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Child Care Subsidies and School Readiness in Kindergarten

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Abstract

The federal child care subsidy program represents one of the government's largest investments in early care and education. Using data from the nationally representative Early Childhood Longitudinal Study – Birth Cohort (ECLS-B), this paper examines associations, among subsidy-eligible families, between child care subsidy receipt when children are 4 years old and a range of school readiness outcomes in kindergarten (sample $n \approx 1,400$). Findings suggest that subsidy receipt in preschool is not directly linked to subsequent reading or social-emotional skills. However, subsidy receipt predicted lower math scores among children attending community-based centers. Supplementary analyses revealed that subsidies predicted greater use of center care, but this association did not appear to affect school readiness.

Keywords

child care; subsidies; school readiness; low-income children

To help poor families purchase child care, the federal government funds child care subsidies through the state-administered Child Care and Development Fund (CCDF). Parents are eligible to receive CCDF subsidies if they have a child under the age of 13, if their household income does not exceed the state maximum for their family's size, and if they are engaged in an approved work or work-related activity. The primary goal of the CCDF subsidy program is to support the employment of low-income parents by reducing the cost of non-parental child care, and it appears to be meeting its aims. Subsidies have been found to decrease the cost of care (Forry, 2009; Gennetian, Crosby, Huston, & Lowe, 2004) and increase maternal employment (Blau & Tekin, 2007). However, little attention has been paid to whether child care subsidies are associated with child development outcomes. This is surprising from a policy perspective, as CCDF is among the federal government's most comprehensive investments in early care and education, costing more than $6 billion annually (US DHHS, 2008c). CCDF also serves nearly as many children as early intervention programs aimed at enhancing child development, like Head Start and public pre-kindergarten (pre-k; US DHHS, 2008a, 2008b; NIEER, 2008).

Theoretically, subsidies received during the preschool year may be expected to have a positive effect on children's school readiness upon kindergarten entry. They should allow

parents to purchase higher quality care than they would otherwise, and higher child care quality predicts greater academic skill at school entry (e.g., Burchinal et al., 2000; NICHD Early Child Care and Research Network [ECCRN] & Duncan, 2003; McCartney, Dearing, Taylor, & Bub, 2007). Subsidies have also been found to increase use of center-based care, which in turn has been associated with enhanced academic school readiness (Gormley, Gayer, Phillips, & Dawson, 2005; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; NICHD ECCRN & Duncan, 2003) but more behavior problems (Belsky et al., 2007; Loeb et al., 2007). Subsidies also represent added household income, which not only reduces parents' stress but also allows them to purchase materials and activities that promote school readiness (e.g., Conger, Conger, & Elder, 1997; Dearing & Taylor, 2007; Gershoff, Aber, Raver, & Lennon, 2007). However, a recent study comparing subsidy recipients to eligible non-recipients found that subsidies were associated with higher quality child care in only a select portion of the population (Johnson, Ryan, & Brooks-Gunn, 2012). Moreover, to the extent that subsidies increase child care quality, they may not yield *enough* of an increase to contribute to children's school readiness. It is also possible that spells of subsidy use are typically too short for higher quality care to translate into greater school readiness. Similarly, if the household income made available by a subsidy is not substantial enough to change a family's spending patterns, subsidies may have no association with school readiness.

To date, only three published studies have examined links between subsidy use in the U.S. and child development at school entry, and all found a negative association (Herbst & Tekin, 2010, 2011, 2012). These studies compared subsidy recipients to all non-recipients, even families with children in parental care whose mothers did not work. To isolate subsidies from the closely related constructs of non-parental care and maternal employment, it may be profitable to examine subsidies among only those children who are eligible (i.e., those who are in non-parental care and whose mothers meet work requirements). From a policy perspective, it is also useful to compare subsidy recipients to non-recipients after excluding those non-recipients who are in other forms of publicly funded care (Head Start or public pre-k). This approach parses the unique contribution of subsidies to child development from those of other public programs targeted to the same population. Last, if there is an association between subsidy receipt and improved school readiness, research is needed to test whether it is mediated by higher child care quality and the other potential pathways outlined above. Until recently, however, no single data set included information on subsidies, these proposed pathways, and school readiness.

The current study aims to address the above issues using the nationally representative Early Childhood Longitudinal Study – Birth Cohort (ECLS-B). Specifically, we ask whether use of a subsidy when children are preschool aged is associated with a range of school readiness outcomes in kindergarten in a sample of subsidy-eligible families. There are four innovations of our approach. First, we restrict our sample to subsidy-eligible families -- namely, low-income families who use non-parental care and in which mothers work or participate in a work-related activity outside the home -- in order to isolate the effects of subsidies from those of maternal employment and non-parental care. Second, we account for other publicly-funded care arrangements that low-income families use – Head Start and public pre-k. We further distinguish between subsidies used in home-based and community-based center (CBC) arrangements. Third, we improve on the precision of past measures of subsidy receipt by considering reports from child care providers as well as those from parents. Fourth, we test whether several child care and family characteristics mediate associations between subsidy receipt and school readiness.

Possible Links Between Child Care Subsidies and Later School Readiness

There are theoretical grounds that suggest a positive effect of subsidies in preschool on school readiness in kindergarten. Subsidy receipt might improve school readiness if it allows low-income parents to expose their child to higher quality child care than they could otherwise afford. Higher quality child care consists of cognitively stimulating materials and activities, provided by caregivers who sensitively and responsively engage with and stimulate children in ways that promote child development. High quality child care is associated with improved cognitive and behavioral outcomes (e.g., Burchinal et al., 2000; McCartney et al., 2007; NICHD ECCRN & Duncan, 2003). If subsidies allow families previously using home-based care to afford center care, they may result in increased quality given that centers at preschool age are generally higher in quality than home-based settings (Dowsett, Huston, Imes, & Gennetian, 2008; Fuller, Kagan, Loeb, & Chang, 2004). Subsidies may also allow families already using center care to attend a higher-quality center, and families already using home-based care to obtain a higher-quality home-based care provider.

Emerging research suggests that in fact, associations between subsidy receipt and child care quality are complicated. On average, children who use subsidies receive care that is approximately one-third of a standard deviation higher in quality than children who are eligible for subsidies but who use neither subsidies nor any other form of publicly-funded care such as Head Start or public pre-k (Johnson et al., 2012; Ryan, Johnson, Rigby, & Brooks-Gunn, 2011). Yet, they receive lower quality care than children who are eligible for subsidies but use Head Start or public pre-k by approximately three-quarters of a standard deviation (Johnson et al., 2012). Thus, the school readiness of subsidy recipients relative to non-recipients may well vary according to whether the non-recipient receives another form of publicly funded care. The current analysis distinguishes among subsidy-eligible non-recipients according to whether they received home-based care, CBC care, Head Start, or public pre-k.

Aside from promoting the use of center care or higher-quality care, a subsidy might predict greater school readiness if it acts as a cash transfer to the family. Income that was previously spent on child care should become available for the family's consumption so long as the cost of child care does not rise. Past research shows that increased income allows parents to improve the quality of their children's home environment, particularly among the lowest-income families (Dearing & Taylor, 2007). By reducing financial strain, increased income may also ease the psychological stress that gives rise to parenting behaviors such as harshness that negatively affect child development (e.g., Gershoff et al., 2007; McLeod & Shanahan, 1993).

Nevertheless, it is also possible that there is no association between subsidy receipt and school readiness. Effects of subsidy use on quality of care may not achieve the magnitude required to affect school readiness, given that the association between quality of care and child outcomes tends to be modest in size (Burchinal, Kainz, & Cai, 2011; Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Mashburn et al., 2008). Even if subsidy use is associated with a large enough increase in child care quality, subsidy recipients' exposure to the care purchased with the subsidy may be limited. Prior research on subsidy use suggests that spells of subsidy receipt are short, ranging from 3 to 7 months on average (Meyers et al., 2002). Moreover, the subsidy-eligible population disproportionately represents single mothers (Herbst, 2008), whose children are more likely to experience multiple, simultaneous child care arrangements (Morrissey, 2008). Thus, even if subsidy recipients experience higher quality of care than non-recipients in unsubsidized care (Johnson et al., 2012), they

may do so for only a short time, or have additional child care arrangements that are low-quality.

Last, it is not necessarily the case that if subsidies increase family income, that will result in greater school readiness. The amount of the increase may not be sufficiently generous to allow parents to purchase higher quality care, increase their investments in children, or reduce stress. Additionally, even if subsidies are generous, the money they free up may not be spent on children. In such a case, there may be no association between subsidy use and school readiness.

In sum, theory and previous research suggest two reasonable yet contradictory associations between subsidies and school readiness. The current study lacks the data needed to test all of the above mechanisms. However, we are able to test whether subsidy use is associated with greater use of CBC care (versus home-based care), and with higher child care quality. We will also test whether subsidy use is associated with greater parental cognitive stimulation at home. We do not examine whether subsidy use is associated with increased income because income is closely associated with subsidy eligibility; however, we examine whether subsidy use is associated with experiencing food insecurity and the amount the parent pays for child care.

Based on emerging findings on subsidies and past research linking child care quality to child outcomes, we tentatively hypothesize that children who receive subsidies will have greater school readiness than eligible children who receive no subsidized care, excluding those who attend Head Start and pre-k. We have little basis on which to hypothesize whether subsidies will operate differentially by type of arrangement (home-based care versus CBC). However, given recent evidence that the association between quality of care and child outcomes may be stronger at the highest levels of quality (Burchinal et al., 2010), and in light of the generally higher quality of care in centers than homes (Dowsett et al., 2008; Fuller et al., 2004), we tentatively expect subsidies to have a stronger association with school readiness in centers than in home-based settings.

Child Care Subsidies and Maternal Employment

Subsidy use promotes maternal employment (Blau & Tekin, 2007), which to varying degrees necessitates non-parental care. If subsidies prompt non-working mothers to enter the work force, we might expect associations between subsidies and child outcomes to mirror those between non-parental care and child outcomes. In general, non-parental care (especially center-based care) during the year before school entry is associated with greater school readiness in comparison to parental care (Hill, Waldfogel, & Brooks-Gunn, 2002; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; Magnuson & Waldfogel, 2005; Zhai, Brooks-Gunn, & Waldfogel, 2010). Therefore, in theory, subsidy use may be expected to confer greater school readiness.

However, some children of low-income mothers who forego employment and subsidies may not be suitable comparisons for subsidy recipients. Surely, just as with low-income working mothers, there are some low-income non-working mothers who do not take up subsidies because they are unaware of the program or find the application process prohibitive. But other low-income non-working mothers may not take up subsidies because they have decided not to enter the work force due to an objection to non-parental care. Such mothers may be particularly enthusiastic about caring for their child, or they may be aware of deficiencies among local child care providers. In either case, these mothers are likely to be differentially endowed with characteristics that contribute to greater school readiness. For instance, low-income mothers with high education levels (e.g., graduate students) who elect to stay home with their children may provide particularly stimulating care. This might

explain why three past studies including both employed and unemployed mothers in their group of subsidy non-recipients found that the children of non-recipients exhibited greater school readiness than the children of recipients.

Specifically, Herbst and Tekin (2010, 2011, 2012) used data from the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K) to assess whether receipt of a subsidy in the year before kindergarten was associated with child cognitive, social, and body mass index (BMI) outcomes in kindergarten. A negative association was found between subsidy receipt and all three outcomes based on a sample of single mothers (Herbst & Tekin, 2010, 2011, 2012).

Although these studies suggest that there may be adverse effects of subsidies on child development, they also raise complex questions about the counterfactual condition for subsidy receipt. Within their comparison group of single mothers, a population that arguably approximates the target population for subsidies, the authors allowed non-working mothers whose children were in parental care alone, and children who may not have been eligible for subsidies because their family income exceeded the maximum allowance. Notably, this is not the only possible comparison group. The counterfactual population for subsidy recipients presumably encompasses two groups. One is composed of mothers who work, use non-parental care and are eligible for subsidies but do not use them. The second group consists of low-income mothers who do not work but would be induced to work by a subsidy. As of yet, however, it remains unknown which non-working mothers are induced by subsidies to enter the labor force and why. Therefore, we are unable to distinguish non-working mothers who would work if given a subsidy from those who would not (because, for example, they oppose non-parental care). Thus the present study selects only the first counterfactual group for its analytic sample. Although this strategy limits the generalizability of our results, it allows for the isolation of the effects of subsidy receipt from factors associated with self-selection into maternal employment and non-parental care. A comparison of these findings with those from past studies may shed light on the processes surrounding mothers' work and child care decisions.

The Present Study

By comparing children who received subsidies only to *eligible* non-recipients, and accounting for non-recipients who participate in other publicly funded care arrangements (Head Start and public pre-k), we build on prior research by isolating the effect of subsidies from the effect of non-maternal care and other types of low- and no-cost care. This study also attempts to create a more precise measure of subsidy receipt by validating parent report of subsidy receipt with provider data, when available, in the process separating out Head Start and public pre-k. Most data sets used to study subsidy use and child development lack the administrative data that are necessary to verify parents' reports of subsidy receipt. Further, parents are rarely asked directly whether they receive subsidies because they may not be fully aware of their care arrangement's funding streams. Researchers, limited by available data, typically create measures of likely subsidy use based solely on parents' reported child care arrangements and funding. For example, prior studies (Herbst & Tekin, 2010, 2011, 2012) have constructed measures of subsidy receipt from retrospective parent responses to questions about whether they used a paid source of child care and if so, whether they paid any out-of-pocket costs for that care. Parents who said that they did not pay for care were presumed to have received a subsidy. Parents were also asked whether they had received any assistance from a social service or welfare agency in paying for that care, and if they answered affirmatively, were considered to be subsidy recipients. Parents, however, may not be able to differentiate between sources of care subsidization or may not be able to recall the sources of child care assistance, which could lead to the misidentification of

subsidy recipients. In fact, research on misreporting of other public benefit programs in survey data sets suggests that benefit recipients tend to substantially underreport receipt (Klerman, Ringel, & Roth, 2005; Meyer, Mok, & Sullivan, 2009). In an attempt to more precisely identify subsidy recipients, the present study considers contemporaneous reports of subsidy receipt from child care providers as well as from parents, and distinguishes subsidies from the other two primary sources of publicly-funded care, Head Start and public pre-k. Last, previous studies did not test whether child care quality, center use, economic relief, or the home environment in part or in whole mediated associations between subsidy use and child outcomes. The present study exploits the availability of rich child care and family background data, including observational measures of child care quality collected during preschool for a subset of cases, in a nationally representative sample.

Method

Data Source

Data for this study were drawn from the ECLS-B, which gathered data from multiple sources, across multiple time-points, on a nationally representative cohort of children born in 2001. Approximately 14,000 birth certificates were sampled from 96 counties or clusters of counties, and approximately 10,700 children participated in the first wave of data collection in 2001, when they were 9 months old on average. Four subsequent waves of data collection followed: wave 2, in 2003, when children were approximately 2 years old; wave 3, in 2005–2006, when children were preschool-aged, and waves 4 and 5, in 2006–2007, when children were in kindergarten. (Because not all children entered kindergarten in the fall of 2006, wave 4 collected data on children who entered kindergarten for the first time in September of 2006 and wave 5 collected data on children who entered kindergarten for the first time in September, 2007.) The current study uses data from all waves. Weights were applied to account for sampling and survey non-response; once applied, these weights adjust the sample to be representative of all children born in the U.S. in 2001.

At each wave, the child's primary caregiver (>90% biological mother) was interviewed and the child's cognitive and social growth was assessed. At the preschool wave, child care providers completed phone interviews about their program and the children served. Also, direct observational assessments of the quality of children's care settings, in both centers and homes, were conducted with a subsample (by design) of children. Last, for children in center-based arrangements, center directors completed questionnaires about program characteristics, including funding source, program type and auspice, and enrollment of subsidized children. The provider interview, director questionnaire, and quality observation were all conducted with the child's primary care provider, defined as the care arrangement in which the child spent the greatest amount of time per week. At the kindergarten wave, kindergarten teachers completed questionnaires that included items about the child's social development.

Analytic Sample

Data from the parent interview and child care provider interview were used to identify families who were likely to be eligible for subsidies. In most states, subsidy recipients are required to demonstrate their eligibility regularly; eligibility determination is based on welfare receipt or income and employment information. Therefore, we assumed that children's subsidy eligibility status at the preschool wave reflected the welfare, income, and employment data reported in the parent interview that year. Using mothers' report of welfare receipt, household income, and work status, and state CCDF rules from 2005 (the year closest to the ECLS-B preschool wave; TRIM3, 2005), we simulated subsidy eligibility in

three steps. At the start, families who used no non-parental care in preschool were excluded. For other families, eligibility rules for their state, detailed below, were applied.

All states guaranteed child care subsidies in 2005 to families receiving or transitioning off welfare; thus, all parents using some form of non-parental care who reported receiving welfare in the last year were coded as subsidy eligible. Next, we compared families' reported annual incomes to their state's eligibility threshold for a family of their size; if the family's income was at or below the threshold, the family was deemed *income eligible*. Finally, families were classified as *employment eligible* if the mother was working, in school or job training, or looking for work. In 2005, 17 states had minimum weekly work hour requirements for households with two parents, so mothers who reported having a partner in the home were considered employment eligible if the mothers reported working and worked enough hours to meet their state's requirement. Families that were *both* income- and employment-eligible, and those who were eligible for welfare reasons, were considered subsidy eligible. In addition, families who were coded as subsidy recipients (see Measures for definition) were also considered eligible if they met certain conditions. First, they had to be low-income (i.e., they received at least one other means-tested public benefit such as food stamps, or had a household income below 185% of the poverty line). Second, families in home-based care had to have an arrangement that appeared to be subsidized, based on the provider's report of whether it was regulated, was affiliated with a family child care network, and accepted subsidies). This criterion was imposed for homes but not CBCs because it was possible that parents who received free care from relatives may have been mistakenly coded as home-based subsidy recipients. In all, there were approximately 2,500 families who were eligible for subsidies (per NCES security requirements, all *N*s are rounded to the nearest 50). Models specified with and without the families initially coded as subsidy ineligible ($n = 200$) did not produce substantively different results.

Our analytic sample is restricted to the subsidy eligible families who had a non-missing value on NCES base weight WK45T0. This weight applies to children whose parents participated in all interviews, and whose teacher participated in the kindergarten wave. Because kindergarten teacher participation was relatively low (approximately 50%) across the full ECLS-B sample, selecting cases with a valid value on WK45T0 reduced the sample by nearly half. However, replicate weights WK45T1-WK45T90 adjusted for non-participation so that results are applicable to the original sample. Missing data on covariates were imputed using the ICE procedure in Stata Version 11; five data sets were imputed using all variables included in the analytic models. The MIM program in Stata was used to combine estimates across imputed data sets. The final analytic sample included approximately 1,350 cases for models predicting reading and math outcomes, and approximately 1,400 cases for models predicting social-emotional outcomes. Regression models used only cases with an un-imputed value on the dependent variable, and *n*s are noted in tables accordingly.[0] Additionally, all regression models were run with the *subpop* command in Stata so that standard errors would account for cases excluded from our analytic sample because they were not subsidy-eligible.

Measures

Subsidy receipt—The measure of subsidy receipt was constructed from information collected during the preschool wave from parents, child care providers, and child care directors. Parents were asked the following question: "Do any of the following people or organizations help to pay for {primary care arrangement}?" There were four response options, including "a social service or welfare agency." The child care provider and director questions used to construct our measure of subsidy receipt are listed in Appendix S1. Following prior studies (Forry, 2009; Herbst, 2008), families who indicated that the child's

primary non-parental care arrangement occurred in a center were coded as receiving a subsidy if (1) the parent reported receiving assistance paying for child care and reported that the assistance came from a social service or welfare agency, and the child did not attend Head Start or public pre-k, according to provider report, or (2) the parent reported using center-based care, that the care was free, and the care was not Head Start or public pre-k, according to provider report. Parents who indicated that their child's primary non-parental care arrangement was home-based were coded as receiving a subsidy if (1) the parent reported receiving assistance paying for care and reported that the assistance came from a social service or welfare agency, or (2) the parent reported that there was no charge for the care *and* the provider reported that he or she was licensed or part of a family child care network, provided care in the provider's home, and cared for 4 or more unrelated children. Families not meeting these conditions were coded as not receiving a subsidy. Of the 2,500 families identified as likely subsidy eligible, 28% ($n \approx 700$) received a subsidy according to these decision rules. The national estimate for subsidy receipt among eligible families in 2005 was 29% (ASPE, 2008), lending confidence to both our measure of subsidy receipt and our identification of eligible families.

All children who were coded as *not* receiving subsidies were classified by their type of primary care into one of three mutually exclusive groups: Head Start, public pre-k, or an unsubsidized care arrangement. We drew on parent report and (when available) center director or child care provider report of program type for which Head Start and public pre-k were two possible response options. Children were considered to be in unsubsidized care if they did not receive any publicly-funded form of care (subsidies, Head Start, or public pre-k). They either paid out-of-pocket or used care outside the market (i.e., the provider does not charge or, for some other reason, the recipient does not pay).

Child care setting—Children were classified as being enrolled in CBC care if their primary care arrangement was a center-based setting that was not a Head Start or a public pre-k program, according to child care provider report. Children were classified as recipients of home-based care if their primary care arrangement was a home-based setting. This produced four mutually exclusive child care settings: Head Start, public pre-k, CBC, and home-based care. Children in both CBC care and home-based care comprised subsidy recipients and non-recipients. Non-recipients included approximately 150 cases missing provider report in which subsidy receipt could thus not be verified. Classifying these cases as non-recipients produces a conservative test of subsidy receipt, and analyses with and without these cases did not yield substantively different conclusions. In regression analyses, indicators for Head Start, public pre-k, and home-based care were used; CBC care was the omitted group.

School readiness—All school readiness outcomes were measured in the year the child first attended kindergarten.

Reading: Reading ability was assessed using a measure developed specifically for the ECLS-K and ECLS-B. It evaluated important pre-reading and reading concepts such as letter and letter-sound knowledge, print conventions, and expressive and receptive vocabulary skills. IRT scale scores, calculated by the ECLS-B, are used in the current study.

Math: Math ability was measured using an assessment developed specifically for the ECLS-K and the ECLS-B. It evaluated children's number sense, properties, operations, measurement, and geometry and spatial abilities. The current study uses IRT scale scores provided by the ECLS-B.

Social-emotional development: Using items drawn from the Preschool and Kindergarten Behavior Scales – Second Edition (PKBS-2; Merrell, 2003) and the Social Skills Rating Scale (SSRS; Gresham & Elliot, 1990), kindergarten teachers rated children's behavior on a 5-point scale (1 = *behavior never observed* to 5 = *behavior observed very often*). We created three measures of social-emotional development: externalizing behavior, which averaged 7 items rating how aggressive, impulsive, and disruptive the child was (α = .92); prosocial behavior, which averaged 6 items rating how friendly, empathic, and interested the child was in other children (α = .87); and approaches to learning, which averaged 6 items rating how attentive, focused, independent, and eager to learn the child was (α = .89).

Covariates—Covariates were selected based on their empirical or theoretical link to subsidy use and school readiness. Three categories of covariates were used in the current study: family background characteristics, earlier measures of child cognitive and behavioral skills, and child characteristics at assessment.

Family background characteristics: To ensure that family characteristics and subsidy receipt were not simultaneously determined, all family background variables were drawn from either the baseline (9-month) or 2-year wave. Covariates drawn from the 9-month wave, either because they were only collected then or because they are time-invariant, included maternal race (white, black, Hispanic, or Asian/other race), and whether the mother was a teen at the focal child's birth. We also included a dummy variable for maternal English proficiency. At the 9-month wave, mothers were asked how well they read, wrote, spoke, and understood English; responses were scored on a 4-point scale (1 = *not well at all* to 4 = *very well*). After summing responses across the 4 items, and assigning native-English speaking mothers who skipped these questions a 4 on each item, mothers who achieved a 12 or higher on the composite were deemed proficient in English.

We drew the remaining covariates from the 2-year wave: maternal education (less than high school, high school diploma/GED, some college, or BA or higher), maternal relationship status (whether mother was single), number of children in the home aged 6 and younger, number of children in the home aged 7 and older, whether the family lived in an urban area, maternal employment (worked full-time, worked part-time, was looking for work or in an education or training program, or was not in the labor force), whether the family experienced any food insecurity in the last year, whether the child received a child care subsidy (per parent report, validated with child care provider report, when possible), and whether the child was in non-parental child care. We also controlled for child sex (1 = *male*) and whether the child had a diagnosed disability.

Earlier skills: We included as controls measures of child cognitive and behavioral skills at the 2-year wave, before subsidy use at the preschool wave was measured. Cognitive skills were assessed using the Mental Development Index on the Bayley Short Form Research Edition (BSF-R), a shortened version of the Bayley Scales of Infant Development adapted for the ECLS-B. Child behavioral skills were measured using six assessor-rated items. These items were selected from the Behavior Rating Scale (NCES, 2007), which described children's interest and engagement in, and behavior during, the administration of the BSF-R. Items (1 = *never* to 5 = *always*) rated how interested, attentive, persistent, frustrated, social, and cooperative the child was (α = .89). Higher scores reflect more adaptive behavior.

Child characteristics at assessment: All analyses controlled for the child's age at assessment, in months, and for whether the child entered kindergarten in the fall of 2006 (as opposed to the fall of 2007). Because the ECLS-B collected kindergarten data in two waves, children who did not enter kindergarten in the fall of 2006 may have received an additional

year of preschool. Thus, not only were these children older when they were in kindergarten, but they may also have been exposed to more preparation in the year before school entry.

Mediators—All hypothesized mediators of the association between subsidy receipt and school readiness were drawn from the preschool wave.

<u>Use of center care:</u> The indicator denoting CBC care described above (see Child Care Setting) was used to test whether enrollment in center care mediated associations between subsidy receipt and child school readiness.

<u>Child care quality:</u> Child care quality was observed for a subsample of the ECLS-B cases by data collectors using the Early Childhood Environment Rating Scale – Revised Edition (ECERS-R; Harms, Clifford, & Cryer, 1998) for center-based settings and the Family Day Care Rating Scale (FDCRS; Harms & Clifford, 1989) for home-based settings. Internal reliability in the ECLS-B was excellent (α = .95 for the ECERS-R and α = .93 for the FDCRS). The ECERS-R and FDCRS collect parallel measures of factors understood to augment children's early learning and development. Items relate to nutrition, safety, cleanliness, furnishings, equipment, display, and activities and materials for play and learning in language, cognitive, and social domains. Each item is scored on a seven-point scale (1 = *inadequate* to 7 = *excellent*). The score used here is the average across all items.

<u>Cognitive stimulation at home:</u> Parents reported how often they read books, told stories, and sang songs with the focal child (1 = *not at all* to 4 = *every day*). Parents were also asked how many children's books were in the home. Families were assigned values from 1 to 4 based on quartiles. Finally, parents were asked whether they had a home computer that the child could use; those who replied affirmatively were assigned a 4, and others were assigned a 1. Responses to these five questions were summed to create an index of cognitive stimulation in the home.

<u>Food insecurity:</u> An indicator of whether the family experienced food insecurity in the last year was created using 10 parent-reported items about the availability and sufficiency of food in the household (e.g., experiencing hunger, having to forego meals, running low on or out of food).

<u>Amount parent paid for care:</u> Parents reported the amount they paid for each of their child's care arrangements, and whether that amount covered just the focal child. The amount was scaled up or down (depending on the unit of report, e.g., hourly, daily) to yield a monthly figure, which was then divided by the number of children that amount covered. The amount paid for the primary care arrangement was selected here.

Results

Subsidy Recipients versus Eligible Non-Recipients

Table 1 presents mean differences on all study measures between families who received subsidies at the preschool wave and those who were eligible but did not receive them. Compared to eligible non-recipients, subsidy recipients were more likely to be white, less likely to have dropped out of high school, more likely to have completed some college and to have a college degree or higher, and more likely to be proficient in English. Subsidy recipients were also less likely to have been teenaged at the child's birth, more likely to work full-time, and more likely to have received a subsidy at child age 2. Approximately 70% of subsidy recipients were in CBC care, while 30% were in home-based care. Of eligible non-recipients, approximately 37% were in Head Start, 17% were in public pre-k,

17% were in CBC care, and 30% were in home-based care. On average, subsidy recipients received lower quality child care than eligible non-recipients. The two groups did not differ on children's cognitive and adaptive behavior scores at age 2, or on school readiness outcomes at kindergarten.

OLS Regression Models

To examine whether subsidy receipt at preschool age was associated with school readiness in kindergarten, we estimated separate OLS regression models predicting each indicator of kindergarten school readiness: reading, math, externalizing behavior, prosocial behavior, and approaches to learning. Each model included all covariates as well as an earlier measure of cognition or behavior (as appropriate) to reduce selection bias due to unmeasured child and family characteristics associated with subsidy receipt and school readiness.

To ease interpretability, all continuous predictors, covariates, mediators, and outcomes were standardized to have a mean of 0 and a standard deviation of 1. Two models were run for each school readiness outcome. Model 1 simply examined whether subsidy receipt was associated with the outcome. The coefficient for subsidy receipt compared all subsidy recipients to all non-recipients, without accounting for the fact that some non-recipients are in Head Start or public pre-K, or that subsidies might affect children in CBCs and home-based care differently. Therefore, Model 2 accounted for child care setting by adding dummies for Head Start and public pre-k, and a dummy for home-based (versus CBC) care. Model 2 also added an interaction term that multiplied subsidy receipt by home-based care. This term tested whether the association between subsidy receipt and school readiness differed for children in home-based versus CBC care. Given this interaction term, the subsidy receipt variable in Model 2 denoted the use of a subsidy in a CBC. The omitted group was unsubsidized children in a CBC. Thus, the coefficient on subsidy receipt in Model 2 compared subsidy recipients to non-recipients only within CBC care. The coefficients for Head Start and public pre-k compared children in those arrangements to unsubsidized children in CBC care. The coefficient on home-based care compared unsubsidized children in home-based care to unsubsidized children in CBC care. Post-estimation Wald tests were conducted to test other contrasts between subsidized and unsubsidized care settings (e.g., subsidy use in a CBC versus Head Start and public pre-k).

Results showed that there were no main effects of subsidy use on the academic indicators of school readiness (Table 2, Model 1). For reading, this pattern persisted once care setting was specified in Model 2. For math, Model 2 revealed a negative association with subsidy receipt among children in CBC care (B = −0.20, SE = .10, p < .05). The non-significance of the interaction term indicated that subsidy receipt did not have differential effects for children in home-based versus CBC care. However, a post-estimation Wald test comparing subsidy recipients in home-based care to non-recipients in home-based care showed no statistically significant difference in math scores. Further, the interaction term in the math model was similar in size but opposite in sign to the coefficient for subsidy receipt. This suggests that the negative association between subsidies in CBCs and math was not found for subsidies in homes.

Notably, among non-recipients, those in home-based care scored lower on math (B = −0.20, SE = −.09, p < .05; Model 2) than children in CBCs. Results from post-estimation Wald tests indicated that subsidy recipients in CBCs scored significantly higher than children in Head Start on reading. However, subsidy recipients did not differ from Head Start participants on math; nor did they differ from public pre-k participants on either math or reading.

With respect to the indicators of social-emotional development (Table 3), there were no main effects of subsidy receipt on externalizing problems, prosocial behavior, or approaches to learning (Model 1). There were also no significant effects when care setting was accounted for in Model 2. The interaction between subsidy receipt and home-based care was non-significant for all three outcomes. Thus, the null effect of subsidy receipt on social-emotional school readiness was the same for children in home-based and CBC care. The significance of the home-based care coefficient in the model of prosocial behavior indicated that unsubsidized children in home-based care scored approximately one-quarter of a standard deviation higher than unsubsidized children in CBCs (B = 0.26, SE = .12, $p < .05$; Model 2). Results from post-estimation Wald tests showed that subsidy recipients in home-based and CBC care did not differ significantly on the indicators of social-emotional school readiness from children in Head Start and public pre-k.

Supplementary Analyses

We conducted two sets of supplementary analyses. Although subsidy receipt did not predict any of the indicators of school readiness in a multivariate context, we were interested in whether our null findings were driven by the absence of associations between subsidy use and our potential mediators, between the mediators and school readiness, or both. Yet another possibility was that two or more mediators operating in opposite directions canceled each other out (McKinnon, Fairchild, & Fritz, 2007). Therefore, in supplementary analyses, we ran OLS regression models to test whether subsidy receipt predicted each potential mediator (use of CBC care, child care quality, cognitive stimulation at home, food insecurity, and amount paid for care). Models included indicators of Head Start, pre-k, and CBC care, as well as controls for all family background characteristics. No distinction was made between subsidy use in a home-based setting versus CBC given that they had not been differentially associated with school readiness indicators. Models testing whether subsidies predicted use of CBC care (and, subsequently, whether CBC care predicted school readiness), did not include children in Head Start and public pre-k because their arrangements perfectly predicted the non-use of CBC care. Results (see Appendix S2) revealed that subsidy use was associated with over 4 times the odds of using CBC care (OR = 4.10, SE = 0.90, $p < .001$). Subsidy receipt was not associated with child care quality, cognitive stimulation in the home, household food insecurity, or amount paid for care, although negative associations between subsidy use and cognitive stimulation (B = −0.18, SE = 0.09, $p < .10$) and between subsidy use and amount paid for care (B = −0.20, SE = 0.11, $p < .10$) just missed the conventional cutoff for statistical significance. (While amount paid for care had been bivariately positively associated with subsidy receipt in Table 1, the association became negative once the reference group changed in multivariate analyses.)

We then tested whether each of the five potential mediators was itself predictive of school readiness. Attendance at a CBC was associated with reductions in prosocial behavior (B = −0.19, SE = 0.09, $p < .05$) and approaches to learning (B = −0.18, SE = 0.08, $p < .05$). Cognitive stimulation in the home was associated with more favorable scores on all five outcomes. The amount parents paid for care was associated with higher reading (B = 0.08, SE = 0.04, $p < .05$) and math (B = 0.09, SE = 0.04, $p < .05$) scores. Child care quality and food insecurity were not associated with any school readiness outcome.

Although most school readiness outcomes had not been directly predicted by subsidy receipt, we conducted formal Sobel-Goodman tests of mediation to examine whether subsidies were *indirectly* linked to these outcomes by any of our potential mediators. These tests did not reveal significant indirect effects of subsidies on any school readiness outcome through any of the five potential mediators.

In a second set of supplementary analyses, we considered the possibility that variation in state characteristics – such as the availability of child care, criteria for subsidy eligibility, or subsidy administration policies – may bias the association between subsidy receipt and child outcomes. Using fixed effects, we re-ran all models including dummy variables for each state. The pattern of significant results was not altered (results available upon request).

Discussion

This paper is the first to evaluate the association between child care subsidy use and school readiness in a sample restricted to subsidy-eligible families in the U.S. It is also the first to combine child care provider report of child care type with parent report of child care payments, which allowed for the identification of Head Start and public pre-k recipients as distinct from subsidy recipients, a key step in evaluating the unique contribution of subsidies to child outcomes. Using the nationally representative ECLS-B data set, we find that subsidy receipt when children are preschool-aged is not associated with reading or social-emotional indicators of school readiness in kindergarten, after accounting for children's family background and earlier abilities. There is some evidence to suggest that subsidy use may be associated with lower math scores among children attending CBCs. It is not immediately apparent why subsidies would have negative associations with math among children in CBCs only, although in light of the non-significant interaction between subsidies and home-based care, we cannot reject the possibility that these associations also obtain among children in home-based care. It is possible that given the absence of a main effect of subsidies on math, the relatively large p-level of the subsidy receipt coefficient, and the absence of similar findings for reading, that this association was found due to chance.

If there is a negative association between subsidies in CBCs and math scores, the most likely explanation lies with the two potential mediators that predicted math – cognitive stimulation at home and amount paid for care. Both of these were positively associated with math, and were also negatively associated with subsidy receipt, albeit with marginal significance. Perhaps the centers that are willing to accept the lower out-of-pocket payments associated with subsidy receipt are of lower quality than other centers, which may explain the lower math scores of the children who attend them. It is evident why subsidies should be linked to a lower amount parents pay for care, but it is not so clear why they should be associated with lower cognitive stimulation at home. To recall, the measure of stimulation combines the presence of learning materials and parent-child time spent on stimulating activities. It is unclear which of these facets should be negatively associated with subsidy receipt per se and not maternal employment more generally, given that all mothers in the sample met work requirements for subsidy eligibility. There may be features of the types of jobs subsidy recipients obtain, or of the available care arrangements, that influence home routines. For example, if child care providers that accept subsidies are sparsely distributed, recipients might spend more time than non-recipients in travel to and from child care. Even then, it remains unclear why subsidy receipt is associated with lower math scores but not reading scores, given that cognitive stimulation and amount paid for care are also positively associated with reading.

It is also notable that subsidy recipients scored lower on math than non-recipients in CBC care, but the same as children in Head Start and public pre-k. This finding suggests that there may be something about the CBCs attended by low-income subsidy non-recipients that promote math scores. It is possible that the parents of such children are particularly resourceful or well-connected, and are able to obtain particular high-quality care for their children and, or instead, promote math learning in the home.

We had hypothesized that subsidies might improve school readiness by freeing up income that could be redirected to the home environment. This study suggests that subsidies may not be generous enough to substantively increase household income. Subsidy receipt was not associated with food insecurity and it was only marginally associated with a very small reduction in the amount paid for care. Thus there is only tentative evidence that subsidies free up money that would otherwise be spent on child care, and very little money at that. Further, subsidies were not positively associated with maternal cognitive stimulation, which has been found to improve with increased family income (Dearing & Taylor, 2005). It may be that families use the money freed up by subsidies to meet basic survival needs, such as food. Past research also suggests that the amount of money freed up by a subsidy may not be enough to significantly change a family's finances (Adams & Rohacek, 2002; Schulman & Blank, 2008). Finally, spells of subsidy receipt are short. Many families who receive subsidies use them for 3–7 months at a time (Meyers et al., 2002). This may not be enough time for parents to recoup income that would have been spent on child care and redirect it towards purchasing items that might enhance child development.

We had also hypothesized that subsidies might boost the quality of child care parents could afford to buy or allow them to purchase center care instead of home-based care, which should be associated with higher quality care (Dowsett et al., 2008; Fuller et al., 2004). However, our results indicated that subsidies were not associated with higher quality of child care. This finding was surprising in light of an earlier study that linked subsidy use to increased child care quality in the ECLS-B, at least among subsidy recipients and children in unsubsidized care (Johnson et al., 2012). One explanation for the discrepant findings may be differences in the studies' samples; for example, the comparison group in our supplementary analyses included children in Head Start and public pre-k, whereas the comparison group in Johnson et al. (2012) did not. Our present results are consistent with a recent study finding weak or no associations between child care quality and child outcomes in the ECLS-B, which recommends a reassessment of the value of the ECERS-R as a measure of quality as it relates to child development (Gordon, Fujimoto, Kaestner, Korenman, & Abner, 2012).

As predicted, subsidies were associated with greater use of CBCs. CBC care predicted higher math scores and decreased prosocial behavior, consistent with past research (Belsky et al., 2007; Gormley et al., 2005; Loeb et al., 2007). Nevertheless, neither the direct nor indirect pathways from subsidies to school readiness outcomes achieved statistical significance (with the exception of math in CBCs). The most likely explanation is that there are one or more unmeasured factors suppressing these associations (MacKinnon et al., 2007). One potential candidate is the duration of subsidized care arrangements. As mentioned earlier, spells of subsidy receipt are generally short (Meyers et al., 2002), and it is likely that a loss of subsidy eligibility necessitates a change in child care arrangement. Therefore, subsidy recipients attending CBCs may not attend long enough for the effects of center attendance – whether positive or negative – to take hold.

Future research is needed to assess these possibilities. It should also be acknowledged that our conceptualization of center use as a mediator of subsidy receipt may be flawed insofar as it assumes the independence of decisions surrounding subsidy use and type of arrangement. Further research should investigate the process by which mothers make choices about child care arrangements and subsidies, and determine whether those decisions are made jointly or sequentially.

As previously mentioned, three prior studies of nationally representative samples in the U.S. found that subsidy use was associated with poorer child cognitive, behavioral, and health outcomes at school entry (Herbst & Tekin, 2010, 2011, 2012). We offer two explanations for the divergence in findings. First, our measure of subsidy use differed from theirs in that

it relied on provider as well as on parent report. Second, the current study sample was limited to subsidy-eligible families. Thus, the comparison group for subsidy recipients was mothers who met income and work requirements but did not take up a subsidy. Prior studies have compared subsidy recipients to a more heterogeneous population of non-recipients, including children who experienced no non-parental care because their mothers did not work outside the home and children whose family income may have exceeded program eligibility. One consequence of this is that the non-recipients in their samples were less disadvantaged than ours (e.g., 18% of non-recipients in Herbst and Tekin (2010) were high school dropouts versus 26% in our sample), which might have contributed to the emergence of negative findings in those studies but not ours.

It appears that once the sample is restricted to already-working mothers whose children are in some form of non-parental care, the effects of subsidies are largely null. This suggests that if there are ill effects of subsidies, they may be driven by families in which the subsidy increased the likelihood of maternal employment activities and non-parental care use. Such a phenomenon may seem counter-intuitive in light of research showing that among low-income families, participation in center-based care versus parental care in the year before school entry is generally associated with better outcomes (Gormley, 2008; Gormley, Phillips, & Gayer, 2008; Magnuson, Ruhm, & Waldfogel, 2007; Zhai et al., 2010). However, this study's results indicate that the rewards of center attendance may be muted for subsidy recipients. In addition, some subsidies are used for informal, unregulated home-based rather than center care, and it is unknown whether the informal care subsidy recipients typically receive is higher or lower in quality than their parental care. If it is lower in quality, then subsidies may be associated with lower-quality care to the extent that they induce mothers who would not otherwise work outside the home to use home-based care. Subsidies may also be associated with lower-quality care if low-income mothers who refuse subsidies do so because they are committed to providing parental care and the care they provide is atypically high in quality. Further research is needed to test these possibilities.

Given that the small body of literature on subsidies and child development has produced mixed findings, future studies must continue to examine this association with different data sources and comparison groups for subsidy recipients. Future research should also consider additional mediators such as the type and extent of maternal employment, maternal mental health, stability of child care arrangement, and subsidy mechanism (contract with provider versus portable voucher). Also, studies measuring family expenditures pre- and post-subsidy would be particularly informative.

Limitations

This study's findings must be considered in the context of its limitations. First, it is possible that error in measuring subsidy receipt limited this study's ability to find an association with school readiness. The strategy used to identify subsidy recipients in the current study attempts to carefully separate subsidies from other types of publicly-funded care. It may be more precise than prior studies using survey data (Herbst & Tekin, 2010, 2011, 2012) because it incorporates information from child care providers and is concurrent rather than retrospective (Herbst & Tekin, 2010, 2011, 2012). Nevertheless, families may have been misclassified as subsidy recipients if they reported receiving free care but their care was actually funded through a local YMCA or other community-based organization. Likewise, some parents whose child's care was subsidized directly through a contract with a provider and who paid a co-payment may have believed that they paid the full cost of care. If they reported not getting assistance with their child care expenses, they would have been coded in error as non-recipients. Such misclassification would have attenuated associations between subsidies and child outcomes. There may also be some children who in fact crossed multiple child care categories (e.g., they attended Head Start in the morning and received subsidized

home-based care in the afternoon). However, using our method of validation by provider report, we could not identify children whose secondary care arrangement was subsidized, because only the provider of the primary arrangement was contacted. Additionally, parents were only asked whether they received help paying for care from a social service or welfare agency with regard to their child's primary care arrangement. Last, we were unable to determine how long subsidy recipients had used subsidies in what we considered their primary arrangement.

A broader analytic challenge is the identification of the ideal counterfactual for subsidy recipients. By restricting our comparison group to non-recipients who met the subsidy program's income and work requirements, we isolated the effects of subsidies from those of non-parental care and maternal employment. While eligible non-recipients are an appropriate and relevant comparison group for subsidy recipients from a policy perspective, they are not the only possible counterfactual. The subsidy program is thought to allow some low-income non-working mothers to enter the work force (Blau & Tekin, 2007). Thus another counterfactual for subsidy recipients are those children of low-income non-working mothers who would enter the work force and place their children in non-parental care were they to receive a subsidy. Our approach relies on the assumption that a subgroup of this population – specifically, children whose mothers do not take up subsidies because they oppose employment or non-parental care – are not potential users of the subsidy program, and as such, are not an appropriate counterfactual for subsidy recipients. In other words, these children do not approximate the subsidy recipients had they not received the subsidy. These children are also likely to diverge from other non-recipients. For example, they may score higher on characteristics that improve school readiness (e.g., a stimulating home environment or strong educational values). As a result, the inclusion of this subgroup of non-recipients in the comparison group may bias estimated associations between subsidies and child outcomes in a negative direction. However, the alternative approach, including all low-income children regardless of non-parental care use or maternal employment status, taken by prior studies (Herbst & Tekin, 2010, 2011, 2012), has the advantage of including in the comparison group the children of non-working mothers who would work in the presence of a subsidy. Together, the two approaches may provide upper- and lower bound-estimates of the association between subsidy use and school readiness.

Conclusion and Future Directions

Although these findings are too preliminary to generate policy recommendations, they are of interest from a policy perspective given that the subsidy program costs more than $6 billion annually and serves nearly 2 million children per month (US DHHS 2008a, 2008b). Our findings also point to areas ripe for future research. Research on associations between subsidy receipt and child outcomes is still in the early stages, and the inconsistency of findings across the small number of studies that *have* addressed this question to date suggests that more work is needed on this topic. Specifically, previous studies have found negative associations between subsidies and later child outcomes (Herbst & Tekin, 2010, 2011, 2012) while the current study found a negative association for only one of five outcomes, which held only when the comparison group was non-recipients in CBC care.

It is clear from these mixed findings that additional research is needed to understand the pathways through which subsidies may or may not influence child outcomes. In particular, more work is needed on processes that influence mothers' selection into subsidies and care type, and whether these decisions are made simultaneously or in sequence. Future research should also test additional pathways such as maternal employment, child care stability, and investment in goods and services that promote child development.

In closing, it is important to remember that the primary aim of the child care subsidy program is not to enhance child development, but to promote parental employment. Thus, if the current study's largely null results are replicated, then in light of the literature consistently linking subsidies to improved parental work outcomes – the subsidy program's primary goal – the subsidy program may be interpreted as a success. Nevertheless, given that findings from this and other studies on this subject are mixed, more work is needed to understand whether subsidy receipt *does* have the potential to impact school readiness, and if so, how.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

References

Adams G, Rohacek M. More than a work support? Issues around integrating child development goals into the child care subsidy system. Early Childhood Research Quarterly. 2002; 17:418–440.

Adams, G.; Snyder, K.; Sandfort, J. Getting and retaining child care assistance: How policy and practice influence parents' experiences. Washington, DC: The Urban Institute; 2002. (Assessing the New Federalism Occasional Paper 55)

Assistant Secretary for Planning and Evaluation [ASPE], U.S. Department of Health and Human Services. Child care eligibility and enrollment estimates for fiscal year 2005. 2008 Jul. Retrieved from http://aspe.hhs.gov/hsp/08/cc-eligibility/ib.pdf

Blau D, Tekin E. The determinants and consequences of child care subsidies for single mothers in the USA. Journal of Population Economics. 2007; 20:719–741.

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

Burchinal, M.; Kainz, K.; Cai, Y. How well do our measures of quality predict child outcomes? A meta-analysis and coordinated analysis of data from large-scale studies of early childhood settings. In: Zaslow, M.; Martinez-Beck, I.; Tout, K.; Halle, T., editors. Quality measurement in early childhood settings. Baltimore, MD: Brookes Publishing; 2011. p. 11-32.

Burchinal MR, Roberts JE, Riggins R Jr, Zeisel SA, Neebe E, Bryant D. Relating quality of center-based child care to early cognitive and language development longitudinally. Child Development. 2000; 71:339–357. [PubMed: 10834469]

Burchinal MR, Vandergrift N, Pianta R, Mashburn AJ. Threshold analysis of association between child care quality and child outcomes for low-income children in prekindergarten programs. Early Childhood Research Quarterly. 2010; 25:166–176.

Dearing E, Taylor BA. Home improvements: Within-family associations between income and the quality of children's home environments. Journal of Applied Developmental Psychology. 2007; 28:427–444.

Dowsett CJ, Huston AC, Imes AE, Gennetian L. Structural and process features in three types of child care for children from high and low income families. Early Childhood Research Quarterly. 2008; 23:69–93. [PubMed: 19609366]

Forry ND. The impact of child care subsidies on low-income single parents: An examination of child care expenditures and family finances. Journal of Family and Economic Issues. 2009; 30:43–54.

Fuller B, Kagan SL, Loeb S, Chang Y. Child care quality: Centers and home settings that serve poor families. Early Childhood Research Quarterly. 2004; 19:505–527.

Gennetian LA, Crosby DA, Huston AC, Lowe ED. Can child care assistance in welfare and employment programs support the employment of low-income families? Journal of Policy Analysis and Management. 2004; 23:723–743.

Gershoff ET, Aber JL, Raver CC, Lennon MC. Income is not enough: incorporating material hardship into models of income associations with parenting and child development. Child Development. 2007; 78:70–95. [PubMed: 17328694]

Gresham, FM.; Elliot, SN. The Social Skills Rating System. Circle Pines, MN: American Guidance Systems; 1990.

Gordon RA, Fujimoto K, Kaestner R, Korenman S, Abner K. An assessment of the validity of the ECERS-R with Implications for measures of child care quality and relations to child development. Developmental Psychology. 2012 Apr 2. Advance online publication.

Gormley W Jr. The effects of Oklahoma's pre-K program on Hispanic children. Social Science Quarterly. 2008; 89:916–936.

Gormley W Jr, Phillips DA, Gayer T. Preschool programs can boost school readiness. Science. 2008 Jun 27.320:1723–1724. [PubMed: 18583597]

Haveman, R.; Wolfe, B. Succeeding generations: On the effects of investments in children. New York: Russell Sage Foundation; 1994.

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

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

Herbst CM, Tekin E. The geographic accessibility of child care subsidies and evidence on the impact of subsidy receipt on childhood obesity. Journal of Urban Economics. 2012; 71:37–52.

Herbst CM, Tekin E. Child care subsidies and childhood obesity. Review of Economics of the Household. 2011; 9:349–378.

Herbst CM, Tekin E. Child care subsidies and child development. Economics of Education Review. 2010; 29:618–638.

Herbst C. Who are the eligible non-recipients of child care subsidies? Children and Youth Services Review. 2008; 30:1037–1054.

Hill LJ, Waldfogel J, Brooks-Gunn J. Differential effects of high quality child care. Journal of Policy Analysis and Management. 2002; 21:601–627.

Howes C, Burchinal M, Pianta R, Bryant D, Early D, Clifford R, Barbarin O. Ready to learn? Children's pre-academic achievement in pre-Kindergarten programs. Early Childhood Research Quarterly. 2008; 23:27–50.

Johnson AD, Ryan RM, Brooks-Gunn J. Child care subsidies: Do they impact the quality of care children experience? Child Development. 2012 Available online.

Klerman, JA.; Ringel, JS.; Roth, B. Under-reporting of Medicaid and Welfare in the Current Population Survey. Santa Monica, CA: RAND; 2005. (Working Paper #169-3)

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

MacKinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. Annual Review of Psychology. 2007; 58:593–614.

Magnuson KA, Waldfogel J. Early childhood care and education: Effects on ethnic and racial gaps in school readiness. The Future of Children. 2005; 15:169–196. [PubMed: 16130546]

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

Mashburn AJ, Pianta RC, Hamre BK, Downer JT, Barbarin O, Bryant D, Howes C. Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. Child Development. 2008; 79:732–749. [PubMed: 18489424]

McCartney K, Dearing E, Taylor BA, Bub KL. Quality child care supports the achievement of low-income children: Direct and indirect pathways through caregiving and the home environment. Journal of Applied Developmental Psychology. 2007; 28:411–426. [PubMed: 19578561]

McLeod JD, Shanahan MJ. Poverty, parenting, and children's mental health. American Sociological Review. 1993; 58:351–366.

Merrell, KW. Preschool and Kindergarten Behavior Scales - Second Edition. Austin, TX: PRO-ED; 2003.

Meyer, BD.; Mok, WKC.; Sullivan, JX. The underreporting of transfers in household surveys: Comparisons to administrative aggregates. Cambridge, MA: National Bureau of Economic Research; 2009. (Working paper)

Meyers, MK.; Peck, LR.; Davis, EE.; Collins, A.; Kreader, JL.; Georges, A.; Olson, JA. The dynamics of child care subsidy use: A collaborative study of five states. New York, NY: National Center for Children in Poverty; 2002.

Morrissey TW. Familial factors associated with the use of multiple child care arrangements. Journal of Marriage and Family. 2008; 70:549–563.

National Institute of Child Health and Human Development Early Child Care Research Network & Duncan, G. Modeling the impacts of child care quality on children's preschool cognitive development. Child Development. 2003; 74:1454–1475. [PubMed: 14552408]

National Institute for Early Education Research. The state of preschool 2008: State preschool yearbook. New Brunswick, NJ: The State University of New Jersey Press; 2008. Retrieved from http://nieer.org/yearbook2008/

Ryan RM, Johnson AD, Rigby E, Brooks-Gunn J. The impact of child care subsidy use on child care quality. Early Childhood Research Quarterly. 2011; 26:320–331. [PubMed: 21874092]

Schulman, K.; Blank, H. State child care assistance policies 2008: Too little progress for children and families. Washington, DC: National Women's Law Center; 2008.

U.S. Department of Health and Human Services, Administration for Children and Families, Child Care Bureau. Child care and development fund: Report of state plans FY2004–2005. 2005. Retrieved from http://trim3.urban.org

U.S. Department of Health and Human Services, Administration for Children and Families. Child Care and Development Fund (CCDF) Data Tables, FFY2008. 2008a. Retrieved from http://www.acf.hhs.gov/programs/ccb/data/ccdf_data/08acf800_preliminary/table1.htm

U.S. Department of Health and Human Services, Administration for Children and Families. Head Start Program Fact Sheet. 2008b. Retrieved from http://www.acf.hhs.gov/programs/ohs/about/fy2008.html

U.S. Department of Health and Human Services, Administration for Children and Families. Child Care and Development Fund (CCDF) fiscal year 2008 state spending from all appropriation years. 2008c. Retrieved from http://www.acf.hhs.gov/programs/ccb/data/expenditures/08acf696/overview.htm

Zhai F, Brooks-Gunn J, Waldfogel J. Head Start and urban children's school readiness: A birth cohort study in 18 cities. Developmental Psychology. 2010; 47:134–152. [PubMed: 21244155]

Table 1

Description of Study Variables

	Total M(SD)/%	Subsidy recipients M(SD)/%	Eligible non-recipients M(SD)/%
N	1,400	400	1,000
Covariates (drawn from 9-month or 2-year wave)			
Maternal race			
White	39.0	45.4 *	36.7
Black	25.7	25.3	25.8
Hispanic	28.9	24.1	30.6
Asian/other	6.5	5.2	6.9
Maternal education			
< HS education	24.2	17.9 *	26.4
HS diploma / GED	43.8	40.1	45.2
Some college	27.5	34.1 *	25.1
BA or higher	4.5	7.9 *	3.3
Mother is single	35.6	40.4	33.9
Mother is proficient in English	86.2	91.1 *	84.3
Mother < age 20 at focal child's birth	20.0	15.2 *	21.7
Number of children in HH, age 6	0.7 (0.8)	0.6 (0.7)	0.7 (0.8)
Number of children in HH, age 7	0.6 (0.9)	0.5 (0.8)	0.6 (1.0)
Family lives in an urban area	68.8	70.8	68.1
Maternal employment			
Mother works full-time	37.6	44.2 *	35.2
Mother works part-time	17.2	18.9	16.6
Mother is in school/job training/looking for work	19.8	16.9	20.8
Mother not in labor force	25.4	20.0	27.4
Child has a diagnosed disability	11.2	13.5	10.3
Child is male	53.8	53.7	53.9
Child received non-parental care at age 2	53.7	60.3	51.3
Child received a subsidy at age 2	18.1	24.7 **	15.7
Potential mediators (drawn from preschool wave)			
Family experienced food insecurity	25.9	21.5	27.5
Child care setting			
Head Start	26.8	0.0	36.6
Public pre-k	12.5	0.0	17.1
Community-based center	31.0	70.3	16.7
Home-based care	29.7	29.8	29.6
Child care quality	4.2 (1.2)	3.8 *(1.2)	4.3 (1.2)
Family experienced food insecurity	41.2	37.4	42.6
Cognitive stimulation in the home	12.7 (3.2)	12.8 (3.0)	12.6 (3.3)

	Total M(SD)/%	Subsidy recipients M(SD)/%	Eligible non-recipients M(SD)/%
Months in care with current provider	12.2 (13.9)	15.1 (14.6)	11.0 (13.4)
$ amount parent pays for care	99 (185)	124 (233)	91 (165)
Child's earlier skills (drawn from 2-year wave)			
Cognition	125.0 (10.3)	125.0 (10.5)	125.0 (10.2)
Adaptive behavior	3.4 (0.8)	3.3 (0.8)	3.4 (0.9)
School readiness indicators (drawn from kindergarten wave)			
Reading	39.5 (13.5)	40.9 (14.4)	39.0 (13.1)
Math	40.3 (9.6)	40.5 (9.7)	40.3 (9.6)
Teacher-reported externalizing behavior	2.1 (0.9)	2.2 (0.9)	2.1 (0.9)
Teacher-reported prosocial behavior	3.7 (0.7)	3.8 (0.7)	3.7 (0.7)
Teacher-reported approaches to learning	3.6 (0.8)	3.6 (0.8)	3.6 (0.8)

Note. Data from ECLS-B 9-month-Kindergarten Restricted Use Data File. All *N*s rounded to nearest 50 per NCES requirements. Standard errors are jackknife standard errors. All estimates are weighted by replicate weights WK45T1-WK45T90.

[**]
p < .01,

[*]
p < .05.

Table 2

Associations Between Subsidy Receipt and Academic School Readiness in Kindergarten

	Reading				Math			
	Model 1		Model 2		Model 1		Model 2	
	B	SE	B	SE	B	SE	B	SE
Subsidy receipt	0.05	0.07	−0.01	0.13	−0.05	0.06	−0.20	0.10 *
Head Start			−0.21	0.11			−0.19	0.10
Public Pre-k			−0.04	0.14			−0.22	0.13
Home-based care			−0.19	0.12			−0.20	0.09 *
Subsidy receipt*home-based care			−0.05	0.19			0.18	0.18
Post-hoc comparisons								
Subsidy in CBC - Head Start			*				ns	
Subsidy in CBC - Public Pre-k			ns				ns	
Subsidy in CBC - Subsidy in home-based care			ns				ns	
Subsidy in CBC - No subsidy in home-based care			ns				ns	
Subsidy in home-based care - Head Start			ns				ns	
Subsidy in home-based care - Public Pre-k			ns				ns	
Subsidy in home-based care - No subsidy in home-based care			ns				ns	
N	1,350		1,350		1,350		1,350	

Note: Data are from ECLS-B 9-month-Kindergarten Restricted Use Data File; standard errors are jackknife standard errors.

All estimates are weighted by replicate weights WK45T1-WK45T90; CBC = community-based center; *ns* = not significant.

All models controlled for the following covariates, drawn from the baseline (9-month) or 2-year waves: maternal race, maternal education, maternal marital status, maternal employment, maternal English proficiency, maternal age at focal child's birth, # of children in home age 6, # of children in home age 7, urbanicity, household food insecurity, child disability status, child sex, child age, wave child first entered kindergarten, prior receipt of non-parental care, prior subsidy receipt, and an earlier measure of the appropriate outcome.

The omitted group in Model 1 is children who did not receive subsidies; the omitted group in Model 2 is unsubsidized children in CBC care.

***
p<.001,

**
p<.01,

*
p<.05.

Table 3

Associations Between Subsidy Receipt and Social-Emotional School Readiness in Kindergarten

	Externalizing behavior problems				Prosocial behavior				Approaches to learning			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Subsidy receipt	−0.01	0.07	−0.08	0.12	0.12	0.08	0.18	0.14	−0.01	0.08	−0.03	0.13
Head Start			−0.04	0.10			0.12	0.12			0.05	0.12
Public Pre-k			−0.06	0.12			0.09	0.16			−0.04	0.15
Home-based care			−0.22	0.12			0.26	0.12 *			0.12	0.12
Subsidy receipt*home-based care			0.14	0.20			−0.03	0.19			0.08	0.20
Post-hoc comparisons												
Subsidy in CBC - Head Start			ns				ns				ns	
Subsidy in CBC - Public Pre-k			ns				ns				ns	
Subsidy in CBC - Subsidy in home-based care			ns				ns				ns	
Subsidy in CBC - No subsidy in home-based care			ns				ns				ns	
Subsidy in home-based care - Head Start			ns				ns				ns	
Subsidy in home-based care - Public Pre-k			ns				ns				ns	
Subsidy in home-based care - No subsidy in home-based care			ns				ns				ns	
N	1,400		1,400		1,400		1,400		1,400		1,400	

Note: Data are from ECLS-B 9-month-Kindergarten Restricted Use Data File; standard errors are jackknife standard errors.

All estimates are weighted by replicate weights WK45T1-WK45T90; CBC = community-based center; ns = not significant.

All models controlled for the following covariates, drawn from the baseline (9-month) or 2-year waves: maternal race, maternal education, maternal marital status, maternal employment, maternal English proficiency, maternal age at focal child's birth, # of children in home age 6, # of children in home age 7, urbanicity, household food insecurity, child disability status, child sex, child age, wave child first entered kindergarten, prior receipt of non-parental care, prior subsidy receipt, and an earlier measure of the appropriate outcome.

The omitted group in Model 1 is children who did not receive subsidies; the omitted group in Model 2 is unsubsidized children in CBC care.

***
  p<.001,

**
  p<.01,

*
  p<.05.