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Is Subsidized Childcare Associated with Lower Risk of Grade Retention for Low-Income Children? Evidence from Child Care and Development Fund Administrative Records Linked to the American Community Survey

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ABSTRACT

This study investigates whether low-income young children's experience of Child Care and Development Fund (CCDF)-subsidized childcare is associated with a lower subsequent likelihood of being held back in grades K-12. High-quality childcare has been shown to improve low-income children's school readiness. However, no previous study has examined the link specifically between subsidized care and grade retention. I do so here by matching information on children from CCDF administrative records to later observations of the same children in the American Community Survey (ACS). I use logistic regression to compare the likelihood of grade retention between CCDF-recipient children and non-recipient children who also appear in the ACS in the years 2008-2014 (N=2,284,857). I find strong evidence for an association between CCDF-subsidized care and lower risk of grade retention, especially among non-Hispanic Black children and Hispanic children. I also find evidence that receiving CCDF-subsidized center-based care in particular is associated with a lower risk of being held back than CCDF-subsidized family daycare, babysitter care, or relative care, again with the largest apparent benefit to non-Hispanic Black children and Hispanic children.

INTRODUCTION

Subsidies paid by the federal Child Care and Development Fund (CCDF) comprise the largest source of means-tested childcare assistance for low-income families in the U.S. (Chaudry 2006). CCDF subsidies reach approximately 1.4 million children per month nationwide (Administration for Children and Families 2015), with average payment amounts that exceed the typical monthly value of payments from both the Temporary Assistance for Needy Families (TANF) program and the Supplemental Nutrition Assistance Program (SNAP) (Ha and Meyer 2010). Although designed to support the employment of low-income mothers, the CCDF subsidy also represents a major determinant of the type and quality of care that low-income children receive. With an emphasis on parental choice in selecting childcare providers, the CCDF subsidy can help to cover the cost of care delivered in center or family day care settings, as well as by babysitters and relatives.

Childcare settings influence children's cognitive and social development (Bradley et al. 2001), and for low-income children, quality care can critically offset the negative effects of material deprivation (McCartney et al. 2007). Center-based care in particular has been shown to boost school readiness and improve early grade outcomes for low-income children (Bradley et al. 2001; McCartney et al. 2007), improving their chances of long-term school success. However, because of data limitations, little research to date has been able to examine the relationship between children's early care settings and their subsequent school outcomes, specifically among children receiving subsidized care. Existing research has used survey data to examine the relationship between subsidized care and measures of children's behavior and pre-academic skills upon entering kindergarten. This evidence shows a negative association with behavior and

math scores, but mixed results on reading scores (Herbst and Tekin 2010; Hawkinson et al. 2013; Johnson, Martin and Brooks-Gunn. 2013). However, no studies to date have examined the relationship of either childcare subsidy receipt or type of subsidized childcare setting to children's school outcomes beyond kindergarten and first grade (Magnuson et al. 2004; Herbst and Tekin 2010; Johnson et al. 2013). Nor have any studies combined national-level CCDF administrative records with survey data to investigate this question.

The present study investigates whether children who received CCDF-subsidized childcare prior to entering kindergarten will be less likely to experience grade retention in primary and secondary school, as compared to children with similar household characteristics who did not receive CCDF-subsidized care.¹ It also investigates the extent to which particular types of subsidized care are associated with differing likelihood of grade retention. Previous research has shown that grade-retention, or being “held back” in school, not only signals a student's academic failure, but also is associated with increased long-term risk of behavioral problems and school dropout, and decreased likelihood of entering or completing college (Jimerson, Anderson and Whipple 2002; Moller et al. 2006). Low-income children have an elevated risk of grade retention (Davouzedeh, McTernan, and Grimm 2015).

In this study, I use information on the childcare experiences of individual children in CCDF administrative records, and link these records to information on the same children in the American Community Survey (ACS) in subsequent years.² I compare CCDF-recipient children to non-recipient children who also appear in the ACS. I find evidence that receiving CCDF-subsidized care is associated with a lower risk of grade retention for low-income children, with

¹ Other factors that also affect the likelihood of grade retention cannot be observed in this study. These include children's cognitive abilities, parent engagement, and teacher bias, among others.

² Information on the American Community Survey can be found at <https://www.census.gov/programs-surveys/acs/>

the largest apparent benefit to non-Hispanic Black children. I also find that children who received primarily CCDF-subsidized center-based care have a lower likelihood of grade retention than those who received primarily CCDF-subsidized family day care, babysitter care, or relative care, again with the largest apparent benefit to non-Hispanic Black children and Hispanic children.

LOW-INCOME CHILDREN AND FAMILIES

Low-income families—which are disproportionately headed by single mothers—face many economic and practical challenges (McLanahan and Sandefur 1994). Low-income mothers on average have lower educational attainment (Ellwood and Jencks 2004), less social support from friends and family (Henly, Danziger and Offer 2005), and less material support from their children’s fathers (Edin and Nelson 2013) than their higher-income peers. Low-income mothers are more likely to experience depression, substance abuse, chronic health problems (Urban and Olson 2005), and poor relationship quality with romantic partners (Evans 2004). Low-income families have limited money to spend on enriching goods such as books or musical instruments, or on experiences such as trips to museums or theater (Bradley et al. 2001). Low-income parents may also speak less to their children and expose them to fewer new words (Bradley et al. 2001; Magnuson et al. 2004). Low-income families often live in chaotic and unsafe neighborhoods with low social trust, and form fewer ties to other children and adults than their higher-income peers (Evans 2004).

All of these factors lead low-income children to lag in cognitive measures and school outcomes (Bradley et al. 2001). At school entry, low-income children score lower than higher-

income children on knowledge of words, letters, math concepts and numbers, and in attention skills. They also exhibit more internalizing problem behaviors (such as anxiety and low self-esteem) and externalizing problem behaviors (such as impulsivity and fighting) (Duncan et al. 2007). Low-income children's cognitive and behavioral disadvantages stem in part from the higher levels of deprivation and stress, and lower levels of cognitive stimulation they experience in the home.

COGNITIVE AND SOCIAL EFFECTS OF CHILDCARE FOR LOW-INCOME YOUNG CHILDREN

High-quality childcare received in early childhood contributes to children's cognitive and social development, and promotes their readiness for school (Peisner-Feinberg et al. 2001). Interacting with adults and other children in childcare settings enables children to develop receptive and expressive language ability (McCartney et al. 2007), and offers opportunities for play and exploration (NICHD Network and Duncan 2003). Childcare gives children experience interacting with non-relative adults (Peisner-Feinberg et al. 2001), taking turns (NICHD Network 1997), working with other children, following directions, and developing impulse control (Duncan et al. 2007). It also can build children's math and language abilities by teaching them letters, numbers and shapes (Duncan et al. 2007; McCartney et al. 2007). When well-developed, these academic and behavioral school-readiness skills enable children to learn effectively once they enter elementary school. Children with better school readiness skills are also more likely to be placed in higher ability groups, making them more likely to succeed academically (Duncan et al. 2007).

Although high quality childcare benefits all children, it is particularly beneficial to low-income children, both because it helps to offset the potential negative effects of impoverished home environments (Bradley et al. 2001; Duncan et al. 1998; McCartney et al. 2007), and because it may help low-income parents to learn developmentally advantageous parenting practices (Sanders, Deihl and Kyler 2007; Votruba-Drzal, Coley and Chase-Landale 2004). Even care of middling quality has been shown to be beneficial to low-income children's development (Peisner-Feinberg 2001).

Among the different types of childcare options, center-based care offers the greatest cognitive and social advantage to low-income children (Loeb et al. 2004). Center care is provided in a non-home setting, with relatively larger numbers of children, and with licensed care providers (Federal Register 1998). Center care is particularly likely to feature organized activities dedicated to children's cognitive development and school readiness. The cognitive and social benefits of center care are greater than those from care given by a babysitter or relative, or from family daycare (Loeb et al. 2004; Loeb et al. 2007), which involves multiple unrelated children, but occurs in the home of a provider, who may or may not be licensed. Low-income children who spend time in center care have higher reading and math scores than low-income children cared for by babysitters (Loeb et al. 2007). Even controlling for maternal characteristics, children who spend time in center care have better-developed language skills than children in family day care settings (Loeb et al. 2004). Children who spent time in center care are also less likely to be held back in the first grade (Magnuson et al. 2004).

Selection into Childcare Settings

Center-based child care providers typically charge the highest fees, followed by family daycare providers and relatives or babysitters (Chaudry 2006). Children in center care have the most stable care arrangements on average. Children in center care tend to be older, whereas younger children and infants are more likely to be cared for by relatives or babysitters (Huston 2002). Children with siblings are also more likely to receive care from relatives and babysitters, whereas only children are more likely to receive care in center and family daycare settings (Tout et al. 2001; Huston 2002). Choice of children's care setting is differentiated by race/ethnicity and nativity status, as well as by mothers' educational, work, and other characteristics. White, Black, and U.S.-born children are more likely to spend time in center care than are immigrant children, and children of other race/ethnic groups (Brandon 2004; Ehrle, Adams and Tout 2001; Fram and Kim 2008). White and Black children are also more likely to move to center care from other kinds of care when family income increases (Radey and Brewster 2007). Black parents are more likely than parents of other race/ethnic groups to express a preference for placing their children in academically-focused care, which in turn is most often found in centers (Shlay 2010). By contrast, Hispanic and Asian children are less likely to spend time in center care (Hirshberg, Huang and Fuller 2005). Hispanic children are more likely to spend time in relative care or family day care (Ehrle et al. 2001; Fram and Kim 2008), and less likely to move to center care when family funds increase (Radey and Brewster 2007). Asian children are also more likely to receive relative care than center care (Fram and Kim 2008).

Mothers who place their children in non-relative care express less anxiety about being away from their children, and more belief in the value of non-parental care (NICHD 1997). Mothers with higher educational attainment are more likely to place their children in center care

(Ehrle et al. 2001), as are mothers who work longer hours, and more regular shifts (Han 2004; Morrissey 2008). Mothers who work non-standard and irregular hours are more likely to place children in relative care (Henly and Lyons 2000; Henly, Shaefer and Waxman 2006). Many low-income mothers view center-based care as developmentally and socially beneficial to children, and more reliable than relative or babysitter care (Chaudry 2006). However, center care is often more difficult for low-income parents to access than other kinds of care. Thus, low-income mothers who successfully place their children in center care may be those who are particularly attuned to the developmental benefits of center care (Zaslow, Oldham and Magenheim 1998), or particularly persistent in seeking out center care arrangements (Chaudry 2006).

CHILD CARE AND DEVELOPMENT FUND (CCDF) SUBSIDY AND RECIPIENT SELECTIVITY

The need for reliable childcare presents a major barrier to employment among low-income mothers. The Child Care and Development Fund was established through the U.S. Department of Health and Human Services in 1996 as a component of larger welfare reforms that shifted the focus of U.S. welfare policy toward promoting employment among low-income single mothers (Gornick and Meyer 2003; Haveman et al. 2015). CCDF monies are allocated to states through block grants, and disbursed to recipients at the state level, with some variation in eligibility and reporting requirements (Minton, Durham and Giannarelli 2014). The vast majority of CCDF funds are administered to support the work, training, and education of low-income mothers (Administration for Children and Families 2015).

Relative to the overall population of low-income mothers, those who receive the CCDF subsidy are positively selected on human capital characteristics. Although eligibility requirements vary by state, in order to be eligible for the CCDF subsidy, a family's income can be no more than 85% of the median in the state where the family lives (Chaudry 2006), placing many eligible families in, or close to, poverty. However, subsidy recipients are more likely to be employed than eligible non-recipients (Grobe, Weber and Davis 2008), which by extension may raise their household income relative to unemployed eligible mothers. On average, CCDF recipients have greater English language ability, more years of education, and higher educational attainment than eligible non-recipients (Hawkinson et al. 2013; Johnson et al. 2013), as well as more-stable housing arrangements and more-stable employment (Grobe et al. 2008). The effort involved not only in seeking the subsidy, but also in proving initial and ongoing eligibility is typically substantial and often frustrating (Adams, Snyder and Sandfort 2002). Women who are able to persist in these efforts may have a greater ability to plan and manage their personal and household resources than those who do not seek out and retain the subsidy (Urban and Olson 2005). All of these characteristics may help to create home environments for the children of CCDF recipients that—compared to the households of low-income children who do not receive the subsidy—are relatively more stable and more cognitively stimulating.

DEVELOPMENTAL EFFECTS OF SUBSIDIZED CARE

Evidence to date is mixed on whether *subsidized* care in particular has cognitive and social effects for children, and whether these differ significantly from effects of unsubsidized

care. Low-income children whose families receive childcare subsidies are more likely to receive non-parental care than children from low-income families that do not receive the subsidy (Magnuson et al. 2004). Children whose families receive a subsidy are also more likely to be in center care (Johnson et al. 2013), and the care they receive is generally of a high quality because the subsidy enables parents to afford more-expensive care (NICHD 1997; Johnson and Ryan 2015). Children receiving subsidized care may also have more stable childcare arrangements than low-income children whose families do not receive the subsidy (Chaudry 2006). These features of subsidized care would seem to suggest that children receiving subsidized care would reap developmental benefits. However, using the Early Childhood Longitudinal Study-Birth cohort (ECLS-B) Hawkinson et al. (2013) show that children in subsidized care have lower math scores prior to kindergarten relative to eligible non-recipients. Using the Early Childhood Longitudinal Study-Kindergarten cohort (ECLS-K), Herbst and Tekin (2010) show that children who receive subsidized care have lower reading scores, and more behavioral problems when entering kindergarten as compared with non-recipient children in single-mother families. Johnson et al. (2013) use the ECLS-B to show lower math scores for children in subsidized center care, but no difference on verbal and behavioral outcomes versus modeled-eligible non-recipient children. The inconsistencies between these results may in part reflect the difficulty of disentangling the effects of subsidy receipt, or subsidized care, from low household income in early childhood. These studies likely also suffer from some amount of bias due to the documented underreporting of public assistance receipt in sample surveys (Bollinger and David 2001). In addition, survey responses on the amount and primary type of care children receive are highly sensitive to question wording, and likely miss much non-maternal care given to children whose mothers are not employed (Raley, Harris and Rindfuss 2000). Taken together, these

factors may result in inaccurate assessments in survey data of which children receive CCDF-subsidized care.

GRADE RETENTION

No previous studies have investigated whether subsidized childcare is associated with greater or lesser likelihood of being held back in school. In addition, no studies have investigated whether children's particular type of subsidized care setting is associated with greater or lesser likelihood of being held back. Grade retention indicates that a child's school performance has been judged poor enough that he or she must repeat a grade. Although it does not necessarily reflect a child's innate abilities, grade retention is a marker of a child's pronounced academic and/or behavioral difficulties. Children who are held back on average score lower on math and reading skills and on behavioral and emotional health indicators than children who are not retained (Jimerson et al. 1997). However, because there are no common standards for when a child should be retained, grade retention decisions may also be subject to teacher or administrator bias about children's intelligence, motivation or behavior (Saft and Pianta 2001), and parent involvement (Ozek 2015).

Grade retention is also a forecast of potential further difficulties to come. Although most grade retention occurs by the third grade (Davouzedeh et al. 2015), experiencing grade retention overall appears to have negative effects for children's academic careers that can manifest as late as high school and beyond. Children who experience grade retention have lower self-esteem and lower perceptions of their own academic competence compared to children who continue on-grade (Pierson and Connell 1992). Their parents express lower estimation of their academic

capabilities relative to the parents of non-retained children (Hughes, Kwok and Im 2013).

Children who experience grade retention are more likely to be tracked into remedial classes, thus limiting the possibility that they will enter postsecondary education (Moller et al. 2006). They are also more likely to experience behavioral problems following grade retention (Ozek 2015). Being held back a grade is associated with an increased probability that a child will drop out of school (Andrews 2014; Jimerson et al. 2002), and a decreased probability that he or she will enter or complete college (Andrews 2014).

Children from economically disadvantaged groups have a high risk of grade retention. Children living in poverty, and those whose mothers have low educational attainment are particularly likely to be held back in school (Davouzedeh et al. 2015). Race/ethnic minorities also have a particularly high risk of grade retention. Black and Hispanic children (Stearns et al. 2007) are more likely to be held back in school. Also more likely to be held back are English language learners, and boys.

EMPIRICAL PREDICTIONS

Below I investigate whether CCDF-subsidized childcare—and in particular, center-based care—is associated with a reduced risk of grade retention for low-income children. Low-income children have a high risk of grade retention due in part to the cognitive disadvantages they may experience growing up in homes and communities with few material resources (Evans 2004), and the accompanying stress of this deprivation (Bradley et al. 2001; Eamon and Wu 2011). I expect that all children who are observed with low incomes in later childhood/adolescence will be more likely to be held back in school than those who do not have low incomes when they are

observed in later childhood/adolescence. Because the CCDF subsidy is available only to families with incomes no more than 85% of the state median, children who received CCDF-subsidized care in early childhood are likely subject to some of the deleterious cognitive, social and health effects of having had a low household income. As such, I expect that children who received the CCDF subsidy will be more likely to experience grade retention, relative to children who did not receive the subsidy.

Research to date has shown that high quality childcare improves children's school readiness by developing their verbal and math skills, and by teaching behaviors that help them to succeed in school settings (Davouzedeh et al. 2015). Relative to other low-income mothers, those who seek out the CCDF subsidy are positively selected on their educational attainment, language ability, and other human capital characteristics (Hawkinson et al. 2013; Johnson et al. 2013; Urban and Olson 2005). Children who receive subsidized care on average also spend time in higher-quality care than low-income children whose families do not receive a subsidy (NICHD 1997; Johnson and Ryan 2015). Thus, I expect that among low-income children with otherwise similar observable characteristics, children who received the CCDF subsidy will be less likely to be held back in school than children who did not receive the CCDF subsidy.

Evidence suggests that center-based childcare in particular gives the greatest benefits to children's cognitive and social development versus relative care or babysitter care, and that this is especially true for low-income children. Low-income children who experience center care have better language development (Loeb et al. 2004), higher reading and math scores (Loeb et al. 2007), and are less likely to be held back in the first grade (Magnuson et al. 2004). I therefore expect that among otherwise-similar children who received the CCDF subsidy, receiving

primarily CCDF-subsidized center care will be associated with a lower risk of grade retention than receiving primarily CCDF-subsidized family day care, babysitter care, or relative care.

Black and Hispanic children have a higher risk of grade retention overall than White children (Stearns et al. 2007). Among low-income children in particular, Black and Hispanic children are less likely than White children to attend schools with available resources to offset the possible deleterious cognitive and social effects of growing up in low-income families. Whereas low-income White children commonly live in mixed-income, predominantly White neighborhoods, low-income Black and Hispanic children are more likely to live in segregated neighborhoods with highly-concentrated poverty (Lichter, Parisi and Taquino 2015; Reardon, Fox and Townsend 2015), and to attend under-funded schools (Frankenberg 2013). Relative to their peers who receive no CCDF subsidy, low-income Black and Hispanic children who learn school-readiness skills and habits in CCDF-subsidized childcare (Duncan et al. 2007), may be better able to thrive independently in schools with few resources available to help them. Therefore, I expect that among otherwise-similar children who received the CCDF subsidy, Black and Hispanic children who receive CCDF-subsidized care will be especially less likely to experience grade retention.

DATA AND METHODS

I use administrative records from the CCDF for the fiscal years 2004-2011, in conjunction with 2008-2014 from the American Community Survey (ACS). The ACS is an annual sample survey with information on the demographic, social, economic and housing

characteristics of the U.S. household population.³ I use ACS years 2008-2014 because the ACS includes a variable denoting a child's school enrollment in single-grade increments—which is necessary to construct the grade retention variable—beginning only in 2008. The CCDF file contains monthly information on children born in the years 1997-2011 whose families received the CCDF subsidy between October 2003 and September 2011, including the type of each child's care setting in a given month. The CCDF file contains information on all participating families in 37 states and 9 territories, and a monthly sample of families from 13 states.

To construct my sample of children receiving CCDF-subsidized care, I limit the CCDF file to children with birth years listed as 1997-2007, from families in the United States, who received the subsidy because of the recipient adult's employment and/or schooling. I exclude children from U.S. territories, and children for whom no information on childcare setting is available. I also exclude children from states that submitted samples of their total program file to the CCDF,⁴ because these states' monthly re-sample format does not allow me to observe recipient children continuously during the period when they received the subsidy. Continuous observation is necessary to construct my independent variable measuring primary type of care.

Because previous research has shown the most important cognitive effects for children of care received in the pre-school years (NICHD Network 2000), I observe only childcare that took place before children began their school careers. I limit the CCDF file to children whose receipt of the subsidy covered the time when they were aged six and under, although some children were still receiving subsidized care above this age. Six is the oldest age at which U.S. children are

³ More information on sample design and sampling error can be found at <http://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html>.

⁴ These are the states of Alaska, California, Connecticut, Florida, Indiana, Iowa, Massachusetts, Minnesota, New York, North Carolina, Pennsylvania, Virginia and Washington.

commonly enrolled in kindergarten (U.S. Census Bureau 2016). Among 6-year-olds observed in the file, 47% were in kindergarten (results not shown). Among CCDF children who were in kindergarten when observed in the file approximately 18% were still receiving CCDF-subsidized care (results not shown).

I include in my ACS file records from 37 U.S. states, and the District of Columbia (DC), which submitted full files to the CCDF.⁵ Table 1 shows how I construct the file by matching birth cohorts of children and years of data between the CCDF file and the ACS. Because I wish to observe only children who are in kindergarten and above in the ACS, I limit children in each year of the ACS file to members of the same birth cohorts observed in the CCDF file who turned 7 or older in the year they were observed in the ACS. For example, children born in 2002 can be observed in the CCDF file at ages 6 and under in years 2003 to 2009. I link this birth cohort of children to the ACS beginning in 2009—the year they turn 7—and observe them in the ACS from 2009 to 2014. Younger and older cohorts cannot be observed as fully in the CCDF and ACS files as cohorts of children born in the middle years of the ACS file. Because the question about single-grade enrollment is asked in the ACS beginning only in 2008, I am unable to observe older cohorts of children in the years between when I stop observing them in the CCDF file and 2008. For example, I observe children born in 1997 at ages 6 and under in the CCDF file in 2003 and 2004, when they turn 7. However, I am unable to measure their grade level in the ACS until 2008, when they turn 11. Conversely, for children born in 2007, I can only observe two years in the CCDF, but can link this cohort to the ACS and observe their grade level in 2014, the year they turn 7.

⁵ As a robustness check, I conducted the same analysis I present below using a file in which I include ACS records from respondents in all 50 states plus DC. This analysis yielded comparable results to those I present below. Results are available upon request.

[TABLE 1 ABOUT HERE]

I link the CCDF file to the ACS using a unique, anonymized protected identifier that is probabilistically assigned to adults in the CCDF file, and to individuals of all ages in the ACS. This identifier is assigned based on a combination of individuals' social security number, and other personally identifiable information (PII) such as name, address and date of birth, as available. PII is removed from each data set before researchers can link the data sets together and use them for research purposes. See Wagner and Layne (2014) for more information on this process. Among CCDF parents in the relevant sample, 100% received this unique identifier. Approximately 90% of ACS respondents received the identifier. Because approximately 10% of ACS respondents cannot be tested for matches to the CCDF file, some unknown amount of bias is introduced into my matches and estimates. The largest magnitude of differences in the probability of receiving a unique identifier by individual characteristics are those by age and race/ethnicity. Children and younger adults, and members of race/ethnic minority groups, are less likely to be assigned a unique identifier than Whites and older adults (Bond et al. 2014). To account for this bias, I weight my estimates for ACS respondents by modeling the probability of receiving the identifier based on observed age and race/ethnicity.

I link the CCDF file to one-year files of the ACS based on the unique identifier assigned to the parents of the CCDF children. Following the cohort matching technique described above, 7.8% of CCDF parents match to the ACS. Once I have linked a CCDF adult to his or her record in the ACS, I exclude adults. I match information on children from the CCDF file to ACS information on children in the same household as the linked adult. I begin from each child's sex,

and month and year of birth, as stated in the CCDF file, and match his or her CCDF record to the ACS record of a child in the same household of the same sex, and with the same birth month plus or minus 8 months. This matching procedure leaves room for some error in how the child's birth month is recorded in both the CCDF and ACS files. At the same time, because siblings are typically at least nine months apart in age, it minimizes the chance that I will mistakenly match a CCDF record to the ACS record of another child in the household. Because I allow a total of sixteen months of error around CCDF children's birth dates, a small number of matched children have birth dates that appear in the ACS as having occurred in 1996 or 2008. A limitation of this matching technique is that it likely creates some false matches.⁶ Based on this matching technique, 2.7% of CCDF children match to the ACS.

Table 2 compares the race, sex and birth years for those with non-missing information on these variables between all CCDF children from the file of full-universe states, all children with a unique protected identifier from the same states in the ACS, children from the CCDF file who matched to the ACS file, children from the CCDF file who did not match to the ACS, and ACS children who do not appear in file of CCDF full-universe state records. The composition of children in the CCDF file who did not match to the ACS was more highly minority overall than than children from the CCDF file who matched to the ACS, although the children who matched to the ACS included more children in the non-Hispanic other race/ethnic group. This discrepancy is likely due in part to documented undercounts of race/ethnic minorities (Raley 2002) and minority and low-income children (O'Hare 2015) in sample surveys. The composition of the CCDF children who matched to the ACS was in turn more highly minority than children who

⁶ As a robustness check, I conducted the same analysis I present below using 1.) a file in which CCDF children were matched on sex and exact month and year of birth, and 2.) a file in which CCDF children were matched on sex and month and year of birth plus or minus 3 months. These analyses yielded comparable patterns of results to those I report below. Results are available upon request.

appear in the ACS only, although the latter group included more non-Hispanic Asian children. Due to my method of probabilistic matching on birth date as described above, children who appear in the CCDF file and matched to the ACS, on average had earlier birth years than CCDF children who did not match to the ACS, and ACS children who do not appear in the CCDF file had somewhat earlier birth years on average relative to both other groups. Relative to CCDF children who did not match, CCDF children who matched to the ACS were more likely to have their main care type be family daycare (25.2% versus 20.2%) or relative care (15.1% versus 12.7%) and less likely to have their main care type be center care (58.1% versus 65.6%). There were also statistically significant sex differences between children in the ACS who do and do not appear in the CCDF file, but these differences were only of a very small magnitude.

[TABLE 2 ABOUT HERE]

After linking children from the CCDF file to each year of the ACS, I exclude CCDF children who do not appear in the ACS. This leaves single-year files composed of ACS child respondents only, including both CCDF-recipient children and non-CCDF-recipient children from the same birth cohorts. I pool single year files for 2008-2014, for a total record count of 2,504,973. After I drop cases with missing data on the key variables, the total sample size is 2,284,857.

I first use descriptive statistics to compare the characteristics of children who have and have not received the CCDF subsidy, as well as the percentage of recipients and non-recipients who have experienced grade retention. Among CCDF-recipient children, I compare characteristics and percentage experiencing grade retention by the main type of childcare they

received. I next use logistic regression to estimate the likelihood that a child will experience grade retention. I weight all my estimates with ACS replicate weights that have been adjusted for the number of years in the pooled file, and for ACS respondents' inverse probability of receiving the anonymous unique identifier I use for record linkage. As discussed above, probability of receiving a unique identifier is generated using a probit model that controls for individuals' age and race/ethnicity. All adults who appeared in the relevant universe in the CCDF file were assigned the unique identifier, so adjusting for their probability of receiving it in the CCDF file is not necessary.

My focal independent variables are 1.) whether or not a child received CCDF-subsidized care, and 2.) whether he or she received primarily CCDF-subsidized center care, family day care, babysitter care or relative care, versus no CCDF-subsidized care. To construct the first measure, I designate all children in the ACS who are also present in the non-sample CCDF file as having received the subsidy. I designate ACS children who are not present in the non-sample CCDF file as having not received the subsidy. To construct the second measure, I identify the type of care in which a child spent the largest total number of hours in the period/s when he or she was observed in the CCDF file. When the number of hours for two or more types of care are equal, I choose the care type in which the child spent the most total months. The categories of this second measure are center care, family day care, babysitter care, or relative care (Federal Register 1998). See Appendix Table 1 for a breakdown of the types and combinations of care in which children were observed. Overall, center care—both alone, and in combination with other types of care—was the most common type of care that CCDF children received.

A limitation of these two measures of CCDF subsidy receipt, and of main CCDF care type, is that they observe children only while they are receiving the CCDF subsidy, and capture

only CCDF-subsidized care. They do not capture any unsubsidized care, care that may have been subsidized only with state funds, Head Start, or state-funded pre-kindergarten, and thus may give only a partial picture of children's experience of child care at ages 6 and under. These measures are also likely to be more accurate for children who were younger in earlier years of the CCDF file, because a larger portion of these children's care history can be observed in the file. An additional limitation is that the file from which the measure is drawn artificially right- and left-censors children's spells of care based on the start and end of the fiscal year. In an attempt to offset this limitation, I exclude all observed spells of only one month that appear in the first and last months in the file (i.e. one-month spells that occurred in October 2003 and September 2011) (Davis, Grobe and Weber 2012). Because administration of CCDF funds varies somewhat from state to state, there may also be unmeasured differences in the families' experience of receiving the CCDF subsidy that are not reflected in the variable (Minton et al. 2014). A final limitation is that because the data in the file were collected for the purposes of program administration and not social science research, the data may contain some amount of unmeasured error, which is currently unknown, and for which I cannot account in my analysis. Future research might constructively consider the scope of possible error within data files that are constructed, as mine is, by linking administrative records to survey data.

My outcome variable is a binary measure of grade retention. I construct this variable based on the ACS variables measuring children's age and the grade they were enrolled in at the time of interview. I code children who are older than the two modal ages for their grade as having experienced grade retention (Bianchi 1984; U.S. Census Bureau 2016). A limitation of this measure is that children may be observed in the ACS some years after they actually experienced grade retention. Hence, the measure can only show that retention has occurred, but

cannot give an indication of when it occurred. It may also miss children who have been held back but are still within the modal two ages for their grade.

Other independent variables include sex and race/ethnicity. I measure whether the child is a girl or a boy. My race/ethnicity measure includes the following categories: 1.) non-Hispanic White alone, 2.) non-Hispanic Black alone, 3.) non-Hispanic Asian alone, 4.) non-Hispanic other race, including American Indian/Alaska Native (AIAN), Native Hawaiian/Pacific Islander (NHPI) individuals, those who list more than race, and those who choose the Some Other Race (SOR) category, and 5.) Hispanic, of any race. For brevity, at times I refer below to the non-Hispanic groups by their racial designation only.

To control for the family “resource dilution” that can hinder cognitive and social development of children with siblings (Joesch, Maher and Durfee 2006) and may affect their school performance, I measure whether a child is an only child. To measure whether a child had a low household income when he or she was observed in the ACS, I create a binary variable denoting whether the child’s family income or household income was 85% or less of the median in the state and year they were observed, versus above this threshold (DeNavas-Walt and Proctor 2015; Noss 2010; 2012; 2013; 2014). For brevity, I refer to this measure below as “household income.” I choose the threshold of 85% of the state median to be analogous to the maximum allowable income for CCDF-eligible families (Chaudry 2006). Because the practice of grade retention varies by region (Warren, Hoffman and Andrew 2014), I include a measure of whether the child lives in the Northeast, Midwest, South, or West at the time they are observed in the ACS. To control for potential changes over time in the practice of grade retention, I include a measure of the year in which the child was observed in the ACS.

A limitation of these income and region measures is that, as captured in the cross-sectional ACS, they may not be representative of the child's experience prior to the time of interview. Children who do not have low household incomes when they are observed in the ACS may have had low incomes earlier in their childhoods, whereas children who *are* observed with low incomes in the ACS may be experiencing only temporary economic difficulties. For children who received the CCDF subsidy, income can effectively be measured twice—once by inference through their earlier CCDF reciprocity, and once in the ACS. For children who did not receive the CCDF subsidy, however, income can be observed only once, in the ACS. That fact that non-recipient children's early childhood economic experiences are unknown constitutes a limitation of my study.

To take into account children's living situation, I measure whether or not the child lives in a doubled-up household when they are observed in the ACS. I am unable to include a more specific measure of the child's family status—such as the presence or absence of a child's father or another paternal figure in the household—due to the fact that the ACS measures family relationships only in reference to the household head. Roughly 10% of CCDF children in the file overall (and 20-30% when children are observed at younger ages) are listed with a relationship to the household head that is either “other relative,” “other non-relative” or “roommate,” and with their linked parent's relationship to the household head similarly listed and therefore offering no further information on family relationships within the household (results not shown). To exclude these children because of their lack of family information would bias the sample toward children in single-family living situations, who, by extension, are likely to have higher SES. To capture human capital among adults in the child's household, I include the highest educational attainment among household adults. I do not include a measure of the child's parents'

educational attainment, again, because for a sizeable portion of children I am unable to identify the child's mother and/or father.

I introduce six models in my logistic regression analysis. Model 1 contains the focal independent variable of whether or not a child received the CCDF subsidy, along with controls for his or her sex, race/ethnicity, only child status, doubled-up status, age observed in the ACS, observed age-squared, observed year, and region of the U.S. Model 2 includes the same variables as Model 1, but introduces the variable indicating whether the child's household income was at or below 85% of the state median at the time when he or she was observed in the ACS, as well as the variable indicating the highest educational attainment in the household. Model 3 adds interactions between receiving CCDF-subsidized care and having a household income at or below 85% of the state median, and between receiving CCDF-subsidized care and race/ethnicity. In Models 4, 5, and 6, I replicate the steps above, but substitute the focal independent variable measuring the main type of subsidized care received for the binary measure of receiving or not receiving CCDF-subsidized care.

RESULTS

Tables 3 and 4 show descriptive estimates drawn from the file of ACS respondent children aged 6 to 17. Table 3 presents measures of children's sex, race, age, household and geographic characteristics, broken down by whether or not they ever received CCDF-subsidized care. I designate a child as a CCDF recipient if he or she was observed both in the ACS file and in the CCDF file. Table 4 presents estimates of these same characteristics among CCDF recipients only, broken down by the main type of CCDF-subsidized care children received.

Table 3 shows that between the years of 2008 and 2014, 5.5% of children had previously received CCDF-subsidized care. Among children who received CCDF-subsidized care, the largest percentage received care primarily in a center-based setting (60.7%), followed by primarily family daycare (22.9%), primarily relative care (14.6%) and primarily babysitter care (1.7%). Among all children observed in the 37 states plus DC, 4.4% had experienced grade retention by the time when they were observed in the ACS. Among children who received the CCDF subsidy, 4.6% had been held back in school, as compared with 4.4% of children who did not receive the subsidy. Children from race/ethnic minority groups were overall more highly represented among those who received CCDF-subsidized care than those who did not. Relative to children who did not receive CCDF-subsidized care, CCDF children included lower percentages who were non-Hispanic White (36.1% versus 57.7%), non-Hispanic Asian (0.6% versus 3.2%), and Hispanic of any race (14.1% versus 20.8%). However, CCDF recipients included higher percentages of non-Hispanic Black children (41.1% versus 13.5%), and non-Hispanic AIAN, NHPI, multiracial and some other race children (8.2% versus 4.8%). A higher percentage of CCDF children lived in doubled-up households (10.4% versus 9.8%). A higher percentage of CCDF children had a household income at or below 85% of the state median at the time they were observed in the ACS (71.2% versus 37.7%). Highest adult educational attainment in the households of children who received the CCDF subsidy included higher percentages with some college (52.4% versus 35.4%), a high school diploma (26.0% versus 18.9%) and less than high school (8.5% versus 7.7%), and lower percentages with a Bachelor's degree or more (13.1% versus 37.9%). CCDF children differed from non-CCDF children on sex and only child status by smaller magnitudes. Among children who received the CCDF subsidy 49.4% were girls, compared with 48.9% of those who did not receive the subsidy. Among CCDF children, 18.9%

were only children at the time they were observed in the ACS, versus 19.3% of non-CCDF children.

Differences between CCDF and non-CCDF children on region, and on the age and year they were observed in the ACS largely reflect my construction of the CCDF file (see Tables 1 and 2). The mean age of children who received the CCDF subsidy was younger when observed in the ACS (9.7 versus age 10.5), likely because a higher percentage of non-CCDF children present in the analytic file were born in 1996 versus a lower percentage of CCDF children born in 1996. Similarly, a higher proportion of children are observed in earlier than later years of the ACS because in each successive year a larger proportion of birth cohorts becomes eligible to be linked and observed.

[TABLE 3 ABOUT HERE]

Table 4 shows characteristics of CCDF-recipient children broken down by the main type of care they received. Consistent with expectations, Table 4 shows that, at 4.3%, children whose main CCDF-subsidized care type was center care were less likely to have experienced grade retention than children who received primarily babysitter care (6.0%) or relative care (5.6%). Among children whose primary care type was family daycare, 4.4% had experienced grade retention; this percentage was not statistically significantly different from the estimate for children who received primarily center care.

Table 4 also shows statistically significant race/ethnic and household differences between the characteristics of CCDF children who received different primary care types. The race/ethnic composition of children who received primarily center care was not statistically significant from

the overall group of CCDF children. Combined with the fact that the largest percentage of children received center care as their main care type (60.7% -- see Table 3), this even race/ethnic distribution of children who received center care as their primary care type likely reflects the widely-held preference for center care among low-income parents (Chaudry 2006). The composition of children who received the other three types of care as their main care type all differed statistically significantly on each point estimate from the overall distribution of CCDF children; most point estimates also differed statistically significantly between children who received the different primary types of care. Non-Hispanic White children were disproportionately represented among the children who received primarily family daycare, at 40.6% of this group, as compared with their share of 36.1% in the overall group of CCDF children. Black children were disproportionately represented among children who received primarily babysitter care, at 63.0% of this group, as compared with their share of 41.1% among all CCDF children. By smaller magnitudes, relative care had higher percentages of minority children versus non-Hispanic White children. Relative to the overall group of CCDF children, higher percentages of children receiving primarily relative care were non-Hispanic Black (43.6% versus 41.1%), Asian (.7% versus .6%), other race (9.2% versus 8.2%), and Hispanic (16.8% versus 14.1%).

Higher percentages of children whose main care type was center care were only children (20.8%) versus children in family daycare (17.2%), babysitter care (12.9%) and relative care (14.2%). This may reflect more availability of resources to pay for center care in families with fewer children, or parents' belief that only children benefit from group-based care with unrelated children (Chaudry 2006). Lower percentages of children whose main care type was center care (69.1%) had household incomes at or below 85% of the state median at the time they were

observed in the ACS, compared with children whose main care types were family daycare (72.0%), babysitter care (79.4%), and relative care (78.0%). Children who received primarily center care also lived with adults with higher educational attainment than children who received primarily other types of care. A higher percentage of children whose main care type was center care had a household member with a Bachelor's degree or more (15.0%) as compared with children whose primary care type was family daycare (11.1%), babysitter care (8.6%) and relative care (9.0%). This suggests that children who receive CCDF-subsidized care in center care settings may have parents with more human capital than children who receive subsidized babysitter and relative care, translating into higher household incomes when children were observed in the ACS later in childhood and adolescence. There were no statistically significant sex differences among children with different primary care types. Again, differences between CCDF and non-CCDF children on region, and on the age and year they were observed in the ACS mainly reflect my construction of the CCDF file (see Tables 1 and 2).

[TABLE 4 ABOUT HERE]

Table 5 shows the results of the logistic regression model of children's likelihood of experiencing grade retention at ages 6-17, in grades K-12, in the years 2008-2014. Results in Model 1 are consistent with my expectation that because children must have low household incomes in order to receive the subsidy, experiencing CCDF-subsidized care will be associated with an overall increased risk of grade retention: the coefficient for receiving the CCDF subsidy (.15) is positive and statistically significant. Consistent across all models, girls and only children are less likely to experience grade retention. Relative to non-Hispanic White children, children

who are non-Hispanic Black and those who are AIAN, NHPI, multiracial, or SOR are more likely to experience grade retention. Asian children are less likely than White children to experience grade retention. Likely due to longer exposure, children observed at older ages are overall more likely to have experienced grade retention; however, consistent with literature, the negative sign on the age-squared coefficient indicates that most grade retentions take place at younger ages. Children observed in later years are less likely to have experienced grade retention. Also consistent with literature, relative to children living in the Northeast, children living in the Midwest and South are more likely to experience grade retention, and children living in the West are less likely to experience grade retention.

Model 2 introduces the variables controlling for household income at or below 85% of the state median, and for highest educational attainment among adults in the household. Consistent with expectations, children with low household incomes are more likely to experience grade retention across all models that include this variable. Children sharing a household with lower-educated adults are also more likely to experience grade retention. With the introduction of these human capital variables in Model 2, the CCDF subsidy coefficient becomes negative, and is no longer statistically significant. This supports an interpretation that the association between the CCDF subsidy and grade retention is largely due to subsidy recipients' lower incomes and more-disadvantaged circumstances relative to the overall child population. Model 3 introduces interactions between receiving CCDF-subsidized care and the low-income variable, and between receiving CCDF-subsidized care and race/ethnicity. The interactions are statistically significant and negative for children with low incomes, for non-Hispanic Black children, and children who are non-Hispanic AIAN, NHPI, multiracial, and SOR. This indicates that receiving CCDF-subsidized care is associated with a lower likelihood of grade retention among these three

race/ethnic groups. Running alternative specifications of the same model, in which the reference category is changed sequentially to include each race/ethnic group also yielded negative and statistically significant interactions with CCDF receipt for White children when either Black or other race children were the reference category, and for Hispanic children when Black children were the reference category. No change to the reference category yielded a statistically significant interaction coefficient for non-Hispanic Asian children (results not shown).

[TABLE 5 ABOUT HERE]

To more clearly illustrate the relationship between receipt of the CCDF subsidy, race/ethnicity, income and grade retention, Figure 1 depicts children's predicted probability of grade retention, for the groups of children with statistically significant interaction coefficients in Model 3. All differences between the probabilities of grade retention for groups defined by income and race/ethnicity that appear in Figure 1 are statistically significant.

The results in Figure 1 are consistent with my expectation that low-income Black and Hispanic children who received the CCDF subsidy would be especially less likely to experience grade retention relative to low-income children of other race/ethnic groups. Black children who received the CCDF subsidy had a lower probability of being held back in school relative to Black children who did not receive the subsidy, regardless of whether they lived in a lower-income home (patterned bars, .050 versus .072) or a higher-income home (solid bars, .040 versus .042) at the time of the ACS survey. Similarly, Hispanic children who received the CCDF subsidy had a lower probability of being held back in school relative to Hispanic children who did not receive the subsidy, regardless of whether they lived in a lower-income home (patterned bars, .046

versus .064) or a higher-income home (solid bars, .035 versus .037) at the time of the ACS survey. The results also show a strong association between receiving CCDF-subsidized care and a lower likelihood of grade retention among low-income White and non-Hispanic other race children who lived in a low-income home when they were observed in the ACS, as compared with low-income children who did not receive the subsidy (patterned bars). These lower probabilities of grade retention among low-income children who had previously received the subsidy were .048 versus .055 for White children, and .047 versus .059 for other race children. Low-income Black children who previously received the CCDF subsidy had the largest reduction in their probability of being held back, with a decrease of .022 points. Low-income Hispanic children who received CCDF-subsidized care had the second-largest reduction in the probability of being held back, with a decrease of .019 points. Low-income children of other races who received CCDF-subsidized care had a reduction in probability of being held back of .012 points. White children who received CCDF-subsidized care had a reduction in probability of being held back of .007 points. The magnitudes of all these decreases in probability of grade retention are statistically significantly different from one another.

By contrast, White and other race children who were living in higher-income homes at the time of the ACS were more likely to be held back in school if they had previously received the CCDF subsidy than if they had not (solid bars, .039 versus .032 for Whites, and .038 versus .035 for other races); nonetheless, these children's likelihood of being held back in school was lower than that of any children living in low income homes in later childhood. Thus, these results likely show the ongoing negative effect for children of having had low incomes in early childhood, rather than any influence of the subsidy itself.

[FIGURE 1 ABOUT HERE]

In Table 5, Models 4-6 replace the binary variable indicating receipt or non-receipt of the subsidy with a variable indicating whether a child received primarily CCDF-subsidized center care, family daycare, babysitter care, or relative care, versus. no subsidized care. The smaller size of the AIC values for Models 4-6 relative to their respective equivalents in Models 1-3 indicates a better model fit for the models that take into account the particular type of care that CCDF children primarily received in relation to their likelihood of grade retention. Although receiving any type of CCDF-subsidized care is again associated with an elevated risk of grade retention, exponentiating these coefficients shows that the magnitude of the increase associated with center care (an increase of 9%) is smaller than the increase associated with the other three types of care (increases of 23% for family daycare, 38% for babysitter care, and 32% for relative care). In addition, changing the reference category on this variable reveals that the difference between center care versus all other three types of the care is statistically significant, although family day care, babysitter care and relative care are not statistically significantly different from each other (results not shown). This is consistent with my expectation that receiving CCDF-subsidized center care in particular will be associated with a lower risk of grade retention among CCDF children. When I add the household human capital variables in Model 5, the sign on the coefficient for center care becomes negative, and the coefficients for family daycare and babysitter care reduce in magnitude, indicating again that the association with increased probability of grade retention is largely due to CCDF children's relatively disadvantaged circumstances relative to children who never received the CCDF subsidy. Model 6 adds interactions of CCDF-subsidized care type with children's race/ethnicity and with children's

current household income when they were observed in the ACS. The interactions with center care are negative and statistically significant for children with low incomes, and for children who are non-Hispanic Black, and AIAN, NHPI, multiracial, and SOR. Changing the reference category on the race variable also yields a statistically coefficient for White children when Black, and other race children are in the reference category, and for Hispanic children when Black children are the reference category (results not shown). Also negative and statistically significant in Model 6 are the interactions of having a low household income with receiving primarily relative care, the interaction of being non-Hispanic Black and receiving primarily family daycare, and the interaction of being non-Hispanic Asian and receiving primarily babysitter care (although the main effect for babysitter care in Model 6 is not statistically significant).

Figure 2 illustrates children's predicted probabilities of grade retention based on the statistically significant main effects and interactions with center care in Model 6. All differences between the probabilities of grade retention for groups defined by income and race/ethnicity that appear in Figure 2 are statistically significant, except for the difference between low-income Hispanic children and non-Hispanic other race children who received primarily center care.

Consistent with my expectations, receiving primarily CCDF-subsidized center care was associated with the largest reduction in probability of grade retention among Black and Hispanic children. For Black children, receiving CCDF-subsidized center care was associated with a lower probability of being held back, regardless of whether they were living in a higher-income home (solid bars, .037 versus .042) or a lower-income home (patterned bars, .046 versus .073) at the time of the ACS interview. Similarly, for Hispanic children, receiving CCDF-subsidized center care was also associated with a lower probability of being held back, regardless of whether they were living in a higher-income home (solid bars, .035 versus .037) or a lower-income home

(patterned bars, .044 versus .064) at the time of the ACS interview. For White and non-Hispanic other race children living in low-income homes at the ACS interview, receiving primarily CCDF-subsidized center care was also associated with a decreased probability of grade retention (patterned bars, .047 versus .055 for White children, and .044 versus .059 for other race children). Again, low-income Black and Hispanic children who previously received CCDF-subsidized center care had the largest reduction in their probability of being held back, with a decrease of .027 points and .020 points, respectively, compared with reductions of .015 among low-income children of other races, and .008 among low-income White children. The magnitudes of these decreases in probability of grade retention are all statistically significantly different from one another.

Again, among children living in higher-income households, having previously received CCDF-subsidized center care was associated with a higher likelihood of being held back for White and non-Hispanic other race children (solid bars, .038 versus .032 for White children, and .036 versus .035 for other race children). For children of these same race/ethnic groups, however, those who received CCDF-subsidized care and lived in higher-income homes when observed in the ACS again had a lower risk of grade retention than all children living in lower-income homes when observed in the ACS. Thus, these results likely show the negative effects for children of having experienced disadvantage in early childhood, rather than any harmful effects of CCDF-subsidized center care.

[FIGURE 2 ABOUT HERE]

DISCUSSION AND CONCLUSIONS

This study is the first to investigate the relationship between receiving Child Care and Development Fund (CCDF)-subsidized childcare in early childhood—and in particular, center-based care—and children’s subsequent likelihood of experiencing grade retention in grades K-12. Grade-retention not only signals a student’s academic failure, but also is associated with increased risk of behavioral problems and school dropout, and decreased likelihood of achieving post-secondary education (Jimerson, Anderson and Whipple 2002; Moller et al. 2006). Previous research has shown that quality childcare offsets the negative effects of poverty on young children’s cognitive and social development, improving early reading and math scores and lowering the risk of grade retention through the second grade (Peisner-Feinberg et al. 2001; McCartney et al. 2007). Evidence from research on the association between *subsidized* care in particular and children’s cognitive outcomes shows that subsidy recipient children have lower math skills in kindergarten relative to non-recipient children, but shows mixed evidence on recipient children’s reading skills and behavior. However, no previous studies have examined the relationship between CCDF-subsidized care and school outcomes in later grades. In addition, no studies have investigated whether a relationship exists between the particular *type* of subsidized care setting in early childhood and children’s later-grade performance.

Because of both the demonstrated cognitive benefits of early childhood care, and the evidence of positive selection on human capital among CCDF-recipient mothers (Hawkinson et al. 2013; Johnson et al. 2013), I expected that low-income children who received CCDF-subsidized care would be less likely to be held back in school. My results show that low-income children who received the CCDF subsidy, and especially those who received primarily CCDF-

subsidized center-based care were less likely to experience grade retention. This association is particularly pronounced for non-Hispanic Black children and Hispanic children.

Because of the demonstrated cognitive benefits of center care (Loeb et al. 2004; Loeb et al. 2007), I expected that CCDF children who received primarily center-based care would have a lower risk of grade retention than CCDF children who mainly received other kinds of care. I found results consistent with this expectation. CCDF children who mainly received center care had a lower risk of grade retention overall than CCDF children cared for primarily in family daycare settings, or by babysitters or relatives. The association between receipt of CCDF-subsidized center care and lower likelihood of grade retention differed by race/ethnicity, with the strongest relationship among Non-Hispanic Black children and Hispanic children. The association I found between low-income children's experience in center care and their better subsequent school outcomes is likely due to a combination of several factors that previous research has shown are associated with center care. These are the direct cognitive and social benefits to children of center care (Peisner-Feinberg et al. 2001; McCartney et al. 2007), parents' learning of developmentally advantageous practice from skilled child care providers (Votruba-Drzal et al. 2004), and selection into center care of higher-educated parents and those who are more-attuned to their children's cognitive and social development (Zaslow et al. 1998). Parents who are able to seek out and receive the CCDF subsidy may also be more likely to place their children in state-funded pre-K, or Head Start. Children's participation in these programs (which I am unable to measure) may also play a role in the association between CCDF-subsidized care and lower likelihood of grade retention.

Because of the particularly elevated risk of grade retention among Black and Hispanic children, and the greater likelihood that low-income Black and Hispanic children will attend

under-resourced schools (Frankenberg 2013), I expected that receiving CCDF-subsidized care would be associated with the largest reduction in probability of being held back in school for these two race/ethnic groups. I found that non-Hispanic Black and Hispanic children who received the CCDF subsidy—and particularly CCDF-subsidized *center care*—were less likely to be held back in school both among those with higher household incomes and with lower household incomes when they were observed in later childhood/adolescence. In addition, out of all race/ethnic and income groups, low-income Black children who had received the CCDF subsidy, and CCDF-subsidized center care in particular, saw the largest reduction of their likelihood of being held back, while Hispanic children had the second-largest reduction. Previous research has documented high social support for non-parent care, and particularly for center care, in Black communities (Sanders et al. 2007), as well as Black parents’ preference for center care with a focus on academic skills and school readiness (Shlay 2010). These factors may explain the broad association I found between CCDF-subsidized center care and lower risk of grade retention for Black children. In addition, low-income children of non-Hispanic racial groups including American Indian/Alaska Native, Native Hawaiian Pacific Islander, multiracial children and children of Some Other Race who received an CCDF-subsidized care, and primarily center care, experienced the third-largest reduction in the probability of grade retention. Thus minority children across an array of race/ethnic groups—who may have an elevated risk of grade retention due to discrimination, and under-resourced schools (Lichter, Parisi and Taquino 2015; Reardon, Fox and Townsend 2015)—appear in my results to benefit the most from CCDF-subsidized care.

The relationship between household income, CCDF subsidy receipt and likelihood of grade retention differed by race/ethnicity. For Non-Hispanic Black, White, and other race children and for Hispanic children, those who were living in lower-income homes in later

childhood/adolescence were less likely to be held back in school if they had previously received CCDF-subsidized care, and specifically CCDF-subsidized center care. Whereas Black and Hispanic children living in higher-income homes who had previously received the CCDF subsidy were *less* likely to be held back, among White and other race children, those living in higher-income homes who had previously received the CCDF subsidy were *more* likely to be held back. Nonetheless, CCDF-recipient children who no longer had low incomes in later childhood were less likely to be held back in school than all children who were living in low-income homes when they were observed in the ACS. Taken together, these results likely reflect the association of having had low incomes in early childhood—i.e. having previously had an income low enough to qualify for the CCDF—with problems in children’s subsequent school performance. They do not likely indicate any negative effects of the CCDF subsidy.

In sum, my study illustrates both the association of low household income in early childhood with negative school outcomes for children, and the association of quality early childhood care with better long-term school outcomes. Receiving CCDF-subsidized care, and especially CCDF-subsidized center care, is associated with a decreased risk of grade retention in grades K-12 among low-income children, especially low-income minority children.

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Table 1: Years When Birth Cohorts of Children Were Observed in the CCDF File and ACS

Birth years of children in the CCDF file	Years observed in the CCDF file	Years observed in the ACS
1997	2003-2004	2008-2014
1998	2003-2005	2008-2014
1999	2003-2006	2008-2014
2000	2003-2007	2008-2014
2001	2003-2008	2008-2014
2002	2003-2009	2009-2014
2003	2003-2010	2010-2014
2004	2004-2011	2011-2014
2005	2005-2011	2012-2014
2006	2006-2011	2013-2014
2007	2007-2011	2014

Table 2: Comparison of the Characteristics of Children Who Appear in the CCDF File, Who Appear in the ACS File, and Who Did and Did Not Match between these Two Files^a

	All Children in the CCDF File ^a		CCDF Children Who Did Not Match to the ACS ^a		Statistical Significance of Point Estimate Difference ^b	CCDF Children Who Matched to the ACS ^a		Statistical Significance of Point Estimate Difference ^c	ACS Children Who Do Not Appear in the CCDF File ^a		All Children in the ACS File ^a	
	Percentage	S.E.	Percentage	S.E.		Percentage	S.E.		Percentage	S.E.	Percentage	S.E.
Sex												
Girl	49.2	0.02	49.2	0.02		49.1	0.15	*	48.6	0.03	48.6	0.03
Boy	50.8	0.02	50.8	0.02		50.9	0.15	*	51.4	0.03	51.4	0.03
Race/ethnicity												
White, non-Hispanic	36.8	0.02	36.5	0.02	*	43.4	0.15	*	64.0	0.03	63.1	0.03
Black, non-Hispanic	42.6	0.02	42.8	0.02	*	34.1	0.14	*	10.7	0.02	11.8	0.02
Asian, non-Hispanic	0.8	0.00	0.8	0.00	*	0.6	0.02	*	2.9	0.01	2.8	0.01
Other, non-Hispanic	3.4	0.01	3.4	0.01	*	9.5	0.09	*	5.6	0.01	5.8	0.01
Hispanic, any race	16.3	0.02	16.5	0.02	*	12.5	0.10	*	16.7	0.02	16.5	0.02
Year of birth^d												
1996						0.1	0.01	*	10.4	0.02	9.9	0.02
1997	3.6	0.01	3.6	0.01	*	6.2	0.07	*	10.4	0.02	10.2	0.02
1998	5.3	0.01	5.2	0.01	*	8.4	0.08	*	10.3	0.02	10.2	0.02
1999	7.0	0.01	6.9	0.01	*	10.7	0.09	*	10.1	0.02	10.1	0.02
2000	8.7	0.01	8.6	0.01	*	13.0	0.10	*	10.0	0.02	10.1	0.02
2001	9.8	0.01	9.7	0.01	*	14.0	0.10	*	9.6	0.02	9.8	0.02
2002	10.7	0.01	10.7	0.02	*	13.0	0.10	*	9.5	0.02	9.6	0.02
2003	11.4	0.02	11.4	0.02	*	11.7	0.09	*	8.2	0.02	8.3	0.02
2004	11.5	0.02	11.5	0.02	*	9.5	0.09	*	6.9	0.02	7.0	0.02
2005	11.1	0.02	11.2	0.02	*	7.0	0.07	*	5.7	0.02	5.8	0.01
2006	10.9	0.02	11.1	0.02	*	4.5	0.06		4.4	0.01	4.4	0.01
2007	10.0	0.01	10.2	0.01	*	2.1	0.04	*	2.9	0.01	2.9	0.01
2008						0.0	0.00	*	1.5	0.01	1.4	0.01
Main type of CCDF-subsidized care												
Center care	65.4	0.02	65.6	0.02	*	58.1	0.14	-	-	-	-	-
Family daycare	20.3	0.02	20.2	0.02	*	25.2	0.13	-	-	-	-	-
Babysitter care	1.6	0.01	1.6	0.01	*	1.6	0.04	-	-	-	-	-

Table 2, Continued: Comparison of the Characteristics of Children Who Appear in the CCDF File, Who Appear in the ACS File, and Who Did and Did Not Match between these Two Files^a

Relative care	12.7	0.02	12.7	0.02	*	15.1	0.11	-	-	-	-	-
Total	4,311,685		4,195,277			116,408			2,388,565		2,504,973	

Sources: 2004-2011 Child Care and Development Fund (CCDF) administrative records, and 2008-2014 American Community Survey (ACS).

Notes: Estimates are unweighted.

^aStates included are Alabama, Arizona, Arkansas, Colorado, Delaware, Georgia, Hawaii, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, Wyoming, and the District of Columbia. These states submitted files containing their full universe of children to the CCDF national data file.

^bRepresents the statistical significance of the difference between CCDF children who did and did not match to the ACS. *Indicates that the difference in a given point estimate is statistically significantly different at at least the .05 level.

^cRepresents the statistical significance of the difference between ACS Children who do and do not appear in the CCDF file of full-universe states. *Indicates that the difference in a given point estimate is statistically significantly different at at least the .05 level.

^dFor CCDF children matched to the ACS, birth year is reported as it appears in the ACS

Table 3: Characteristics of Children Observed at Ages 6 to 17 in the Years 2008-2014, by Whether They Previously Received the Child Care Development Fund (CCDF) Subsidy When Aged 6 and Under

	Total		Received CCDF subsidy		Did not receive CCDF subsidy		Statistical Significance of Point Estimate Difference ^a	χ^2 p-value ^b
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.		
Percentages								
Received CCDF-subsidized care ^c	5.5	0.02	-	-	-	-	-	-
Main type of CCDF-subsidized care ^c								-
Center care	3.3	0.02	60.7	0.19	-	-	-	
Family daycare	1.3	0.01	22.9	0.16	-	-	-	
Babysitter care	0.1	0.00	1.7	0.05	-	-	-	
Relative care	0.8	0.01	14.6	0.13	-	-	-	
Ever held back a grade ^d	4.4	0.02	4.6	0.08	4.4	0.02	*	0.031
Sex ^d								0.009
Girl	48.9	0.04	49.4	0.19	48.9	0.04	*	
Boy	51.1	0.04	50.6	0.19	51.1	0.04	*	
Race/ethnicity ^d								<.001
White, non-Hispanic	56.5	0.04	36.1	0.18	57.7	0.04	*	
Black, non-Hispanic	15.0	0.03	41.1	0.19	13.5	0.03	*	
Asian, non-Hispanic	3.1	0.01	0.6	0.03	3.2	0.02	*	
Other, non-Hispanic	5.0	0.02	8.2	0.10	4.8	0.02	*	
Hispanic, any race	20.4	0.04	14.1	0.14	20.8	0.04	*	
Only child ^d	19.3	0.03	18.9	0.15	19.3	0.03	*	0.009
Lives in a doubled-up household ^d	9.8	0.03	10.4	0.11	9.8	0.03	*	<.001
Region ^d								<.001
Northeast	7.1	0.02	4.6	0.08	7.2	0.02	*	
Midwest	29.5	0.04	41.9	0.19	28.8	0.04	*	
South	47.0	0.04	37.7	0.19	47.6	0.04	*	
West	16.4	0.03	15.8	0.14	16.4	0.03	*	
Income at or below 85% of annual state median ^d	39.5	0.04	71.2	0.17	37.7	0.04	*	<.001
Highest educational attainment among adults in household ^d								<.001
Less than high school	7.8	0.02	8.5	0.11	7.7	0.03	*	
High school	19.3	0.03	26.0	0.17	18.9	0.04	*	
Some college	36.4	0.04	52.4	0.19	35.4	0.04	*	
Bachelor's degree or more	36.6	0.04	13.1	0.13	37.9	0.04	*	
Year observed ^d								<.001
2008	9.6	0.02	7.4	0.10	9.7	0.03	*	
2009	11.2	0.03	9.6	0.11	11.3	0.03	*	
2010	12.9	0.03	12.6	0.13	13.0	0.03	*	
2011	14.5	0.03	14.5	0.14	14.5	0.03	*	
2012	16.0	0.03	16.9	0.14	15.9	0.03	*	
2013	17.5	0.03	18.7	0.15	17.4	0.03	*	
2014	18.3	0.03	20.2	0.15	18.2	0.03	*	

Table 3, Continued: Characteristics of Children Observed at Ages 6 to 17 in the Years 2008-2014, by Whether They Previously Received the Child Care Development Fund (CCDF) Subsidy When Aged 6 and Under

Means								
Age ^d	10.4	0.00	9.7	0.01	10.5	0.00	*	<.001
Unweighted Total	2,284,857		114,125		2,170,732			

Sources: 2004-2011 Child Care Development Fund (CCDF) administrative records and 2008-2014 American Community Survey (ACS) files from the states of Alabama, Arizona, Arkansas, Colorado, Delaware, Georgia, Hawaii, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, Wyoming, and the District of Columbia.

Notes: All estimates are weighted.

^a A * indicates that the difference in a given point estimate is statistically significantly different at at least the .05 level between CCDF recipient and non-recipient children.

^b χ^2 p-value indicates statistical significance of the overall difference in the distribution of characteristics between

^c Variable measured in CCDF administrative records.

^d Variable measured in the ACS.

Table 4: Characteristics of CCDF Recipient Children Observed at Ages 6 to 17 in the Years 2008-2014, by the Main Type of CCDF-Subsidized Care They Received When Aged 6 and Under

	All CCDF Children		Center care		Family daycare		Babysitter care		Relative care		Statistical Significance of Point Estimate Differences ^a	χ^2 p-value ^b
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.		
Percentages												
Ever held back a grade ^c	4.6	0.08	4.3	0.10	4.4	0.16	6.0	0.69	5.6	0.22	<i>E, F, G, H</i>	<.001
Sex ^c												0.821
Girl	49.4	0.19	49.4	0.25	49.7	0.39	48.8	1.44	49.2	0.49		
Boy	50.6	0.19	50.6	0.25	50.3	0.39	51.2	1.44	50.8	0.49		
Race/ethnicity ^c												<.001
White, non-Hispanic	36.1	0.18	36.3	0.23	40.6	0.38	22.4	1.19	29.6	0.43	<i>D, E, F, G, H, I</i>	
Black, non-Hispanic	41.1	0.19	41.1	0.25	37.9	0.39	63.0	1.38	43.6	0.49	<i>D, E, F, G, H, I</i>	
Asian, non-Hispanic	0.6	0.03	0.6	0.03	0.4	0.05	0.2	0.11	0.7	0.08	<i>D, E, H, I</i>	
Other, non-Hispanic	8.2	0.10	8.1	0.13	7.8	0.21	4.8	0.58	9.2	0.27	<i>E, F, G, H, I</i>	
Hispanic, any race	14.1	0.14	13.9	0.18	13.2	0.27	9.6	0.82	16.8	0.38	<i>D, E, F, G, H, I</i>	
Only child ^c	18.9	0.15	20.8	0.20	17.2	0.29	12.9	0.98	14.2	0.33	<i>D, E, F, G, H</i>	<.001
Lives in a doubled-up household ^d	10.4	0.11	10.5	0.14	9.2	0.22	13.2	0.91	11.2	0.28	<i>D, E, F, G, H, I</i>	<.001
Region ^c												<.001
Northeast	4.6	0.08	5.2	0.10	4.4	0.15	3.4	0.52	2.8	0.16	<i>D, E, F, G, H</i>	
Midwest	41.9	0.19	33.0	0.23	55.4	0.39	61.0	1.45	55.5	0.49	<i>D, E, F, G, I</i>	
South	37.7	0.19	47.5	0.25	24.2	0.35	25.5	1.34	19.4	0.40	<i>D, E, F, H, I</i>	
West	15.8	0.14	14.3	0.18	16.1	0.29	10.1	0.90	22.2	0.41	<i>D, E, F, G, H, I</i>	
Income at or below 85% of annual state median ^c	71.2	0.17	69.1	0.23	72.0	0.35	79.4	1.15	78.0	0.40	<i>D, E, F, G, H</i>	<.001
Highest educational attainment among adults in household ^d												<.001
Less than high school	8.5	0.11	7.5	0.14	8.6	0.23	13.0	0.99	11.7	0.32	<i>D, E, F, G, H</i>	
High school	26.0	0.17	24.6	0.22	27.1	0.35	30.9	1.35	30.0	0.45	<i>D, E, F, G, H</i>	
Some college	52.4	0.19	52.9	0.25	53.2	0.39	47.5	1.44	49.4	0.49	<i>E, F, G, H</i>	
Bachelor's degree or more	13.1	0.13	15.0	0.17	11.1	0.24	8.6	0.73	9.0	0.27	<i>D, E, F, G, H</i>	

Table 4, Continued: Characteristics of CCDF Recipient Children Observed at Ages 6 to 17 in the Years 2008-2014, by the Main Type of CCDF-Subsidized Care They Received When Aged 6 and Under

Year observed ^c												<.001
2008	7.4	0.10	7.1	0.13	7.7	0.21	10.0	0.90	8.1	0.27	<i>D, E, F, G, I</i>	
2009	9.6	0.11	9.4	0.15	9.2	0.23	10.8	0.94	11.2	0.32	<i>F, H</i>	
2010	12.6	0.13	12.2	0.16	12.5	0.26	12.4	1.00	14.2	0.35	<i>F, H, I</i>	
2011	14.5	0.14	14.5	0.18	14.4	0.28	13.1	0.91	14.8	0.36	<i>I</i>	
2012	16.9	0.14	17.0	0.18	17.2	0.28	17.6	1.07	16.3	0.34	<i>H</i>	
2013	18.7	0.15	19.0	0.20	18.9	0.31	16.3	1.09	17.6	0.37	<i>E, F, G, H</i>	
2014	20.2	0.15	20.8	0.20	20.1	0.31	19.8	1.12	17.8	0.36	<i>D, F, H, I</i>	
Means												
Age ^c	9.7	0.01	9.5	0.01	9.6	0.02	10.4	0.03	10.0	0.08	<i>E, F, G, H, I</i>	<.001
Unweighted Total	114,125		66,313		28,665		1,883		17,264			

Sources: 2004-2011 Child Care Development Fund (CCDF) administrative records, and 2008-2014 American Community Survey (ACS) files from the states of Alabama, Arizona, Arkansas, Colorado, Delaware, Georgia, Hawaii, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, Wyoming, and the District of Columbia.

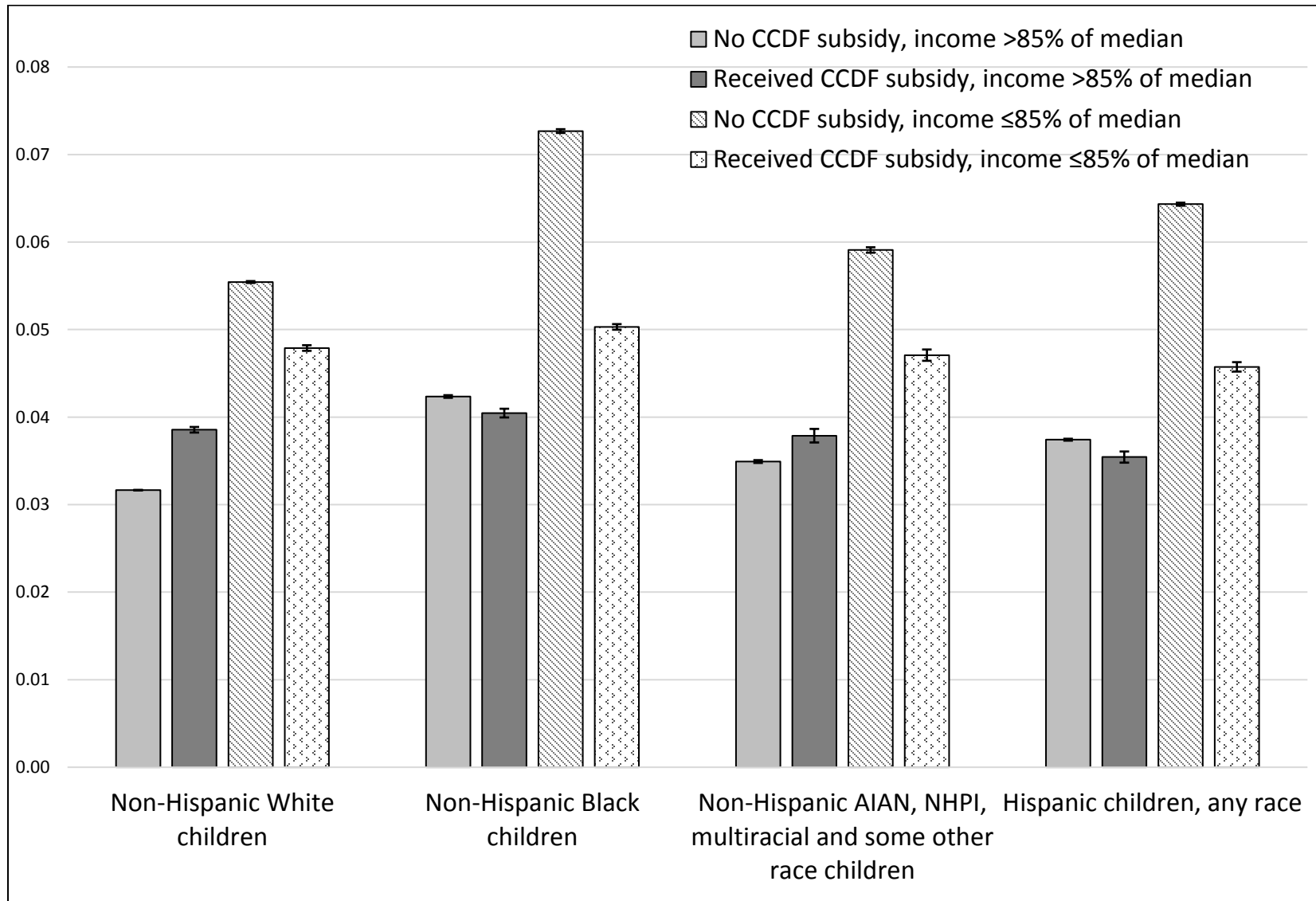
Notes: All estimates are weighted.

^aPoint estimate differences that are statistically significant at at least the .05 level are indicated as follows. D: center care versus family day care; E: center care versus babysitter care; F: center care vs. relative care; G: family day care versus babysitter care; H: family daycare versus relative care; I: babysitter care versus relative care.

^b χ^2 p-value indicates statistical significance of the overall difference in the distribution of characteristics among CCDF subsidy recipients with different primary care types.

^c Variable measured in the ACS.

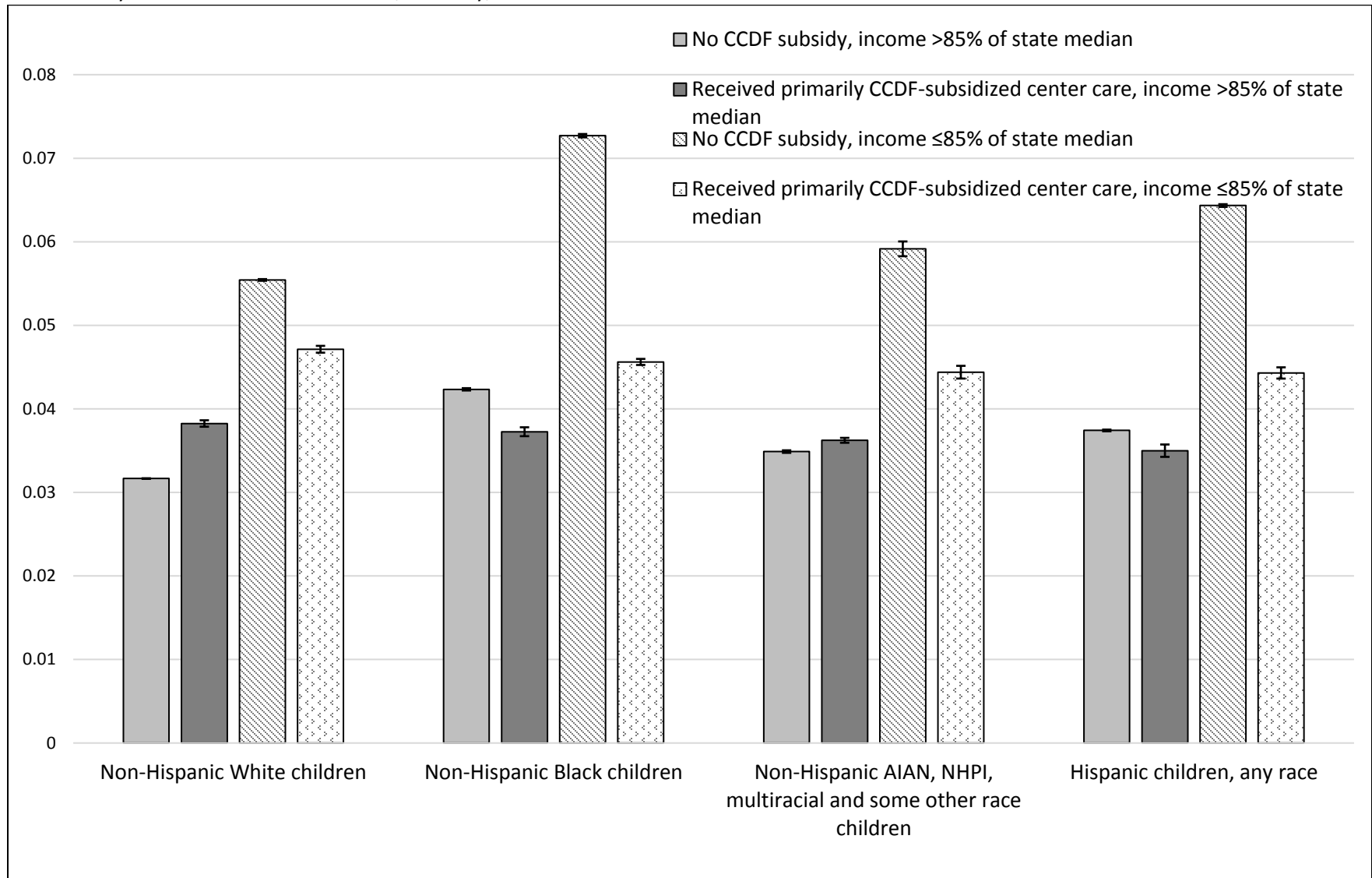
Figure 1: Differences in the Probability That Children Who Received CCDF-Subsidized Care and Non-CCDF Children Will Experience Grade Retention, by Household Income and Race/Ethnicity, with 95% Confidence Intervals



Sources: 2004-2011 Child Care Development Fund (CCDF) administrative records, and 2008-2014 American Community Survey (ACS).

Note: All differences between probabilities are statistically significant at the .05 level.

Figure 2: Differences in the Probability That Children Who Received Primarily CCDF-Subsidized Center Care, and Non-CCDF Children, Will Experience Grade Retention by Household Income and Race/Ethnicity, with 95% Confidence Intervals



Sources: 2004-2011 Child Care Development Fund (CCDF) administrative records, and 2008-2014 American Community Survey (ACS).

Note: All differences between probabilities are statistically significant at the .05 level except between low-income Hispanic and other race children who received primarily CCDF-subsidized center care.

Appendix Table 1: Types of Care Received at Ages 6 and Under, Observed in Years 2004-2011, among CCDF Children in the Analytic Sample from Full-Universe States Who Matched to Respective State Files of the ACS^a

All Matched CCDF children		CCDF children who received multiple types of care	
Center care only	50.5	Center care and family daycare	61.9
Family daycare only	14.6	Center care and babysitter care	2.0
Babysitter care only	0.9	Center care and relative care	12.1
Relative care only	10.6	Family daycare and babysitter care	2.5
Multiple types of care	23.4	Family daycare and relative care	13.4
		Babysitter care and relative care	3.3
		Center care, family daycare and babysitter care	1.5
		Family daycare, babysitter care and relative care	2.2
		Center care, family daycare, babysitter care and relative care	1.2
Unweighted total	114,125		24,517

^aStates included are Alabama, Arizona, Colorado, Delaware, Georgia, Hawaii, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, Wyoming, and the District of Columbia. These states submitted files containing their full universe of children to the CCDF national data file.

Sources: 2004-2011 Child Care Development Fund (CCDF) administrative records, and 2008-2014 American Community Survey (ACS)

Note: Estimates are weighted.