Everything I Need to Know I Didn't Learn in Kindergarten: Early Childhood Non-Parental Care Cognitive and Behavioral Skill Effects

Christopher E. Near

Yu Xie

With increases in mothers' labor force participation within the last few decades, the effects of non-parental early child care on children's cognitive skills, behavioral skills, and later life outcomes have taken on greater importance in the study of intergenerational mobility. Among single working mothers non-parental child care is a necessity. As a result, variation in availability, use, and quality of child care by family background characteristics may serve to either limit or enhance intergenerational mobility among disadvantaged children.

Two major aspects of early childhood care contribute to its heterogeneous impact. First, in a context like the U.S. where pre-kindergarten child care is predominantly paid for by the parent, family structure and socioeconomic status can affect access to particular types. Less wealthy parents, especially those with long work hours and no partner, may not be able or willing to take their children to private day care and preschool centers. For some of them, free or low-cost Head Start programs may be a viable alternative; for wealthier parents Head Start is not an option due to income eligibility restrictions. Other parents may prefer to use only care from well-known friends or relatives or handle care themselves.

Second, care arrangements may differ in how well they foster child development based on a variety of factors. Care providers' training, familiarity with their charges, level of attention, and care or curriculum style could influence child skill development. Care setting characteristics, such as what playthings and educational materials are available and how many other children are present, also play a role. These characteristics can vary greatly by care arrangement, but

increasingly institutionalized care centers may provide some homogeneity of characteristics within types (such as Head Start or pre-kindergarten) by establishing requirements like care provider certification and provider-child ratios.

Our study takes both aspects into account in evaluating the long-term impact of child care type. We examine patterns of early child care use by family background and their influence on subsequent child skills. By using inverse propensity weighting with longitudinal data, we are able to provide estimates of child care type effects with reduced bias from care selection.

Research Question

Child care effects have been extensively studied using early-childhood experimental intervention programs, which provide estimates of "ideal" child care effects with fewer issues of endogenous selection bias. Experimental intervention studies targeting disadvantaged children (e.g., the Perry Preschool program, Abecedarian project, and Infant Health and Development studies) have demonstrated persistent effects of quality early child care on skills and outcomes (Barnett 1995). Improvements in cognitive skills often fade soon after the intervention ends but long-term adulthood outcomes such as educational achievement, health behaviors, employment, and involvement in crime are improved by such programs, due partly to lasting improvements in non-cognitive behaviors such as self-control (Heckman, Pinto and Savelyev 2013). Unfortunately, their samples are often drawn from a single city with some eligibility restrictions, preventing them from being representative of the national population of children; furthermore, the high quality of the care provided may be atypical of the care most children actually receive.

There have been fewer long-term, large-scale observational studies. In contrast to experimental studies, observational study samples are often representative of a wider range of children and care arrangements, allowing them to show how effects vary based on timing,

duration, type, and quality of child care as well as child characteristics (Vandell 2004). Generally, higher quality child care is associated with better educated caregivers, lower caregiver-child ratios in group care, and center-based care (which usually has more cognitively stimulating materials and better educated caregivers than home-based care). In turn, high-quality child care is associated with higher cognitive and social skills and fewer behavioral problems (Li et al. 2013, Ruzek et al. 2014, Vandell 2004). However, center-based care can also be associated with greater behavioral problems and worse learning behaviors in early childhood if used for an extended period of time (Coley et al. 2013), if used by children with lower initial social skills (Vandell 2004) or if caregivers are switched often (Pilarz and Hill 2014). Short-term negative effects may not persist into later childhood or may reverse direction if experimental program results are generalizable (Barnett 1995).

Thus, while experimental studies have demonstrated what high-quality child care *can* achieve, many questions remain about the long-term effects associated with *most* child care. The goal of the present study is to begin to answer some of these—in particular, how family socioeconomic status influences what kinds of early child care parents utilize, and how this care may then affect their children's development of cognitive and non-cognitive skills into later childhood.

The contributions of this study result from two methodological improvements on many previous studies. First, use of a longitudinal observational data set allows us to examine at what ages child care is most critical and how long care type associations with cognitive and non-cognitive skills persist, up through age nine. While previous observational studies have replicated the short-term impact seen in experimental studies of child care on child cognitive and non-cognitive skills, most have not had the data to investigate whether these effects fade over

3

time. Our data allow us to do this.

Second, observational studies have the issue that child care selection is endogenous to the processes influencing children's skill development—many of the same socioeconomic factors that are associated with cognitive and non-cognitive skill development (such as income, family structure, and parental education) also influence access to and decisions on child care, resulting in biased estimates of care type effects. By using multiple-treatment propensity score methods, we can adjust for selection bias in care type use, helping us to separate the effects of the child care itself from those of the socioeconomic factors that influence access to different types.

Method and Data

We use data from the Fragile Families and Child Wellbeing study, a longitudinal study of mothers, most of whom were unmarried, and their children. The initial wave sampled 4700 mothers when they gave birth at 75 hospitals in 20 large cities (population 200,000 or more) in the US from 1998 to 2000. Follow-up waves interviewed the child's mother, the father (if possible), and teachers/care providers when the child was 1, 3, 5, and 9 years of age; the most recent wave includes about 4100 families. An additional survey wave, now being collected, will eventually provide data on age 15 delinquent behavior and high school educational outcomes. The data set is well-suited for studying patterns of child care usage in urban areas (where many options are available) and long-term associations with child skills, especially among single mothers for whom quality care is crucial.

Measures

Independent and control variables. The main independent variable of interest is household permanent income. We use the log of the average of annual household income in the first four waves (at child's age 0, 1, 3, and 5) as a proxy measure for permanent income. Child

and family background controls include mother's education at baseline (less than high school, high school, technical or associate degree, bachelor's degree, or advanced degree), mother's age at baseline, whether both biological parents are present at child's age 5, mother's weekly work hours at child's age 5, mother's race/ethnicity (white, Black, Hispanic, Asian/Pacific Islander, or other), and child's gender.

Mediating variable. The mediating variable of interest is the primary type of non-parental child care used for the child (whichever type is used for the most hours per week) at child's age 5 immediately prior to entering kindergarten. Because that interview wave was collected at the age when some children in the sample were not yet in kindergarten and others were, interviewers first asked if the child was currently in kindergarten or on summer break from kindergarten. Parents whose children were in kindergarten or on break were asked about their child care in the semester before the child entered kindergarten, while parents whose children had not yet entered kindergarten were asked about current child care. They were first asked about non-kindergarten center care and then, if the child had not been in some type of center care for at least eight hours a week, about non-program care by relatives or non-relatives used for at least eight hours a week. We constructed five categories of primary child care type from these measures: day care (day care center, nursery school, or preschool); pre-kindergarten (including junior kindergarten); Head Start; non-program care (no center-based care and at least 8 hours a week of care by a relative or non-relative); and parental care only (no center care and less than 8 hours a week of non-center care).

Dependent variables. The primary dependent variables are measures of child cognitive skills and behavioral problems. Four standard measures of the *child's cognitive skills* are included in the age 9 interview: the Woodcock-Johnson standardized applied problems (i.e.,

5

math skills) and passage comprehension scores (i.e., reading skills); the Peabody Picture

Vocabulary Test (PPVT-III) standardized score; and the Wechsler Intelligence Scale for

Children (WISC-IV) Digit Span (memory) subtest.

Child behavioral problems were measured at child's age 9 using four subscales from the

Child Behavior Checklist CBCL/4-18: attention problems, social problems, externalizing

behavior, and internalizing behavior. Each subscale was constructed as the average of several

ordinal items about how often the child exhibited specific behaviors or issues ranging from 0

("never" or "not true") to 2 ("very often" or "very much true"), with a higher subscale value

representing greater behavioral problems. "Attention problems" ($\alpha = .72$) includes 11 items on

the child's attention management, engagement with school work, and self-control skills (e.g.,

"Child can't concentrate"; "Child can't sit still"; "Child has poor school work"; and "Child is

impulsive or acts without thinking"). "Social problems" ($\alpha = .4$) is composed of eight items

indicating difficulties the child has with social interaction (e.g., "Child acts too young for his/her

age," "Child clings to adults or is too dependent," and "Child does not get along with other

kids"). "Externalizing behavior" ($\alpha = .86$) comprises 30 items on aggressive, bullying, and

destructive behavior by the child (e.g., "Child argues a lot," "Child destroys things belonging to

his/her family or others," "Child physically attacks others," and "Child lies or cheats"). Finally,

"internalizing behavior" ($\alpha = .75$) includes 22 items on whether the child seems depressed,

socially anxious, or lonely (e.g., "Child would rather be alone than with others," "Child is

unhappy, sad, or depressed," and "Child worries").

Data Analyses

Our analyses use a two-step process to examine interrelationships between family

background, child care use at age 5 (immediately prior to kindergarten), and child cognitive

skills and behavioral problems at age 9. We first predict children's likelihoods of using each type of child care (parental care, non-program care, day care center, Head Start, or pre-kindergarten) using a multinomial logit regression, which shows us how type of child care used is patterned by family socioeconomic variables. We then estimate OLS regressions of the treatment effects of each type of child care on child cognitive skills and behavioral problems at age 9, adjusting for child care type selection using the predictions from the first step in inverse propensity weights (IPWs). This process, accomplished using Stata's "teffects ipw" command, is described below.

The first step in an IPW model is to estimate a propensity score model for likelihood of treatment (Guo and Fraser 2015). In our case, because there are multiple treatment categories for care type, we use a multinomial logit model of age 5 care type on family and child background covariates at child's age 5, which include log average income in the first four waves, mother's race, mother's age and level of education at child's birth, and mother's relationship status (cohabiting/married vs. single) and weekly work hours at child's age 5.

From this model we predict five propensity scores—one for each care type—for each child, which represent estimates of the probability the child would use a given type of care as his or her primary care based on his or her characteristics. However, because each child received only one type of care as his or her "primary" child care, we need a single propensity score that we can use in constructing weights. Thus, for each case, we use only the propensity score for the type of care that case actually received to calculate an inverse probability of treatment weight (IPTW).

Finally, we estimate OLS regression models of the four cognitive skills and four non-cognitive skills on care type at age 5 using the IPTWs as sampling weights. We estimate unweighted regressions in Model 1, and IPTW-weighted models for average treatment effect and

average treatment effect on the treated in Model 2.

Results

Descriptive statistics for outcomes are shown in Table 1. Mean average household permanent income was $35,000 (SD = $33,000). At age 5, half the children were in preschool/kindergarten; a majority of mothers were Black, had a high school education or less, and were not living with the child's father.

Insert Tables 1 – 4 about Here

Income and Child Care Type

Table 2 shows estimates from a multinomial logit regression for the likelihood of types of non-parental child care at age 5 (versus parental care only) on controls and household permanent income in the same wave. Income was associated with a greater probability of using non-program, day care center, or pre-kindergarten care rather than only parental care. Mothers with less than a high school education were more likely to use only parental care, while mothers with a bachelor's degree or more were more likely to use day care or pre-kindergarten care. Single mothers were more likely than cohabiting or married mothers to use some type of non-parental care, particularly non-program care. Finally, mother's work hours were associated with a greater likelihood of using non-program, Head Start, or pre-kindergarten care.

Income, Child Care Type and Child's Outcomes

Table 3 shows OLS estimates for cognitive skills at age 9 on age 5 care type, while Table 4 shows OLS estimates for behavioral problems at age 9 on age 5 care type. For each variable, Model 1 lists the estimates for a basic OLS regression, while Model 2 uses inverse propensity

weights constructed from the care type propensities estimated in Table 2 to adjust for care type selection effects. Use of day care or pre-kindergarten care is associated with greater applied problems and passage comprehension scores, even in Model 2, though coefficient estimates are reduced by weighting. They were also associated with Peabody Picture Vocabulary Test and Weschler 4-digit scores in Model 1, but these associations do not carry over to Model 2 (see Table 3). Non-program and Head Start care were not significantly associated with cognitive skills, and care type was not significantly related to any behavioral problems in Model 2 (see Table 4).

Discussion

Results from this study support two important ideas about early child care and its impact. The first is that family background, specifically socioeconomic status and family structure, greatly influences access to child care. Mothers with greater income and education are more likely to use non-parental child care, especially day care, preschool, and pre-kindergarten; the exception to this is Head Start, to which only lower-income children have access. Mothers with more time constraints—those who are single and/or work more hours—are more likely to use any type of non-parental care, particularly non-program care, which in some arrangements does not require shuttling children to and from care. These results are unsurprising, but show that there are substantial differences in access to particular types of child care that could exacerbate existing inequalities.

Second, while care type does not appear to have a lasting impact on behavioral problems, some types of care do appear to have cognitive benefits that last into later childhood. Specifically, day care centers and pre-kindergarten—the types most associated with socioeconomic advantage—are associated with higher cognitive skill scores, even after adjusting

9

for care type selection. Results for non-program and Head Start care are less conclusive, likely because non-program care is so heterogeneous and Head Start is associated with economic disadvantage. It is possible that the methods used in this study did not succeed in fully removing selection bias, or that the benefits of Head Start are greater for more disadvantaged children.

Regardless, these results do suggest that early childhood care does matter, that not all care is created equal (though some may be more equal than others as a result of regulations), and that child care access is not equal. If access to quality childcare remains so unequal, then existing social inequalities seem unlikely to improve; but there is the potential to help increase social mobility if public preschool of high quality are made more available. Additional research is needed to tell us how, and how much: what sorts of programs are most effective for which children; how effective they are in practice; how accessible they are or could be; and how long their impact persists.

Table 1. Descriptive Statistics (n = 2526)

Variable	Mean	SD	Min	Max
Avg. household income in $1000s (age 0-5)	35.03	33.39	1.84	320.94
Log avg. household income (age 0-5)	10.11	0.85	7.52	12.68
Mother's education at baseline				
<HS	0.31			
HS (reference)	0.32			
Technical/Associat's degree	0.26			
Bachelor's degree	0.08			
Graduate degree	0.03			
Mother's race				
White (reference)	0.22			
Black	0.51			
Hispanic	0.24			
Asian/PI	0.02			
Other	0.01			
Single mother (age 5)	0.54		0.00	1.00
Mother's age at baseline	25.07	6.00	15.00	43.00
Mother's weekly work hours (age 5)	37.79	14.88	0.00	120.00
Child's gender (female = 1)	0.48		0.00	1.00
Child's age (age 5)	5.10	0.20	4.75	6.00
Primary care type (age 5)				
Parent only (reference)	0.14			
Non-program	0.08			
Day care	0.37			
Head Start	0.14			
Pre-kindergarten	0.27			
Applied problems score (age 9)	98.54	15.66	1.00	152.00
Passage comprehension score (age 9)	93.31	13.51	1.00	136.00
Peabody picture vocab score (age 9)	93.27	14.94	44.00	159.00
WISC-IV digit span (age 9)	9.39	2.79	1.00	19.00
Self-control (age 9)	0.28	0.30	0.00	2.00
Social skills (age 9)	0.23	0.25	0.00	2.00
Externalizing behavior (age 9)	0.24	0.24	0.00	2.00
Internalizing behavior (age 9)	0.17	0.20	0.00	2.00

Table 2. Multinomial Logit Estimates for Likelihood of Using Type of Child Care at Age 5

Reference: parent only	Non-program	Day care	Head Start	Pre-K
Log avg. income	.44 **	.51 ***	-.12	.45 ***
Mother's education (ref.: HS)				
< HS	-.47 *	-.39 *	-.38 *	-.52 **
Tech/AA	-.39	.33	.17	.28
BA	.04	1.03 **	.08	.78 *
Advanced	-.59	1.26 **	.74	.75
Mother's race (ref. white)				
Black	-.06	.67 ***	1.14 ***	.85 ***
Hispanic	.26	.43 *	.96 ***	.89 ***
Asian	-.99	-.23	-.56	-.47
Other	-1.61	-.56	.42	.04
Single mother	1.17 ***	.59 ***	.52 **	.57 ***
Mother's age	-.03	-.02	-.03 *	-.03 *
Mother's work hours	.02 **	.01	.01 **	.01 *
Child's gender: female	-.13	.17	.16	-.03
Constant	-5.12 **	-4.92 ***	.31	-4.37 ***

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table 3. OLS Regression Estimates of Age 9 Cognitive Skills on Age 5 Child Care Type

	Applied Problems		Passage Comprehension		Peabody Picture Vocabulary		Weschler 4-digit	
Model	1	2	1	2	1	2	1	2
Avg. treatment effect								
Non-program	2.18	1.76	2.35	1.98	1.76	.90	.08	.07
Day care	5.33 ***	3.19 **	4.29 ***	2.41 **	4.42 ***	1.20	.46 **	.20
Head Start	1.30	1.70	-.37	.01	-.76	.20	.00	.01
Pre-K	4.11 ***	3.12 **	2.54 **	1.96 *	2.80 **	1.34	.14	.04
Constant	95.11 ***	95.89 ***	90.92 ***	91.43 ***	90.85 ***	92.08 ***	9.18 ***	9.26 ***
Avg. treatment effect on treated								
Non-program		2.80		3.55 **		1.66		0.11
Day care		4.17 ***		3.31 **		1.57		0.16
Head Start		2.93		0.81		1.89		0.15
Pre-K		4.02 **		3.05 **		1.85		0.05
Constant		94.49 ***		89.71 ***		90.95 ***		9.15 ***

$^{*} p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

Table 4. OLS Regression Estimates of Age 9 Behavioral Problems on Age 5 Child Care Type

	Attention		Social		Externalizing		Internalizing	
Model	1	2	1	2	1	2	1	2
Avg. treatment effect								
Non-program	.06 *	.02	.02	-.01	.02	-.01	.03	.01
Day care	.00	.00	-.01	-.01	.00	.00	-.01	.00
Head Start	.03	.02	.01	.00	.02	.01	.01	.01
Pre-K	.01	.00	-.01	-.01	.01	.00	-.01	-.01
Constant	.27 ***	.27 ***	.24 ***	.24 ***	.24 ***	.25 ***	.18 ***	.18 ***
Avg. treatment effect on treated								
Non-program		.02		.00		-.01		.02
Day care		-.02		-.01		-.01		-.01
Head Start		.02		-.01		.00		.00
Pre-K		-.01		-.02		-.01		-.02
Constant		.31 ***		.26 ***		.27 ***		.19 ***

$^{*} p < 0.05,$ $^{**} p < 0.01,$ $^{***} p < 0.001$

Appendix: Behavioral problem subscale items

Attention Problems (11 items, α = .72)
Child acts too young for age
Child can't concentrate
Child can't sit still
Child is confused or seems to be in a fog
Child daydreams or gets lost in his/her thoughts
Child is impulsive or acts without thinking
Child is nervous high strung, or tense
Child is nervous moment or twitching
Child has poor school work
Child is poorly coordinated or clumsy
Child stares blankly

Social Problems (8 items, α = .4)
Child acts too young for age
Child clings to adults or too dependent
Child does not get along with other kids
Child gets teased a lot
Child not liked by other kids
Child is overweight
Child is poorly coordinated or clumsy
Child prefers being with younger kids

Internalizing behavior (22 items, α = .75)
Child would rather be alone than with others
Child refuses to talk
Child is secretive, keeps things to self
Child is shy or timid
Child stares blankly
Child sulks a lot
Child is underactive, slow moving, lacks energy
Child is unhappy, sad, or depressed
Child is withdrawn, doesn't get involve w others
Child complains of loneliness
Child cries a lot
Child fears s/he might think/do something wrong
Child feels s/he has to be perfect
Child feels or complains no one loves him/her
Child feels others out to get him/her
Child feels worthless/inferior
Child is nervous, high strung, or tense
Child is too fearful or anxious
Child feels too guilty
Child is self-conscious or easily embarrassed
Child is suspicious
Child worries

Externalizing behavior (30 items, α = .86)
Child argues a lot
Child brags or boasts
Child is cruel, bullying, or mean to others
Child demands a lot of attention
Child destroys his/her own things
Child destroys things belong to his/her family or others
He/She is disobedient at home
He/She is disobedient in school
Child is easily jealous
He/She gets in many fights
Child physically attacks people
Child screams a lot
Child is showing off or clowning
Child is stubborn, sullen, or irritable
Child has sudden changes in mood of feelings
Child talks too much
Child teases a lot
Child has temper tantrums or hot temper
Child threatens people
Child is unusually loud
Child does not seems to feel guilty after misbehaving
Child hangs around with others who get in trouble
Child lies or cheats
Child prefers being with older kids
Child runs away from home
Child sets fires
Child steals at home
Child steals outside home
Child swears or uses obscene language
Child vandalizes

REFERENCES

Barnett, Steven W. 1995. "Long-Term Effects of Early Childhood Programs on Cognitive and School Outcomes." *The Future of Children* 5:25-30.

Coley, Rebekah Levine, Elizabeth Votruba-Drzal, Portia L. Miller and Amanda Koury. 2013. "Timing, Extent, and Type of Child Care and Children's Behavioral Functioning in Kindergarten." *Developmental Psychology* 49:1859-73.

Guo, Shenyang and Mark W. Fraser. 2015. *Propensity Score Analysis: Statistical Methods and Applications*. Thousand Oaks, California: Sage.

Heckman, James J., Rodrigo Pinto and Peter Savelyev. 2013. "Understanding the Mechanisms through Which an Influential Early Childhood Program Boosted Adult Outcomes." *American Economic Review* 103(6):2052-86. doi: 10.1257/aer.103.6.2052.

Li, Weilin, George Farkas, Greg Duncan, Margaret Burchinal and Deborah Vandell. 2013. "Timing of High-Quality Child Care and Cognitive, Language, and Preacademic Development." *Developmental Psychology* 49:1440-51.

Pilarz, Alejandra Ros and Heather D. Hill. 2014. "Unstable and Multiple Child Care Arrangements and Young Children's Behavior." *Early Childhood Research Quarterly* 29:471-83.

Ruzek, Erik, Margaret Burchinal, George Farkas and Greg Duncan. 2014. "The Quality of Toddler Child Care and Cognitive Skills at 24 Months: Propensity Score Analysis Results from the Ecls-B." *Early Childhood Research Quarterly* 29:12-21.

Vandell, Deborah Lowe. 2004. "Early Child Care: The Known and the Unknown." *Merrill-Palmer Quarterly* 50:387-414.