birth to

kindergarten, or the ECLS-K dataset that followed the kindergarten class of 1998-99. Three of these studies found a negative relationship between subsidized child care and preschoolers' outcomes (Hawkinson et al., 2013; Herbst & Tekin, 2010, 2015), whereas the fourth study found a neutral association (Johnson, Martin, & Brooks-Gunn, 2013). The fifth analysis focused on children of immigrants and found a positive relationship between children's early literacy skills and enrollment in subsidized center-based care, but negative associations between these same skills and subsidized family child care home settings. There was a neutral relationship between care type and children's mathematics skills and externalizing behavior. The research team hypothesized that children's literacy skills improved when enrolled in centers due to greater access to English verbal interactions and print materials as compared to what children had access to in family child care homes or FFN settings (Johnson, Han, et al., 2014). Relatedly, a sixth study analyzed data from the Miami School Readiness Project to examine whether improvements in Latino 4-year-olds' (n=6,929) kindergarten readiness over the school year was associated with enrollment in a subsidized center versus subsidized family child care home. Their analyses also found that enrollment in centers provided an advantage, particularly for boys (Tran & Winsler, 2011).

Research on the Quality of Subsidized Child Care

Six U.S.-based, subsidy-relevant studies suggest that subsidies can be associated with the quality of care infants and toddlers receive. In four of these studies, researchers also attempted to shed light on some of the specific programmatic inputs that were associated with the quality of subsidized settings (see Table 3).

ECLS-B. Johnson and Ryan (2012) analyzed ECLS-B data to examine whether subsidy-receiving families ($n=250$) chose higher quality care for their 2-year-olds as compared to non-subsidy families ($n=250$). Quality was assessed via the ITERS (Harms et al., 1990) and the FDCRS (Harms & Clifford, 1989). Their analyses found that subsidy-receiving parents were more likely to rely on center-based rather than family child care, which on average had higher quality ratings as compared to the latter settings.

In a second analysis of ECLS-B data, Sullivan et al. (2018) compared the type and quality of child care attended by 4,000 special needs and non-special needs children from subsidy-eligible families at age 2 and age 4. Once again, receipt of subsidies was associated with increased use of center-based child care in comparison to family child care homes or parental care across both subsamples of families. However, subsidies did not result in consistent access to higher-quality care as evidenced by scores on the CIS (Arnett, 1989), ITERS (Harms et al., 1990), ECERS-R (Harms et al., 1998), and FDCRS (Harms & Clifford, 1989). These analyses also found that 15.6 percent of subsidized 2- and 4-year-olds were in settings that did not meet NAEYC recommended ratios as compared to 5.6 percent of unsubsidized children.

Kentucky KIDS Now Longitudinal Evaluation. Antle et al. (2008) used a stratified random sample of 91 Kentucky subsidy-supported infant-toddler ($n=47$) and preschool ($n=44$) center-based classrooms to explore the association between teacher salary, education level, subsidy density, and quality. They measured the quality of the participating classrooms using the ITERS-R (Harms et al., 2003), ECERS-R (Harms et al., 1998), and Early Language and Literacy Classroom Observation (ELLCO; Smith & Dickinson, 2002). Their analyses found that subsidy density was inversely related to the observed quality of

the preschool classrooms, whereas teacher education levels were predictive of the quality of the infant-toddler classrooms.

Midwest Child Care Research Consortium. As part of a project that took place in Iowa, Kansas, Missouri, and Nebraska, Raikes et al. (2005) conducted a telephone survey and in-person quality observations to examine if subsidy density, provider-reported education levels and annual training hours, and state policies predicted the FDCRS (Harms & Clifford, 1989) and CIS (Arnett, 1989)-rated quality of 120 randomly selected family child care homes. Lower subsidy density levels and higher caregiver education levels predicted caregiver sensitivity, whereas lower subsidy density levels and higher regulation levels predicted global quality. In a follow-on study (Raikes et al., 2013) using an expanded dataset of 514 family child care homes used by subsidy- and non-subsidy-receiving parents, the researchers examined whether quality was related to being licensed ($n=357$) versus “registered”/non-licensed ($n=157$). Licensed and non-subsidy providers each received higher overall scores on the FDCRS (Harms & Clifford, 1989) as compared to their non-licensed or subsidy-accepting counterparts. These results were due, in part, to significantly higher scores related to the domains of space and furnishings, learning activities, social development, and adult needs. Yet, the average scores of all of the setting types were merely adequate, as opposed to good or excellent.

In a third Midwest Child Care Research Consortium study, researchers examined associations between child care quality and the household incomes. This study relied on data from a telephone survey of 1,313 parents and ITERS (Harms & Cryer, 1990), FDCRS (Harms & Clifford, 1989) and ECERS-R (Harms et al., 1998) scores from 359 child care centers, family child care homes, and FFN providers serving infants, toddlers, and preschoolers. In this study, family income was inversely related to observed quality. However, one limitation of this study for purposes of this report is that only 13.1 percent of the families in this study were receiving a child care subsidy and the researchers did not report any findings specifically related to this group (Torquati et al., 2011).

Why are Subsidy-Receiving Parents Purchasing Low Quality Infant-Toddler Child Care?

Although these six infant-toddler studies paint a picture of less-than-exemplary quality in subsidy-accepting child care settings and raise concerns about the potential contributions of subsidy density, teacher characteristics (i.e., education, experience, and salary), and a setting’s licensed status to these findings, they offer few insights into *why* subsidy-receiving parents selected lower-quality child care. This question is especially salient given that CCDF policy emphasizes parent choice and could increase a parent’s child care purchasing power. One research base suggests parent priorities play a role, including preferences for a specific type of care. However, another research base points to parents’ in-practice options, including provider capacity and motivation to offer high-quality experiences within the CCDF policy and funding context.

Parent priorities. Most parents consider an array of factors when making decisions regarding child care for their infants and toddlers. Some parents may prioritize adult-related criteria over supporting their child’s development. Convenience and travel costs (time and money) are two considerations for most parents (Peyton et al., 2001). Also, some low-income parents prioritize care that is aligned with their job requirements, particularly if they

work during nontraditional hours or have an unpredictable schedule (Adams & Katz, 2015; Forry, Wessel et al., 2012; Henly & Adams, 2018; Sandstrom & Chaudry, 2012; Weber et al., 2018).

Other parents may purchase subsidized FFN care from an extended family member because that individual has limited employment opportunities, essentially using the subsidy to “share the wealth” (Uttal, 1999). However, the prevalence of this priority appears to be speculative. For example, analysis of family child care data from the Midwest Child Care Research Consortium showed that 51 percent of subsidy-receiving providers cared for at least one relative (excluding their own children) versus just 27 percent of non-subsidy-accepting providers (H. Raikes et al., 2003). And, in Markowitz et al.’s (2014) secondary analysis of data from the FFCWS study – which relied on an urban sample of families living in 14 cities – living with extended family was associated with purchasing FFN care. However, it is not clear that the reason for this association in either of these analyses was supporting a relative’s household income. In fact, in H. Raikes et al.’s (2012) Midwest Child Care Consortium telephone survey of 659 subsidy-receiving parents – 60 percent of whom had a child between the ages of 0 and 35 months – parents were asked to rate on a scale of 1–5 the importance of eighteen possible reasons for choosing a particular child care provider. The only reason rated less than 3.0 was “provider was a relative.”

A slightly different question is whether a parent’s preference for a specific *type* of care is related to the quality of subsidized care purchased. For example, the six infant and toddler-relevant studies highlighted earlier in this section demonstrate the mediocre quality of subsidized family and FFN child care, which is aligned with additional research by Forry et al. (2013). And, other data point to a preference for these two types of settings. Carlin et al. (2019) examined data from a 2009–2012 telephone survey data of 323 Minnesota parents of children aged 0–6 to predict the type of subsidized child care these families used for their infants, toddlers, preschoolers, and early primary grade students. Their analyses found that nearly half of the sample reported relying on family child care (11.4 percent) or FFN care (38.2 percent). An additional 37.4 percent relied on centers, but this quantity included PreK and Head Start programs. They also found that the availability of FFN care reduced the probability that parents would elect to enroll their child in a child care center or family child care provider. One final finding was that parents of infants, as well as parents with less than a high school diploma, also showed a preference for FFN care. Henly & Adams (2018) also note that parents of infants and toddlers are more likely to enroll their child in a home-based setting, rather than a center, particularly if they work a nontraditional schedule.

Although low-income parents may not necessarily be accurate judges of child care quality (Bassok et al., 2018; Mocan, 2007), additional studies suggest that they prioritize structural and process quality broadly defined (Herbst et al., 2020; Shlay, 2010), which theoretically can serve as a proxy for prioritizing their children’s development. Yet, given the variety of study designs and aspects of quality explored, it is challenging to determine to what extent this is the case for parents of infants and toddlers. For example, in Raikes et al.’s (2012) telephone survey, high quality in general was deemed as important as the provider being licensed and registered. Forry et al. (2011) also analyzed telephone survey data from the 2009–2012 Minnesota Child Care Choices Study. In these analyses, half of the parents used a subsidy at the time of the telephone survey. The most cited reason for selecting their child’s primary care arrangement was knowing or trusting the provider (27 percent),

followed by quality (23 percent). When analyzing these data separately for subsidized families with an infant or toddler, knowing or trusting the provider still was the top criterion. However, the report does not indicate whether these responses were open-ended or forced-choice. Parents also were asked to rate the importance of ten quality-related indicators, including a warm and caring environment and staff, books, and staff that speak a child's home language. Over 75 percent of parents rated 6 of the 10 indicators as extremely important. Three of the final 4 indicators were rated as extremely important by nearly 70 percent of parents, as well. Of course, parents also could have responded with these favorable ratings so that they did not appear to be less likely to prioritize their child's development.

Another example of prioritized child development-by-proxy is Chaudry et al.'s (2011) study which analyzed open-ended interview data collected from 86 low-income parents living in Rhode Island and Washington state, 67 percent of whom had a child between the ages of 0 and 2. In addition, 38 percent of the sample received subsidies. In these results, child development on its own was not mentioned as a priority. Instead, the most cited criterion was the activities and learning opportunities provided (61 percent), followed by sensitive caregiving and positive relationships (52 percent), a safe and trustworthy provider (49 percent), and a bilingual or native speaker (43 percent). In a fourth example, Shlay et al. (2005) investigated the child care preferences of 141 low-income African American parents of children with a mean age of 2.9 years. Of this sample, 27.6 percent used a subsidy to pay for child care. In this study parents rated the desirability of 30 computer-generated child care vignettes that were related to structural and process quality inputs. The vignettes included factors such as subsidy acceptance, convenience, and whether the provider was licensed, but there was no explicit vignette sentence related to "quality" or "child development." Their analyses showed that the vignettes that were most desirable included descriptions of caregivers providing individual attention, creating and maintaining a safe and sanitary environment, and having experience and specialized training.

Provider Capacity. An equally compelling theory is that providers that accept subsidies may not have the motivation, much less the financial capacity to offer higher quality child care. In fact, many early childhood education stakeholders argue that CCDF subsidy reimbursement rates are not sufficient to fully pay for the quality of child care that has the potential to support the learning and development of low-income children (Adams & Henly, 2020; Giannarelli et al., 2019; Hatfield et al., 2014; Mongeau, 2020). A study that relied on data from 8 focus groups with center directors or family child care providers in Maryland examined challenges to offering high quality care. The most cited challenge was inadequate financial resources. In turn, the lack of resources was attributed to the fees charged (and fear that they would lose their customer base if they charged higher fees), as well as cash flow issues related to subsidies (Forry, Simkin et al., 2012).

Universal Subsidized Child Care in Quebec. Quebec's universal subsidized child care program for children ages 0 to 4 provides another opportunity to learn about the effects of subsidies and to obtain insights into the relationships between quality and child development. The province's universal, full-time (30–35 hours per week) program was rapidly phased in on an age-staggered basis (i.e., 4-year-olds only in the first year, 3- and 4-year-olds in Year 2, etc.) between 1997 and 2000 and relied on both child care centers and family child care providers. The program greatly increased nonparental child care rates and

duration for infants and toddlers while increasing maternal labor force participation and child care stability. However, research has found some negative impacts (e.g., on 2- to 3-year-olds' anxiety and physical aggression and on cognitive skills at school entry) and little positive impact on child development (Baker et al., 2008; Haeck et al., 2015, 2018; Kottelenberg & Lehrer, 2013; Lefebvre & Merrigan, 2011; Lefebvre et al., 2008).

Japel et al. (2005) analyzed ECERS-R (Harms et al., 1998) and FDCRS (Harms & Clifford, 1980) scores collected while Quebec's universal program was being ramped up and found that just 5 percent of the province's subsidized settings were rated as excellent and an additional 23 percent as good. In comparison, 61 percent of settings were rated as having minimal quality and the remaining 11 percent received inadequate ratings. In addition, in the first several years of the program most children were enrolled in unregulated home-based settings, 26 percent of which were rated as having inadequate quality. The lowest average domain scores across all settings were related to space and furnishings, which includes sufficient classroom space and equipment for physical activities for the number of children enrolled. Relatedly, the province's regulations allowed for ratios of one teacher to eight children in centers serving children ages 18 months–4 years, and up to six children per caregiver in home-based settings.

Analyses of the long-term effects of Quebec's subsidized program on children's outcomes have produced mixed results. Haeck et al.'s (2018) analysis suggests that short-term negative effects became much smaller or disappeared by the teenage years. Other researchers suggest that the lack of substantive positive effects on child development, as well as any negative effects, were concentrated among the children of highly educated mothers who enrolled their infants and toddlers to bypass preschool subsidy waitlists (Ding et al., 2020). Yet, other analyses suggest negative long-term cognitive and behavioral outcomes (Baker et al., 2015, 2019). Furthermore, the low quality of care – especially in earliest years when capacity was rapidly expanded – and long duration (many hours across many years) were associated with the strongest negative effects on children. This resonates with findings from the NICHD longitudinal studies discussed earlier. Together with other research on universal child care programs, these studies suggest the possibility of positive impacts for low-income children and null or even negative effects for higher-income peers depending on quality and context (e.g., Cornelissen et al., 2018; Dietrichson et al., 2020; Duncan & Sojourner, 2013).

4. U.S.-based Intervention Studies

The results of research on four different interventions designed to improve infant and toddler development provide particularly strong evidence regarding the effects of care quality (see Table 4). Similar to the 1970s-era Abecedarian (Sparling & Meunier, 2019) and Carolina Approach to Responsive Education (CARE) (Burchinal et al., 1997; Wasik et al., 1990) initiatives, these interventions are based on the theoretical premise that at-risk children's social, emotional, and cognitive developmental trajectories can be changed via participation in a high quality child care and early education programs. The first intervention was the Infant Health and Development Program (IHDP), which targeted low birth-weight infants. Two additional interventions took place in Early Head Start and Educare programs, both of which are designed to seamlessly transition children between their infant-toddler and preschool services. As a result, research on these programs investigates the role infant and

toddler child care plays in at-risk children's school readiness skills. The final intervention – Program for Infant/Toddler Care – focused on the effects on children's short-term cognitive and social-emotional development of on-site infant and toddler caregiver training in 251 centers and family child care homes. Infant Health and Development Program

The IHDP intervention, which began in the late-1980s, used a randomized-control trial design to investigate the effects of follow-up visits to a pediatrician, referrals to specialists, home visits, parent support groups, and participation a high-quality center-based educational program from ages 1 – 3 on the cognitive, behavioral, and health outcomes of low birth-weight infants. The treatment families ($n=377$) received access to the full set of services, whereas the comparison group ($n=608$) received the pediatrician follow-up visits and any related referrals. The IHDP intervention was based on the Abecedarian/Care model but was not limited to low-income families (Brooks-Gunn et al., 1993; C. T. Ramey & S. L. Ramey, 1993). The study's managers also were able to maintain a level of implementation control that could be challenging to replicate in large-scale public program (Duncan & Sojourner, 2013).

At 36 months of age children receiving the IHDP intervention had better cognitive development and prosocial behaviors than the control group of children (C. T. Ramey & S. L. Ramey, 2008). Intensity of participation in services was associated with stronger effects on children's IQ (Liaw et al., 1995; C. T. Ramey et al., 1992). This is a critical finding given that the average IHDP family had access to 260 days of child development center care (over two years) for up to 8 hours a day (Duncan & Sojourner, 2013). Substantial heterogeneity has been found in treatment effects. "Heavier" low birth-weight children experienced more positive effects as compared to their "lower" low birth-weight peers, and children in low-income families experienced more positive outcomes. However, even some children from higher-income families benefitted, although the inverse relationship between treatment effect and income was stronger for children closer to normal birthweight and therefore are most relevant to both means-tested and universal public programs (Battistin et al., 2020).

Early Head Start (EHS) Research and Evaluation Project

The federally funded EHS program began in 1995 and is aimed at low-income pregnant women and families with infants and toddlers across the U.S. Currently there are EHS programs in every U.S. state and the District of Columbia. As is the case with the Head Start program for preschoolers, one hallmark of EHS is its quality standards for center-based staff-child ratios, maximum group sizes, and formal staff qualifications. In addition, families have access to services aimed at improving their parenting skills and economic self-sufficiency (Mayoral, 2014).

As a means for gauging EHS's short-term impacts on children's cognitive, language, and social-emotional development, during the first two waves of program funding, 3,001 racial and ethnically diverse families with a child under the age of 1 were randomly assigned the opportunity to enroll in one of 17 initially funded programs ($n=1,513$) or to a business-as-usual control group ($n=1,488$). All of the families were living at or below the poverty level and qualified for EHS services but differed in the degree to which they had up to five demographic risk factors at program entry, including being unemployed, a single parent, or not completing high school. The 17 programs also differed in terms of EHS delivery model

(i.e., center-based, home-based, or mixed). Research teams collected child outcome data via direct assessments and parent reports² (Faldowski et al., 2013; Raikes et al., 2013).

Analyses of these data demonstrated that as compared to the control group, EHS enrollees had modestly higher cognitive and vocabulary assessment scores at ages 2 and 3, and better social-emotional and approaches to learning outcomes at age 3. Effects were largest for African American and Hispanic children. Cognitive and social-emotional impacts were stronger for children attending fully implemented programs as compared to those that were partially implemented, as well (Chazan-Cohen et al., 2013; Love et al., 2002, 2005; Vogel et al., 2013).

A related set of analyses investigated the quality of the child care a subset of treatment and control families used when children were 14- ($n=509$), 24- ($n=547$), and 36- ($n=596$) months-old. These analyses mostly focused on center-based child care settings and relied on scores from the ITERS (Harms et al., 1990), ECERS-R (Harms et al., 1998), CIS (Arnett, 1989) and Child-Caregiver Observation System (C-COS; Boller et al., 1998), which incorporated features of both the ORCE (NICHD Early Child Care Research Network, 1996) and the Adult Involvement Scale (Howes & Smith, 1995) and focused on quantity of four types of caregiver-child interactions. The observers also noted the number of children and adults in a classroom to determine group sizes and ratios. The quality of EHS-provided or affiliated infant-toddler child care was significantly better than the care in which the control children were enrolled. For example, average ITERS scores in infant and toddler EHS child care classrooms were 4.8 and 4.9, whereas the control children's infant and toddler classrooms had average ITERS scores of 3.9 and 3.8. In addition, the average adult-child ratio in the EHS child care classrooms was 1 caregiver to every 2.8 infants or 3.2 toddlers, versus 3.9 infants and 5.5 toddlers in the control group's child care settings (Love et al., 2003, 2004).

In a third EHS evaluation study, researchers collected data from the randomized sample of families two years after their EHS eligibility ended and therefore coinciding with their children's eligibility for kindergarten (mean age of 63 months). No positive effects were found on any direct assessments of child development overall, although EHS attendees had better scores on measures of children's approaches to learning and observed attention, as well as fewer reported problem behaviors. Spanish-speaking EHS enrollees also had better receptive vocabulary scores in that language as compared to Spanish-speaking control group children (Chazan-Cohen & Kisker, 2013; Vogel et al., 2013).

Experimental Evaluation of Educare. The third set of intervention studies emanated from Educare, which is an enhanced, full-day and full-year EHS and Head Start program for low-income children ages 6 weeks to 5 years. Educare began in Chicago in 2000, and since that time has expanded to 21 cities across the U.S. (Educare, 2020). Classrooms are characterized by low ratios that exceed EHS standards (e.g., 1 adult for every 2.8 children in classrooms serving toddlers versus a 1 to 4 ratio), well-educated teachers (minimum of a BA versus the EHS minimum of an Associate's degree), and master teacher-led professional development. Relatedly, Educare classrooms are considered to be of high quality as indicated by their average ITERS-R (Harms et al., 1998), ECERS-R (Harms et al., 2003),

² As part of the EHS Evaluation, the research teams also collected and analyzed data related to parenting outcomes (e.g., support for at-home learning and progress towards self-sufficiency), but I do not focus on these analyses here.

and CLASS-Toddler (La Paro et al., 2012) or CLASS-PreK (Pianta et al., 2008) scores. In addition to a focus on children's cognitive development and behavioral regulation skills, the program has an emphasis on promoting positive parenting interactions. School leaders also engage in a classroom quality and child assessment data-supported plan, review, and do model to inform programmatic and pedagogical decisions. Another hallmark of the program is its blended Head Start, state PreK, child care subsidy, and private philanthropy funding stream (Guss et al., 2013; Horm, 2017; Horm et al., 2017; Amanda Stein et al., 2013; Yazejian et al., 2015, 2020).

To evaluate the effects of enrollment in Educare, a small, randomized study examined 2-year-olds' expressive and receptive language skills and parent-reported social skills. In this study, the randomized treatment children ($n=112$) had participated in the Educare program for a year, whereas the control group of low-income children ($n=94$) were "business as usual." Their analyses found that as compared to the non-Educare control group, Educare enrollees had better language skills and fewer parent-reported behavior problems. In addition to its experimental research design, a strength of the study is its initial assessment of children's baseline skills. Relatedly, both groups entered the study with language scores that reflect the national average, but in comparison to their Educare peers, the control children did not keep up with national norms over the course of the year (Yazejian et al., 2017).

In a second evaluation study, Yazejian et al. (2020) investigated the effects of randomized enrollment in Educare on 3-year-olds' ($n=202$) receptive vocabulary, early mathematics skills, and parent-reported social skills. These analyses found that participation in the Educare program ($n=111$) was modestly, but positively related to children's receptive language skills, with larger impacts for dual language learners in comparison to monolingual English speakers. Educare enrollees also had better early mathematics skills as compared to the control sample. Parents of Educare students also were less likely than control parents to indicate that their children had behavior problems.

Implementation Study of the Educare Learning Network. An additional (but non-randomized) Educare study investigated whether differences between monolingual English ($n=3,542$) and dual language learner ($n=1,492$) Educare students' receptive language and social-emotional outcomes were related to "dosage" in terms of age of entry into, and amount of time in the program. The sample was drawn from 2003 – 2013 enrollees from the first 12 Educare sites located in 10 cities. Average age of entry into Educare was just over 2½, with 35 percent of the sample entering by age 2 and half of the sample entering as a 3- or 4-year-old preschooler. These analyses suggested a relationship between dosage and students' receptive language scores such that students who enrolled at a younger age and stayed in the program had higher language scores. This association was stronger for the dual language learner group as compared to the English-only students. In addition, children who spent more time enrolled in Educare had higher teacher ratings on measures of initiative and self-control. However, a limitation of the study was that no language measures were available to assess children prior to age 3 and therefore when half of the sample enrolled in Educare (Yazejian et al., 2015).

In another non-randomized Educare study, Horm et al. (2018) examined the relationship between children's ($n=851$) age 3 social-emotional and language development and prior participation in "continuity of care" (COC) center-based classrooms as an infant and toddler

($n=414$). As noted in Section 2, in a COC approach children remain with the same teacher over a longer period of time (e.g., multiple years) instead of being assigned to an age-specific classroom (e.g., infant versus toddler) for up to 12 months. Across the sample the mean age of initial enrollment in Educare was 1 and total time enrolled prior to transitioning into a Educare preschool classroom ranged from three to seven or eight semesters. The quality of the COC and non-COC infant and toddler classrooms experienced by the sample was similar, with average ITERS-R (Harms et al., 2003) or ECERS-R (Harms et al., 1998) scores of 5.7. Analyses of this study's data showed that infants and toddlers in COC classrooms were rated as having better social-emotional skills. However, additional analyses did not support an association between COC and children's age 3 outcomes.

Program for Infant/Toddler Care (PITC). The final intervention study took place between 2007 and 2010 and used an experimental design to evaluate the effect of a professional development program on infant and toddler child care quality and children's ($n=936$) language, cognitive, and social-emotional outcomes. Participating caregivers ($n=1,067$) worked in 92 child care centers and 159 licensed family child care homes located in 10 counties in Arizona and California. At baseline, the intervention ($n=124$) and control ($n=127$) child care settings had average ITERS-R (Harms et al., 2006) scores of 3.66 and 3.51, respectively. In addition, similar percentages of caregivers in both subsamples had a degree in early childhood (roughly 22 percent). The professional development that the treatment settings were randomly assigned to receive lasted an average of 14 months and involved 64 hours of training and 40 hours of on-site coaching and support. The control settings followed a "business as usual" approach. The research team also made a concerted effort to ensure that the control settings were not inadvertently exposed to the intervention. Analysis of the study's data found no evidence that participation in the training improved either global quality, the quality of staff interactions with children, or children's outcomes. One limitation of this study was that at the time of the final child assessment, 48 percent of children had left their original child care setting. At least 25 percent of children in the treatment group received little or no treatment, as well (Weinstock et al., 2012). Also, given the minimal ITERS-R scores at baseline and this measure's focus on structural inputs, it is not clear why the research team hypothesized that caregiver professional development alone (as opposed to also providing financial assistance aimed at improving children's access to equipment and supplies, for example) would be sufficient for improving setting quality and child outcomes.

5. Discussion and Implications

This review focused on research on the infant-toddler care in the last several decades with an emphasis on the potential for such care to influence development, particularly for children at risk. Overall, the conclusions that can be made from research regarding infant-toddler care quality have not changed much since Vandell and Wolfe (2000).

Differences in learning and development, especially language development, associated with poverty emerge by age 2 and persist.

Infant-toddler child care is both positively and negatively associated with child development. These associations vary with care quality, family background (e.g., income and education), home environment and parental relationships, and broader contexts that

influence the additional and alternative experiences of children during the first three years and beyond.

Both structural and process quality are associated with child development, but research provides a weak guide to identifying minimums to be set by policy.

Interventions through high quality infant-toddler child care have improved learning and development for economically disadvantaged children and for children who are otherwise at-risk regardless of family background. Effects do not always persist beyond the early childhood years.

Publicly funded child care following the Abecedarian-IHDP model with respect to structure (e.g., ratios of 1:3 up to 24 months and 1:4 from 24-26 months) and process (e.g., a strong, well-implemented curriculum) can produce substantial, persistent improvements in child development that would reduce social and economic inequality. This suggests standards for these models should be the starting place for public policies from which policymakers might work back to what is the least costly approach likely to achieve their goals.

That more progress has not been made toward informing policy since 2000 can be attributed to the small number of studies focusing on infant-toddler care and the limitations of these studies.

Implications for a Policy-Focused, Infant-Toddler Child Care Research Agenda

This review revealed remarkable gaps in research on infant-toddler care. I could not identify even one study of the effects of child care subsidies on the development of infants and toddlers. Most studies relied on correlational designs. Studies frequently failed to include specifics on the sample's demographics or to investigate how findings might vary with family income. Some of the European studies identified the type of child care children participated in as an infant or toddler but did not provide details on the programmatic inputs that were part of that care. Importantly, few studies in the U.S. or Europe measured quality inputs in ways that would inform policy today regarding how to best support learning and development.

The limitations of past research suggest ways that future research could better inform infant-toddler care policies. First, increase the number of child care studies that focus on infants and toddlers with follow-up into the school years. Second, studies need sufficiently large and diverse samples to investigate interactions between child care experiences, family (e.g., income, education, race/ethnicity, and home language), and context. Third, studies need to recognize that parental employment, home learning experiences, and child care experiences are jointly determined and interactive. Therefore, when investigating the consequences of child care, measures of all three factors should be included. Fourth, randomized trials should test policy models, not just intervention programs. These randomized trials should be at least at the same scale as those used to study welfare reform (Moffitt, 2004). Of course, this still leaves a need for testing variations in care features to inform policy, as well. Early Head Start could serve as a base for experiments that would inform not only its own improvement, but improvement in child care policies generally.

Limitations

This report has one key limitation to note. Specifically, I attempted to identify all of the relevant infant-toddler research to be included in Sections 2, 3, and 4 by conducting key word searches in scholarly peer-reviewed journal websites, ResearchGate, Google Scholar, and Child Care and Early Education Research Connections. I also paid close attention to the literature cited by other scholars. Yet, it is possible that I have overlooked some important studies that highlight the contributions of infant-toddler child care quality, subsidized care, and different programmatic inputs for supporting the school readiness of very young children considered to be at-risk for poor developmental outcomes. This especially may be the case for studies that have been produced as in-house reports, were published in languages other than English, or emanate from non-early childhood-specific fields.

Conclusion

This report reviewed recent research on infant-toddler child care. Overall, the evidence indicates that quality of infant-toddler care is an important consideration for public policy which has the potential to harm as well as benefit children if not carefully designed. Both structural and process quality inputs are associated with child outcomes, but research is so thin that it provides limited guidance on exact levels of each that policy should support. However, infant-toddler child care interventions found to produce strong long-term gains in learning, development, and other long-term benefits do identify a set of features that are sufficient to achieve important policy goals for children at-risk for poor developmental outcomes. Accordingly, the field could benefit from a research agenda that would provide much more precision regarding the relationships between care quality for infants and toddlers and their development, as well as descriptive research that would indicate how the care received by infants and toddlers compares to that known to be highly beneficial.

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Table 1. U.S.-Based Studies of Parent-Selected Infant-Toddler Child Care and Child Outcomes

Authors	Data Source	Focus	Findings	Study Limitations
Tran & Weinraub (2006)	NICHD Study of Early Child Care (1991-1999)	Association between 15-month-olds' language production and comprehension and quality of primary child care setting	Combination of multiple arrangements and a low-quality primary child care setting was negatively correlated with both language comprehension and production, whereas multiple arrangements with a high-quality primary child care setting predicted higher language performance results.	"Multiple" was defined solely in terms of number of arrangements between 6 and 15 months of age, as opposed to length of each arrangement.
NICHD ECCRN (2000b)		Association between children's cognitive and language skills at 15, 24, and 36 months and child care type and quality	Child care quality – especially regarding language stimulation – was modestly associated with children's cognitive and language outcomes at all three time points. At age 2, better outcomes from enrollment in centers and family child care homes; at age 3, better outcomes from enrollment in centers or prior enrollment in family child care homes up to age 2.	Only 26 percent of the observed 3-year-old sample were from low-income families
McCartney et al. (2007)		Relationship between low-income children's cognitive and language skills at 36 months and prior enrollment in higher vs lower quality child care	Higher quality child care was most strongly and positively associated with children's language skills and school readiness	Higher quality was defined as being in the upper half of the distribution of quality scores, as opposed to meeting a particular ORCE or other metric
NICHD ECCRN (1999)		Relationship between children's cognitive development at 24 and 36 months and center ratios, group sizes, and caregiver training and education	Positive association between classrooms meeting more standards and few reported behavior problems at 24 months; Positive association between higher levels of caregiver training and education few behavior problems, as well as higher school readiness and receptive language scores at 36 months	No data provided for demographics of the sample used.
NICHD ECCRN (2002)		Relationship between 54-month-olds' pre-academic and language skills, short-term memory, and social competence and the quantity, quality, and type of early child care in which they had been enrolled	Enrollment in higher quality care, as well as a center (versus other types of care) was associated with better scores on tests of language and pre-academic skills. When quality of care increased over time, children experienced better pre-academic skill scores, whereas a decrease in quality over time was associated with lower pre-academic skills.	Larger NICDH sample excluded some families (e.g., adolescent mothers, families who did not speak English), child sample is not representative of population at large in terms of being considered at-risk for poor developmental outcomes.

McCartney et al. (2010)	Association between caregiver-reported externalizing behavior at 24, 36, and 54 months and time spent in, and quality of child care	Externalizing behavior was related to more hours spent in low-quality care, including a greater percentage of time spent with a large group of other children	Externalizing behavior ratings were limited to caregiver self-reports as opposed to also including mother self-reports.
Li et al. (2013)	Association between school readiness skills at 54 months and infant, toddler, and preschool child care quality	Children who experienced high-quality child care as both infants, toddlers, and preschoolers had better school readiness skills at 4 ½ than children who experienced high quality care during none or only one of those periods.	Because NICHD study excluded some families (e.g., adolescent mothers, families who did not speak English), full sample was not racially representative of US and was relatively advantaged in terms of family income.
NICHD Early Child Care Research Network (2004)	Relationship between First Graders' reading and mathematics scores and previous enrollment in child care, parenting, and the school context (i.e., instructional support for student learning and emotional support)	Parenting had the strongest relationship with children's outcomes overall. Reading scores were associated with the quality of the literacy instruction and teacher feedback received. Children who had experienced better quality child care also had higher language scores at age 4½; in turn, these scores predicted better First Grade reading and mathematics scores.	
NICHD Early Child Care Research Network (2005)	Relationship between Third Graders' standardized mathematics and reading scores, memory, and teacher-reported externalizing behavior and the quality, quantity, and type of child care up to age 4½	Higher-quality child care was associated with better scores on tests of children's mathematics, reading, and memory skills. More time in centers was related with better memory scores, but worse work habits. Time in child care was no longer found to be related to teacher-reported externalizing behavior problems.	
Belsky et al. (2007)	Association between Fifth and Sixth Graders' language, literacy, mathematics, and social skills and the quality and quantity of their previous child care experiences	Parenting had the strongest relationship with all outcomes, but higher quality of children's child care also was associated with better Fifth Grade vocabulary scores.	
Vandell et al. (2010)	Relationship between the sample's outcomes while enrolled in high school and the quality and quantity of their child care up to age 4½.	Higher scores on standardized mathematics, language, and literacy assessments at age 15 (n=1,002) were associated with child care quality. Higher quality care also was inversely related with the sample's self-reports of externalizing behavior.	

Vandell et al. (2016)			Higher quality child care was related to the sample's academic standing in terms of their class rank, grades, and advanced coursework.	
Ruzek et al. (2014)	ECLS-B (2001-2006)	Relationship between children's cognitive skills at 24 months and observed child care quality	Cognitive scores of 2-year-olds attending medium or high quality care were better than for children in low care.	When differentiating child care quality by family income, low-income children were more likely to attend low-quality out-of-home care as compared to middle- or high-income children.
Colwell et al. (2013)		Relationship between children's cognitive and social-emotional outcomes at ages 2 and 4 and the quality of their family child care settings at age 2 and center-based settings at age 4.	Small associations between family child care CIS scores and 2-year-olds' social-emotional outcomes and emerging cognitive skills, but no significant association between CIS scores and 4-year-old's cognitive or social-emotional outcomes.	Quality was measured solely by the CIS; findings were not differentiated by children's family income levels.
Coley et al. (2013)		Association between at-kindergarten-entry teacher- and parent-reported behavior problems of approximately 6,000 children and the parent-, home-, or center-based child care in which they were enrolled at 2- and 4-years-old	In comparison to children who had been cared for at home, enrollment in centers at 9 months old was associated with greater amounts of kindergarten teacher-reported learning behaviors. Teachers also reported higher externalizing behaviors for children enrolled full-time in center-based child care at age 2 as compared to their home-based peers.	The weighted infant and toddler center-based sample was small, with 91 percent of 9-month-olds and 85 percent of 2-year-olds receiving parent- or home-based care
Loeb et al. (2007)	ECLS-K (1998-1999)	Relationship between entering kindergartners reading and math scores and their previous type of child care and length of enrollment.	Scores were higher when children had participated in center care as opposed to being cared for by their parents. The largest effects were found for children who were first enrolled in a center between the ages of 2 and 3, rather than as infants or at age 4. More years, and time per week enrolled in centers was related to increased teacher-reported behavioral problems, particularly for middle- and high-income children, as well as White and Black kindergartners.	Roughly 25 percent of the sample was considered to be low-income and child assessments could not be administered to children with limited English skills.

Votruba-Drzal et al. (2004)	Welfare, Children, and Families: A Three-City Study (1999-2001)	Relationship of child care quality in three urban cities and low-income 2- to 4-year-olds' cognitive and social-emotional development over a roughly 16-month timespan	No association between child care quality and children's early mathematics and literacy skills. When controlling for quality, there was no association between type of care and these outcomes. Quality was inversely related to children's internalizing and externalizing behavior and correlated with their positive behaviors. More hours in higher quality care was related to reductions in children's behavior problems, whereas more hours in lower quality care were related to increased levels of externalizing behavior problems.	Child outcome data were not differentiated for toddlers and preschoolers
Burchinal et al. (1996)	Otitis Media and Hearing Loss Study	Relationship between the quality of the child care centers in which African American infants were enrolled and their cognitive and language development	Infants' scores on measures of cognitive and language development and communication skills were modestly related to classroom quality. Children in classrooms with smaller staff-child ratios had better communication skills.	Small child and center sample; range of ITERS scores across the sample classrooms was limited, as were teachers' formal education levels.
Burchinal et al. (2000)	(1999-2003)	Association between classroom quality and children's cognitive and language development at 12, 24, and 36 months	Higher quality child care was associated with higher scores of cognitive and language development and communication skills across time; smaller staff-child ratios were related to better language and communication skills	Small child sample
Peng & Robins (2010)	FFCWS (1998-2003)	Relationship between mostly low-income children's age 3 receptive vocabulary and social development skills and infant care type up to age 12 months	Highest language development scores were correlated with relative-provided infant care, whereas children's social development was strongest when they had received center-based infant care.	No information provided about the child care received from 12 to 36 months, or quality of care received up to age 3.
Pilarz & Hill (2014)		Relationship between child care instability and reported problem behaviors at age 3	Long-term child care instability and the use of back-up arrangements for low-income children between birth and age 3 was associated with reported behavior problems at age 3. Researchers did not find a similar association if children experienced stable multiplicity over time	No information on why care provider changed
Bratsch-Hines et al. (2015, 2016, 2020)	Family Life Project			Study took place in six rural counties; no data on quality of care; no data on why care provider changed

Ruprecht et al. (2015)	Infant Toddler Care and Education (no date provided)	Relationship between COC and Toddler's Social Competence and Problem Behaviors	No relationship between COC status and toddler's social competence. However, as compared to the non-COC-enrolled classrooms, caregivers in the COC classrooms were less likely to report that toddlers experienced problem behaviors	Classrooms were not randomly assigned to implement a COC approach; Information about the quality of these classrooms was limited; less than 25 percent of the sample was low-income and 35 percent of families enrolled were high-income
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Table 2. European Studies of Parent-Selected Infant-Toddler Child Care and Children's Outcomes

Authors	Country & Data Source	Focus	Findings	Limitations
Sylva et al. (2011)	England: FCCC (1999-2003)	Association between 18-month-old children's cognition, language, and task-related behaviors and their in- and out-of-home child care settings at 10 and 18 months	Positive relationship between group care and children's cognition, but not their language skills. The quality of care, and especially related to opportunities for stimulation, was positively associated with children's cognition. Amount of time in group care also predicted higher levels of children's cognitive functioning, whereas time in individual care predicted lower orientation and engagement behavior	Quality measures had a strong focus on caregiver sensitivity, but not on the degree to which caregivers engaged in cognitively or linguistically stimulating activities; no information provided about the programmatic inputs used in nursery care; findings were not differentiated by family's socioeconomic status
Barnes et al. (2010)		Relationship between children's behavior problems and social competence at 36 months and use of childcare at 3, 10, 18, and 36 months	Age of entry into non-maternal care, and amount, type, and quality of child care were not associated with disruptive behavior at 36 months; Positive association between full-time (35 hours per week or more) child care from 19 – 36 months and maternal report of children's confidence in expressing themselves, joining activities, and displaying sympathy for peers.	Only 18 percent of the sample experienced full-time, non-maternal child care and no information was provided regarding the programmatic inputs of the group settings; results were not differentiated by family income or other at-risk status
Alan Stein et al. (2013)		Association between children's emotional and behavioral functioning at 51 months as measured by a mother- and teacher-completed questionnaire and the type, quantity, and quality of child care experienced at 10, 18, and 36 months	Largest and most consistent contributor to children's emotional and behavioral development was their home environment. Children who experienced more time in nursery school were more likely to demonstrate behavior problems, whereas more time in a playgroup was associated with fewer peer problems.	Findings were not differentiated by family income or at-risk status

Melhuish et al. (2001)	UK: EPPE (1997-2003)	Baseline data on the sample's social, behavioral, and cognitive development and their child care history since birth	Care by a relative prior to enrolling in the study was related to better cooperation/conformity scores and lower antisocial scores baseline, whereas more time in "group care" was related to higher levels of antisocial behavior, but also better scores on the cognitive measure.	No differentiation among the baseline sample's results by family income or at-risk status. No information provided about the settings children attended prior to age 3 or the percentage of infants or toddlers who had experienced any type of setting
Mathers & Sylva (2007)	England: Neighbourhood Nursery (2003-2005)	Relationship between the quality of a random sample of 103 nurseries and children's behavior at 33 months	Children's positive behaviors were significantly related to child and family characteristics, whereas there was no significant relationship between their behavior and age of initial enrollment in a nursery or the nursery's quality scores. Younger children that were in mixed-age classrooms (infants, toddlers, and 3- and 4-year-old preschoolers) were slightly more apt to display worries about receiving sufficient attention, access to toys, or food or drink. Higher ITERS-R Space and Furnishings domain scores were related to fewer worried behaviors.	Relied solely on the ITERS-R to measure setting quality despite the mean age of the child sample (i.e., 33 months) and inclusion of children over the age of 4.
Dearing et al. (2018)	Norway: Norwegian Mother and Child Cohort (1998-2008)	Relationship between children's language skills at age 3 and enrollment at age 1½ in Norway's universal child care program.	In comparison to children who did not enroll in Norway's universal child care program at 18 months, low-income children benefitted the most, whereas the differences for enrolled and not-enrolled high-income children were not significant	The study's language and externalizing behavior measures both relied on maternal reports.
Zachrisson et al. (2013)		Correlation between hours in child care and mothers' reports of children's externalizing behavior at 18 and 36 months	No relationship between child care enrollment and externalizing problems at either time point	
Drange & Havnes (2015)	Oslo Universal Child Care (2004-2010)	Determine the effects of randomized lottery enrollment into the city's universal child care for toddlers on children's age 7 language and mathematics.	Receiving an offer to enroll was associated with children's language and math test scores at age 7 in comparison to the children who did not receive an initial offer to enroll. However, when differentiated by household income, these findings held only for low-income families.	

Pinto et al. (2019)	Portugal: Porto Transition to Child Care (2013-2014)	Association between quality of teacher-child interactions in infants' first month of enrollment in a child care center and children's adaptive behavior 6 months after entering the center	Higher quality infant classrooms were modestly associated with children's levels of adaptive behavior and active engagement	Small sample size; 59 percent of the infants' mothers had a university degree
Beijers et al. (2011)	Netherlands: Basale Invloeden op de Baby Ontwikkeling (BIBO; Basal Influences on Baby Development)	Relationship between infants' illnesses and the number of concurrent child care arrangements and amount of time in those arrangements.	Infant placement in two or more arrangements was related to more skin illnesses, but fewer respiratory issues or general illnesses. In comparison, more hours in center-based care was related to more respiratory issues and general illnesses, whereas there was no relationship between amount of time in family child care or FFN settings and infants' health	Majority of sample mothers were well-educated and considered to be of high socioeconomic status; No data provided on group sizes or ratios and no measures of quality were used.
Beijers et al. (2013)	(2006)	Association between children's behavior at 30 months, whether they were enrolled in center-based child care, and the average number of hours of child care in which they were enrolled on a weekly basis	Study's data failed to demonstrate a correlation between non-parental care and mother- or caregiver-reported behavior problems, but higher levels of inhibitory control were inversely related to caregiver-reported levels of behavioral issues	

Table 3. *U.S. Quality Comparison Studies Using a Sample of Subsidy-Accepting Child Care Settings*

Authors	Data Source	Focus	Findings	Study Limitations
Johnson & Ryan (2012)	ECLS-B (2001-2006)	Do subsidy families choose higher quality care for their 2-year-olds compared to non-subsidy families?	Subsidy parents more likely to choose center-based rather than family child care, but all ratings were merely adequate rather than good or excellent.	ECLS-B lacks data on quality of infants' child care settings; uneven center attendance across subsamples
Sullivan et al. (2018)		Type and quality of child care attended by 4,000 special needs and non-special needs children from subsidy-eligible families at ages 2 & 4	Use of subsidies did not result in access to higher-quality care	Quality measures used may not capture all inputs relevant to development of special needs subsample
Antle et al. (2008)	Kentucky KIDS NOW Longitudinal Evaluation (2000)	Association between teacher salary, education level, subsidy density, and quality in infant/toddler and preschool center-based classrooms	Subsidy density was inversely related to observed quality of the preschool classrooms; teacher education levels were predictive of the quality of the infant-toddler classrooms	Study took place in a single state; subsidy and teacher salary data were based on each center's average as opposed to the specific classrooms that participated in the study
H. A. Raikes et al. (2005)	Midwest Child Care Research Consortium (2001-2004)	Whether subsidy density, provider-reported education levels and annual training hours, and state policies predicted the FDCRS-rated quality	Lower subsidy density levels and higher caregiver education levels predicted caregiver sensitivity, whereas lower subsidy density levels and higher regulation levels predicted global quality	"Regulated" was operationalized via simple point system; no data were provided on distribution of infants and toddlers in sample
H. Raikes et al. (2013)		Whether quality was related to being licensed versus "registered"/non-licensed	Licensed providers received higher overall scores on the FDCRS as compared to the non-licensed providers, as did non-subsidy providers in comparison to the subsidized family child care homes. Yet, average scores across all types were adequate as opposed to good or excellent	
Torquati et al. (2011)		Associations between quality and the household incomes of families served	Family income was inversely related to observed quality	Just 13.1 percent of families received a child care subsidy; researchers did not report any findings specifically for the subsidized sub-sample

Table 4. U.S.-Based Intervention Studies of Infant-Toddler Child Care and Early Education

Authors	Intervention	Focus	Findings	Limitations
C. T. Ramey & S. L. Ramey (2008)	Infant Health and Development Program (IHDP; 1985-1988)	Comparison of children’s cognitive development and prosocial behaviors at age 3	IHDP treatment group experienced better rates of cognitive development and prosocial behaviors as compared to the control group of children	Sample was limited to low birth-weight and premature infants; uneven treatment and control subsample sizes; level of quality control over treatment services may be challenging to replicate on large-scale basis
Duncan & Sojourner (2013); Liaw et al. (1995); C. T. Ramey et al. (1992)			Intensity of participation in all treatment services mattered for positive effects on children’s IQ	
Battistin et al. (2020)			Greater numbers of “heavier” low birth-weight children experienced positive returns as compared to their “lower” low birth-weight peers, including children from higher-income families	
Chazan-Cohen et al. (2013); Love et al. (2002, 2005); Vogel et al. (2013)	Early Head Start (EHS; 1996-2001; 2001-2004)	Comparison of children’s cognitive, language, and social-emotional development at ages 2 and 3	EHS enrollees had modestly higher cognitive and vocabulary assessment scores at ages 2 and 3, and better social-emotional and approaches to learning outcomes at age 3. Effects were largest for African American and Hispanic children as compared to White children, as well as for families with 3 of 5 demographic risks. However, families with less than 3 risk factors experienced only a few impacts, and those with all 5 risk factors experienced no favorable impacts. Cognitive and social-emotional impacts were stronger for children attending fully implemented programs as compared to those that were partially implemented. Children in the home-based programs alone did not experience the same cognitive and language gains experienced by those assigned to the mixed programs, which involved both center- and home-based programming.	Evaluation took place during the first two waves of program funding and therefore some EHS programs were not “up to speed” in terms of being fully implemented.
Love et al. (2003, 2004)		Comparison of child care quality received at 14, 24, and 36 months	Quality of EHS-provided child care that the subsample of treatment children received as infants and toddlers was significantly better than the care in which the control children were enrolled as measured by the ITERS, ECERS-R, and adult-child ratios.	

Chazan-Cohen & Kisker (2013); Vogel et al. (2013)		Comparison of children's cognitive, language, and social-emotional development at kindergarten entry	EHS attendees had better scores on measures of children's approaches to learning and observed attention, as well as fewer reported problem behaviors. Spanish-speaking EHS enrollees also had better receptive vocabulary scores in that language as compared to Spanish-speaking control group children. No group differences for children's early literacy or mathematics skills. Combination of EHS and a post-EHS formal program for two years was related with higher early literacy scores, but not vocabulary or mathematics scores. Participation in EHS for three years plus two years of Head Start was related to better mathematics scores.	No information on the programmatic inputs used in the non-HS programs the sample attended?
Yazzejian et al. (2017)	Educare (2005-present)	2-year-olds' expressive and receptive language skills and parent-reported social skills	As compared to the control group, Educare enrollees had better language skills and fewer parent-reported behavior problems	No data available on quality of child care settings in which control sample was enrolled
Yazzejian et al. (2020)		3-year-olds' receptive vocabulary, early mathematics skills, and parent-reported social skills	Enrollment in Educare was modestly, but positively related to children's receptive language skills, with larger impacts for dual language learners in comparison to monolingual English speakers. Educare enrollees also had better early mathematics skills as compared to the control sample. Parents of Educare students also were less likely than control parents to indicate that their children had behavior problems	
Yazzejian et al. (2015)		Whether differences between monolingual English and dual language learner Educare students' receptive language and social-emotional outcomes were related to "dosage" in terms of age of entry into, and amount of time in the program.	Educare enrollees who started in the program at a younger age and stayed in the program had higher language scores. Association was stronger for the dual language learner group as compared to the English-only students. Children who spent more time enrolled in Educare had higher teacher ratings on measures of initiative and self-control.	

Horm et al. (2018)		Relationship between children's age 3 social-emotional and language development and participation in Educare's "continuity of care" (COC) center-based classrooms as an infant and toddler	Infants and toddlers in COC classrooms were rated as having better social emotional skills in comparison to enrollees with 2 or more lead teachers, but no association between COC and children's age 3 outcomes.	Lack of data on COC was implemented (e.g., mixed-age grouping vs looping teaching team with same-age children)
Weinstock et al. (2012)	PITC Professional Development (2007-2010)	Effect of a training program on infant and toddler child care quality and children's language, cognitive, and social-emotional outcomes.	No evidence that participation in the training improved either global quality, the quality of staff interactions with children, or children's outcomes	Child sample attrition issues; not clear why training was hypothesized to improve quality and child outcomes.