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Technical Appendices

Preschool and School Readiness

Experiences of Children with Non-English-Speaking Parents

Jill S. Cannon, Alison Jacknowitz, Lynn A. Karoly

with research support from Karina Jaquet

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Appendix A: RAND California Preschool Study Data Description

To provide representative information for California preschool-age children, we use the California Preschool Study survey and observation data collected by the RAND Corporation (Karoly et al., 2008). The survey, conducted in early 2007, is a representative sample of California children with birth dates from December 3, 2001, to December 2, 2003. The survey sample includes information on 2,025 children, all of whom participated in the household survey (via a telephone interview with the child's parent), 615 of whom were part of the provider survey (via a telephone interview with the director and lead classroom teacher in the center-based program they attended), and 248 of whom were part of the provider subsample that included direct observations of the early care and education classrooms they attended. In this report, we focus on the four-year-old cohort representing children born between December 3, 2001, and December 2, 2002, for whom data was collected in the year before they were eligible for kindergarten entry in fall 2007. The universe of four-year-olds for this report is 1,009, and of those 384 had data from the provider survey and 155 had data from the provider subsample with direct center-based care observations. Like the ECLS-B, this is a rich data set with survey information from parents and care providers, and direct observations that contain quality measures, as well as significant numbers of children of immigrants in the sample. Sampling weights are provided to report estimates that are representative of California.[1]

Although not longitudinal, these data have the advantage of being collected within a couple of years of the ECLS-B preschool wave and are representative of California's preschoolers and their experiences. Many of the items in the RAND survey were adopted from the ECLS-B survey instruments and observational assessments, so we have many of the same variables for consistency. One difference from the national data is that the RAND survey includes children who were born outside the United States but were living in the state in 2007. This represents 9.1 percent of four-year-old children, over half of whom are in the linguistically isolated subgroup. Thus, the California sample will have a higher proportion of new immigrant families, those living in the U.S. four years or fewer, than the ECLS-B data will, and these California families will more likely be linguistically isolated. California is also expected to have a higher share of foreign-born children than is found nationwide.

Variables

The complete list of variables we examine from the RAND data and their specifications is available in Tables A1 through A3. To the extent possible, when a variable is included in both the RAND data and the ECLS-B data, we tried to specify the variable in the same way for comparison purposes. A few variables are included in the RAND data but not the ECLS-B, and vice versa, and we include them in the appropriate descriptive tables. To preserve as much of the sample as possible, for all variables in Tables A1 through A3, we only exclude observations that are missing values for the nativity-language subgroup variable. For the few continuous variables, such as maternal age, that contain missing values, we drop those observations only when generating means for that particular variable. Among the remaining categorical variables that contain

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[1] Additional information on construction of weights to produce the California preschool representative sample is found in Appendix A of Karoly et al. (2008). There are three weights, one for the household survey variables, one for the provider survey variables, and one for the imputed provider subsample survey.

missing values, we include a missing data group. For example, maternal employment status is represented by four variables: full time work, part time work, not employed, and missing information. The following highlights key variables and those requiring explanation.

Nativity and language subgroups

We describe four subgroups of children based on parental nativity and language: 1) parents are U.S. born ("Native"), 2) at least one parent is an immigrant and the primary language of both parents is English ("English-Speaking"), 3) at least one parent is an immigrant, primary home language is non-English for at least one parent, but at least one parent speaks English pretty well or very well ("Non-Isolated"),[2] and 4) at least one parent is an immigrant , primary home language is non-English for both parents, and parents speak English not very well or not at all (linguistically isolated, or "Isolated").[3] We base our subgroup classifications on both parents' nativity and language fluency for two-parent (or guardian) households, and on a single parent's characteristics in single-parent (or guardian) households.

Spanish-language surveys were administered for parents who did not understand English well enough to respond, but the survey was not translated into other languages. When a parent did not understand English or Spanish well enough to respond, another household member served as a proxy respondent for the parent survey where possible. Even so, there may be some immigrant parents who spoke a language other than English or Spanish who could not be surveyed. If so, this would result in children in the Isolated subgroup speaking languages other than Spanish being underrepresented in the study population. Although the survey weights are not designed to adjust for undersampling by language status, language status is highly correlated with other demographic characteristics that were used to develop the weights so that any underrepresentation is likely to be very small.

Early care and education arrangements

The use of any nonparental care is coded as 1 if the parent reported that the child had one or more regular nonparental care arrangements at the time of the interview. Home-based care arrangements include relative care or non-relative care in the child's home or another's home, and center-based care arrangements include State Preschool Program, Head Start, public school prekindergarten, and other types of center care. Primary nonparental care arrangement identifies the type of nonparental care where the child spent most of his or her time on a regular basis. The use of any center-based care, including Head Start, is coded as 1 for those who were in center-based care at the time of the interview.[4] There are also a subset of questions answered by the parents regarding their difficulty finding care and whether they believed they had good choices. In addition, they were asked to rate the importance of certain care and provider characteristics.

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[2] The wording of the question in the California data is "Would you say you speak English very well, well, not very well, or not at all?"

[3] Our Isolated definition differs somewhat from the U.S. Census definition of linguistically isolated households. The Census defines linguistically isolated households as ones in which no one 14 years old and over speaks only English or speaks a non-English language and speaks English "very well." We rely solely on parents' language due to data limitations on all household members' English fluency, and we do not include parents speaking English "well" in our Isolated group. Sensitivity tests that include speaking English "well" in the Isolated group produced qualitatively similar results.

[4] Information from the following two survey questions is used to create this variable. "Now I want to ask you about child care centers, nursery schools or pre-kindergarten programs {CHILD/TWIN} may attend, not including Head Start programs. Is {CHILD/TWIN} now attending a day care center, nursery school, preschool, or pre-kindergarten program on a regular basis?" "Head Start is a federally sponsored preschool program primarily for children from low-income families. Is {CHILD/TWIN} currently attending Head Start on a regular basis?"

Child, maternal, and household variables

We include several child, maternal, and household variables in our regression models and examine others in our descriptive analyses. These variables are selected for inclusion in our study based on the previous literature and their expected relationships with child care decisions or a child's performance. Several of these control variables warrant further explanation. With regard to the maternal employment status variable, full-time work is defined as 35 or more hours per week and working less than 35 hours but more than zero is classified as part-time work. Receipt of cash assistance (CalWORKS or welfare) or food stamps, or participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is included to capture access to and knowledge of government programs. Household region is based on county of residence. Central counties include Fresno, Kern, Kings, Madera, Merced, Monterey, Placer, Sacramento, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Solano, Stanislaus, Tulare, Ventura, and Yolo. North counties include Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, and Sonoma. Los Angeles County is its own region. Other southern counties include Orange, Riverside, San Bernardino, and San Diego. Other counties include all else.

Early care and education characteristics

For children in any center-based care, the Provider Sample Survey collected information from the director and lead classroom teacher about their characteristics (e.g., education, years of experience, and race/ethnicity) and about the care provided (e.g., care type and organization sponsorship). This information was collected through a telephone survey conducted with the center-based provider, even if the center-based setting was not the child's primary nonparental care arrangement. For most children, however, the two were the same.

In addition to the provider survey, a subset of centers was randomly selected to participate in the on-site observation portion of the study.[5] As part of the visit, the Classroom Assessment Scoring System (CLASS) and the Early Childhood Center Environment Rating Scale – Revised (ECERS-R) were administered as global assessments of structural and process quality. The CLASS measures include subscale scores for emotional support, classroom organization, instructional support for learning (ISL), and student engagement. The ECERS-R measures include two subscale scores, one for space and furnishings and one for activities, as well as a combined score of both. These two subscales were intended to serve as complements to data collected through CLASS, so the full ECERS-R assessment was not administered. Thus the combined score is not equivalent to the ECERS-R total score reported in the ECLS-B data (see Appendix B for further description of the ECERS-R). The scores for all CLASS and ECERS-R measures fall on a scale of 1 to 7, with 7 being the highest. For the ECERS-R, a score of 1 is described as inadequate quality, 3 is minimal quality, 5 is good quality, and 7 is excellent. For the CLASS, a score of 1 to 2 indicates low levels of the constructs measured, scores from 3 to 5 indicate moderate levels, and scores of 6 to 7 indicate high levels. Research on the CLASS suggests that the instructional support domain may be the strongest predictor of settings that improve children's language and academic skills (Hamre & Pianta, 2005; Howes et al., 2008; Mashburn et al., 2008), and that even an instructional quality score of 3.25 or above can be an indicator of center quality that is associated with gains in learning (Burchinal et al., 2010).

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[5] To reduce costs, providers in the 28 least populous counties were excluded from the sample eligible for observation. These counties represent less than 4 percent of the preschool-age population. Only English- and Spanish-speaking care providers were eligible for the telephone interviews and on-site observations.

Analysis Samples

In order to address the first research question, several analysis samples were created. We divided our analysis into child and household variables, including parents' choice of care type (family sample survey), center-based care provider variables (provider sample survey, which includes responses from the center-based caregiver even if this is not the primary care arrangement for the child), and quality measures (provider subsample on-site observations). Of the 1,009 children in the four-year-old cohort, we exclude nine because of missing information on parents' immigrant or language status. Of the 1,000 observations, 93 children belong to the Isolated subgroup, 199 to the Non-Isolated subgroup, 129 to the English-Speaking subgroup, and 579 to the Native subgroup. The provider sample includes 384 children, with 26 in the Isolated subgroup, 73 in the Non-Isolated subgroup, 46 in the English-Speaking subgroup, and 239 in the Native subgroup. The on-site observation subsample includes 155 children, with 8 in the Isolated subgroup, 29 in the Non-Isolated subgroup, 19 in the English-Speaking subgroup, and 99 in the Native subgroup. Data include two weights to ensure reported results are representative of four-year-olds in California: one for the family survey responses and one for the provider sample survey. In addition, the on-site center observation values (e.g., quality scores) must be imputed for children in the full provider sample of 384 in order to apply the provider weight and create state-representative results.

We include missing indicator variables for child and family characteristics in Table A1 to preserve sample size for the descriptive statistics. However, we still have relatively small sample sizes for our immigrant subgroups, and this affects the power to detect significant differences between some of the subgroup proportions. With our sample sizes, we can only detect significant differences in proportions between subgroups that are greater than 10 percentage points. The exact difference that is detectable also depends on the starting proportion. For example, if the Isolated subgroup has a proportion of 0.705 as we see in Table A1 for "Any nonparental care," we can detect a difference from a Native proportion that is 0.856 or higher (at 90% power). This helps explain why we do not note a statistical difference between the Isolated and Native subgroups, where the difference between subgroups is 0.136. As another example, if the Isolated proportion is 0.20, we can detect a difference if the Native proportion is 0.37 or higher or, in the opposite direction, 0.075 or lower. Because of these limitations with the power of our California sample, we are cautious about concluding that differences in subgroup proportions are not statistically significant and focus more on describing the relative differences in these characteristics.

We have two analysis samples in our regression models addressing our research question related to center-based care use. The first regression, examining use of any nonparental care, relies on the family survey and includes 953 children with non-missing covariates, with the exception of missing income for which we include a categorical variable (see Table D1).[6] The second and third models, examining center care compared to home-based care and the use of home-based care as primary care arrangement, also rely on the family survey and include 811 children who use any nonparental care and have non-missing covariates (see Tables D2 and D4).

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[6] We also examined the same models using imputed data for the missing covariate information, and results were unchanged.

Table A1.
California child and family descriptive characteristics for four-year-olds by subgroup

	Children of Immigrants			
Descriptive characteristics	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	Native (d)
Early care and education arrangement				
Parental care only	29.5%	23.8%	23.5%	15.9%
Any nonparental care	70.5%	76.2%	76.5%	84.1%
Any center-based care	64.8%	62.6%	59.4%	71.1%
Primary nonparental care				
Relative care	3.8%	9.6%	11.3%	11.0%
Non-relative care in child's home	2.2%	0.0%[d]	2.8%	2.4%[b]
Non-relative care in another home	0.2%[d]	9.6%	4.6%	8.4%[a]
Center-based care	64.2%	57.0%	57.8%	62.3%
Child characteristics				
Race/ethnicity				
White	2.3%[d]	6.6%[d]	11.9%[d]	45.5%[abc]
Black	–	–	0.1%	9.8%[a]
Hispanic	91.1%[bcd]	61.2%[ad]	52.5%[ad]	30.2%[abc]
Asian	0.9%[bc]	26.9%[ad]	23.2%[ad]	4.2%[bc]
Other	0.0%[d]	5.2%	12.3%	8.9%[a]
Missing race/ethnicity	5.7%	–	0.0%	1.4%
Female gender	60.8%	54.3%	50.2%	41.5%
Maternal characteristics				
Mother's birth country				
US	5.6%[d]	6.8%[d]	24.9%[d]	100%[ac]
Mexico	87.0%[bcd]	45.1%[ad]	32.7%[ad]	0.0%[abc]
All other countries	7.2%[bcd]	45.4%[ad]	41.9%[ad]	0.0%[abc]
Missing birth country	0.2%	2.7%	0.5%	0.0%
Mother's education				
Less than high school diploma	75.2%[bcd]	39.0%[ad]	16.5%[a]	14.2%[ab]
High school diploma	16.1%	19.9%	28.9%	11.3%
Some college	8.6%[d]	10.7%[d]	21.3%	37.5%[ab]
Bachelor's degree	0.0%[bcd]	24.6%[a]	30.6%[a]	36.0%[a]
Missing education level	0.0%	5.8%	2.7%	0.9%
Maternal age in years	30.8	31.1[d]	34.6	34.9[b]
Mother's employment				
Full time	11.3%[cd]	29.0%	35.7%[a]	36.5%[a]
Part time	17.2%	11.5%	6.4%	17.9%
Not employed	64.8%	56.3%	56.4%	44.7%
Missing	6.7%	0.5%	1.0%	0.0%
Household characteristics				
Partner/spouse lives in household	94.5%[d]	92.9%	97.9%[d]	77.6%[abc]
Total persons in household	4.5[b]	5.2[a]	5.3	4.5
Total siblings age 0-5 in household	0.6	0.5	0.4	0.5
Income-to-poverty ratio				
100% or below	41.5%[cd]	26.5%	14.5%[a]	14.8%[a]
101%-130%	16.7%	10.8%	13.4%[d]	3.9%
131%-185%	14.0%	8.8%	6.7%	6.2%

Table A1 *(continued)*

Descriptive characteristics	Children of Immigrants			Native (d)
	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	
Over 185%	6.7% [bcd]	41.5% [ad]	61.9% [a]	69.7% [ab]
Missing poverty ratio	21.1%	12.4%	3.5%	5.3%
Received welfare or food stamps	18.9%	8.7%	19.6%	9.9%
Received WIC	64.5% [bcd]	27.6% [ac]	2.1% [abd]	13.7% [ac]
Region of household				
Central	36.2%	18.1%	37.7%	22.8%
North	7.3% [bd]	27.1% [a]	19.9%	20.2% [a]
Los Angeles	30.3%	29.3%	28.4%	32.1%
Other southern counties	19.6%	24.6%	14.0%	23.0%
Other region	6.5%	0.9%	0.0%	2.0%
Unweighted N	93	199	129	579

SOURCE: RAND California Preschool Study household and provider survey data.

NOTES: Sample size is 1,000. All means are weighted. The sample sizes for the maternal age (17 observations missing), WIC (8 observations missing), total adults (1 observation missing), and total persons in household (1 observation missing) variables are slightly lower. – indicates no observations for that cell. Difference in mean is statistically significant at the 5 percent level of significance from [a]Isolated subgroup, [b]Non-Isolated subgroup, [c]English-speaking subgroup, or [d]Native subgroup.

Table A2.
California ECE arrangements and provider characteristics for four-year-olds by subgroup

	Children of Immigrants			Native
	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	(d)
ECE arrangements and preferences				
Child has nonparental care full time (30+ hours per week)	15.0%[cd]	37.1%	55.4%[a]	44.6%[a]
Characteristics are very or somewhat important in choosing arrangement				
Location	100%[d]	92.8%	99.5%[d]	90.3%[ac]
Cost	97.1%[d]	92.0%[d]	80.4%	78.0%[ab]
Reliability	100%	100%	100%	98.1%
Learning activities	100%	100%	99.0%	99.2%
Other kids	100%	100%	100%	98.2%
Hours/days open	100%[d]	94.1%	85.0%	96.3%[a]
Teacher education/training	100%	100%	97.0%	96.6%
Group size	98.5%[d]	92.9%	95.4%[d]	83.3%[ac]
Difficulty finding wanted arrangement:				
A lot	4.1%[d]	12.8%	19.4%	24.1%[a]
Some	2.8%[bcd]	22.7%[a]	17.5%[a]	16.5%[a]
A little	22.8%	20.8%	13.3%	14.9%
No difficulty	63.4%[bd]	34.0%[a]	44.8%	39.3%[a]
Feel there are good choices for care	85.8%	86.5%[d]	73.7%	73.3%[b]
Need care for:				
Evening	26.6%	16.4%	22.4%	15.7%
Night	6.1%	6.1%	8.6%	2.7%
Weekend	12.2%	9.9%	16.2%	8.6%
Child:adult ratio	5.4	7.3[acd]	4.7[b]	5.7[b]
Center teacher characteristics				
Race/Ethnicity				
White	9.5%[cd]	13.4%[cd]	53.5%[ab]	62.1%[ab]
Black	8.5%	0.4%	2.7%	6.7%
Hispanic	81.0%[cd]	48.2%	30.6%[a]	16.6%[a]
Other	0.9%[b]	38.0%[a]	13.2%	14.6%
Education level				
High school graduate or below	0.0%	11.6%	0.9%	4.3%
Some college	0.4%[cd]	21.7%	60.2%[a]	29.4%[a]
Associate's degree	42.4%	38.3%	17.8%	16.6%
Bachelor's degree or some post BA	38.9%	22.4%	15.5%	25.6%
Graduate or professional degree	18.3%	6.0%	5.6%	24.1%
Has early care and education Associate's degree or higher	41.2%	42.5%	26.2%	42.5%
Has Child Development Associate credential	53.1%	76.6%[cd]	29.8%[b]	25.1%[b]
Has California teacher credential	26.0%	47.2%[c]	8.0%[bd]	32.3%[c]
ELL noncredit hours				
0 hours	34.1%[c]	26.4%[cd]	92.3%[abd]	67.7%[bc]
1-5 hours	0.0%	8.9%	0.3%	4.4%
6+ hours	65.9%[c]	64.7%[cd]	7.5%[ab]	27.9%[b]
ELL credit hours				
0 hours	24.3%[bcd]	75.4%[a]	94.2%[ad]	72.4%[ac]
1-5 hours	2.6%	2.4%	0.1%	3.5%
6+ hours	73.1%[bcd]	22.2%[a]	5.8%[a]	24.1%[a]
Years experience	14.3	14.3	15.0	17.9
Teacher's primary language				
English only	97.3%	75.4%	97.6%	90.8%
Spanish alone or with English	2.4%	22.2%	2.2%	3.4%
Other languages or combination	0.3%	2.4%	0.2%	5.7%
Teacher's primary language with children				
English only	98.3%	75.6%	99.6%	97.1%
Spanish alone or with English	1.7%	24.4%	0.4%	2.7%
Other languages or combination	0.0%	0.0%	0.0%	0.2%

Table A2 *(continued)*

	Children of Immigrants			
	Isolated (a)	**Non-Isolated** (b)	**English-Speaking** (c)	**Native** (d)
Center and classroom characteristics				
Center type				
State Preschool Program	51.4%[cd]	36.6%[c]	0.2%[ab]	10.8%[a]
Head Start	28.6%	12.1%	0.5%	5.7%
Public school prekindergarten	11.3%	14.6%	4.9%	13.7%
Other	8.6%[cd]	36.8%[cd]	94.4%[abd]	69.8%[abc]
Days per week child is in center care	4.8[cd]	4.7[cd]	4.0[ab]	4.1[ab]
Hours per day child is in center care	3.5[d]	4.3	4.5	5.1[a]
Licensed by state	93.4%	97.5%	68.3%	83.6%
Nonprofit status	99.0%[cd]	77.5%	53.5%[a]	72.6%[a]
Any fee charged	24.0%[cd]	40.8%[c]	94.2%[abd]	70.3%[ac]
Offers sliding scale fee or need-based scholarships	16.4%[c]	5.3%[cd]	72.4%[ab]	43.7%[b]
Program provides				
Full day	30.2%	49.0%	57.3%	64.6%
Extended day	8.6%[bd]	39.0%[a]	30.8%	43.2%[a]
Evening	0.0%	0.0%	0.0%	2.4%
Weekend	0.0%	0.0%	0.0%	2.6%
Bilingual	44.8%	48.4%[c]	10.7%[b]	28.9%
% of children in group speaking language other than English	69.9[cd]	59.1[cd]	23.1[ab]	27.4[ab]
Uses research-based curriculum	51.7%	48.5%[c]	11.2%[bd]	48.3%[c]

SOURCE: RAND California Preschool Study household and provider survey data.

NOTES: All means are weighted. Information in the first panel is from the household survey using the household weight, and information from the other panels is from the provider survey using the provider weight. The unweighted sample size varies from 832 to 997 for the early care and education arrangements section. The unweighted sample size varies from 284 to 384 for the center teacher characteristics and center and classroom characteristics. Difference in mean is statistically significant at the 5 percent level of significance from [a]Isolated subgroup, [b]Non-Isolated subgroup, [c]English-Speaking subgroup, or [d]Native subgroup.

Table A3.
California center quality measures for four-year-olds by subgroup, ECERS-R and CLASS

| | Children of Immigrants | | | Native |
	Isolated	Non-Isolated	English-Speaking	Native
ECERS-R mean scores				
Space and furnishings subscale	4.4	4.0	4.4	4.7
Activities subscale	4.2	3.9	4.1	4.1
Combined ECERS-R score	4.3	3.9	4.2	4.4
CLASS mean domain scores				
Instructional support for learning	2.9	2.4	2.7	2.9
Emotional support	5.8	5.6	6.2	5.7
Classroom organization	5.2	5.1	5.6	5.2
Student engagement	5.5	5.7	6.0	5.8
Unweighted N	26	73	46	239

SOURCE: RAND California Preschool Study provider survey and observation data.

NOTES: Sample size is 384 children in the 4-year-old cohort who have provider survey information. Missing data are imputed using N=20 imputations and the Imputation by Chained Equations (ICE) method. Means are weighted. * indicates that the value is significantly different from that of the Isolated subgroup at the 5 percent level using a two-tailed test. ECERS-R = Early Childhood Center Environment Rating Scale - Revised; CLASS = Classroom Assessment Scoring System.

Appendix B: ECLS-B Data Description

The ECLS-B is a longitudinal data set collected by the National Center for Education Statistics (NCES). The baseline sample of approximately 10,700 out of 14,000 selected children was designed to be nationally representative of children born in the United States in 2001 with an over-sample of Asian and American Indian children, twins, and low and very low birth weight children.[7] The ECLS-B follows children from birth through kindergarten with data collection occurring when the child was 9 months of age (2001-02), 2 years of age (2003-04), approximately 4 years of age (2005-06, also known as the preschool wave), and at kindergarten entry in either 2006-07 or 2007-08.[8] The 9-month data collection also includes variables from infants' birth certificates. All five waves of data are presently available. For additional information on the ECLS-B, see the survey instruments available from NCES.[9]

Given that the broad motivations of the ECLS-B include understanding children's health status and care utilization, growth and development, transitions to child care and early education programs, and school readiness, these data are quite rich and appropriate for this study. In every wave of data collection, information was collected from a parental respondent, usually the mother. The parental respondent provided information on the types of regular nonparental care used and other early learning activities in the home such as frequency of reading to the child. Through the preschool data collection, the resident and/or nonresident father was also surveyed. Among family background characteristics, the ECLS-B contains information on the country of birth for the focal child's parents, the language spoken at home, the parents' English language proficiency, and the socio-economic characteristics of the household such as parental education, poverty status, and use of cash assistance or food stamps. Children were also assessed in terms of their cognitive development at each wave. When relevant in the two-year, preschool, and first kindergarten waves of data, information was collected from the home- and center-based caregivers providing regular care to the sampled children. Finally, during the 2-year and preschool waves, a subset of the sampled children was observed in their regular nonparental care and education settings to obtain objective assessments of care quality.

The strength of the ECLS-B data is that they provide the aforementioned detailed child, family, and early care provider information on children at different ages, including kindergarten, but the data have two limitations relevant to this study. First, we are not able to provide California state-level representative information because the sampling design does not allow this. Second, the data do not include children born outside the United States who attend preschool in the United States and will attend kindergarten here. We estimate that approximately 3 percent of four-year-old children were born outside the United States, based on the percentage found in the Early Childhood Longitudinal Study – Kindergarten Class of 1998-99. Even with some growth in immigration between 1998 and 2006, a relatively small population is excluded from the ECLS-B sample.

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7 The reported sample sizes have been rounded to the nearest 50 per NCES restrictions regarding disclosure of restricted-use data. However, the analyses and statistics presented in the tables and text are generated using all observations in each subsample.

8 Kindergarten data were collected at two points in time. In the fall of 2006, information was collected from all participating children, approximately 75 percent of whom were in kindergarten or higher. In the fall of 2007, data were collected from the remaining 25 percent of participating children who had not yet entered kindergarten, as well as children who were repeating kindergarten in the 2007-08 school year.

9 Survey instruments are available from NCES at http://nces.ed.gov/ecls/Birth.asp.

To address the first few research questions related to descriptive characteristics and use of nonparental care, data from the preschool (wave 3) and the first kindergarten wave (wave 4) are used unless noted. For children entering school in wave 4 of the data (2006-07), we extract preschool information from the preschool wave (wave 3). For the remaining children who enter school in wave 5 of the data (2007-08), preschool information is from the wave 4 data collection. To address the final research question about the influence of preschool use on school readiness outcomes, we include kindergarten outcomes from 2006-07 (wave 4) or 2007-08 (wave 5) depending upon when the child entered school for the first time. To summarize, preschool information for children who entered school in 2006-07 would be from the preschool wave of data and their kindergarten outcomes from the 2006-07 kindergarten data. Preschool information for children entering school in 2007-08 was extracted from the 2006-07 kindergarten wave and their kindergarten outcomes were collected in the final wave of data collection.

Variables

The complete list of variables from the ECLS-B and their specifications is available in Tables B1 through B3. The following text highlights key variables and those requiring explanation.

Nativity and language subgroups

In the ECLS-B, all sampled children are native born. We describe four subgroups of children based on parental nativity and language: 1) parents are U.S. born ("Native"), 2) at least one parent is an immigrant and the primary language spoken at home is English ("English-Speaking"), 3) at least one parent is an immigrant , primary home language is non-English, but at least one parent speaks English pretty well or very well ("Non-Isolated") [10], and 4) at least one parent is an immigrant , primary home language is non-English, and parents speak English not very well or not at all (linguistically isolated, or "Isolated").[11] We base our subgroup classifications on both parents' nativity and language fluency for two-parent (or guardian) households, and on a single parent's characteristics in single-parent (or guardian) households. Both of the measures of language use at home and proficiency speaking English are from the 9-month wave of data.

ECLS-B administered English and Spanish-language household surveys, and provisions were made for respondents speaking other languages by using an interpreter to interview those families. Only one parent survey was not completed owing to language difficulties.

Early care and education arrangements

The use of any nonparental care is coded as 1 if the parent reported that the child had one or more regular nonparental care arrangements during the year before school entry. Home-based care arrangements include relative care or non-relative care in the home or another's home, and center-based care arrangements include Head Start, public school prekindergarten, and other types of center care. The primary nonparental care type

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[10] The wording of the question in the ECLS-B is "How well do you speak English?" Respondents could select from very well, pretty well, not very well, and not well at all.

[11] Our Isolated definition differs somewhat from the U.S. Census definition of linguistically isolated households. The Census defines linguistically isolated households as ones in which no one 14 years old and over speaks only English or speaks a non-English language and speaks English "very well." We rely solely on parents' language due to data limitations on all household members' English fluency, and we do not include parents speaking English "well" in our Isolated group. Sensitivity tests that include speaking English "well" in the Isolated group produced qualitatively similar results.

is the type of care the child spent most of his or her time in on a regular basis. The use of any center-based care, including Head Start, is coded as 1 for those who are currently in center-based care during the year before school entry.[12] There is also a subset of questions answered by the parents regarding whether they had difficulty finding care and whether they believed they had good choices. In addition, they were asked to rate the importance of certain care and provider characteristics.

Kindergarten assessments

Kindergarten assessments of reading and mathematics skills are conducted typically in the early part of the kindergarten year with most children in the ECLS-B being assessed before January. The assessments were developmentally appropriate for children approximately four to six years old. Almost all children were assessed in English.[13] The reading examination assessed children's early reading, emergent literacy, and English language skills. Examples of specific skills tested include letter recognition, letter sound knowledge, recognition of simple words, phonological awareness, receptive and expressive vocabulary knowledge, and knowledge of print convention. The mathematics assessment tested children's skills in number sense, counting, operations, geometry, pattern understanding, and measurement. Standardized reading and mathematics scores were created with a mean of zero and a standard deviation of 1 using the Item Response Theory (IRT) scale scores provided by the ECLS-B.[14]

Child, maternal, household, and state variables

We include several child, maternal, household, and state policy variables in our regression models and examine others in our descriptive analysis. These variables are selected for inclusion in our study based on the previous literature and on the expected relationship of the variable to parents' child care decisions or to a child's performance. Several of these control variables warrant further explanation. First, the variable indicating that the child is part of a multiple birth is included because the ECLS-B over-samples twins and because having a multiple birth may influence child care choices. The variable capturing the number of times at age 2 years in a typical week the parental respondent or another family member reads to the child is intended to capture parental investment. Whether the parent believes speaking English is an important skill to have upon entering kindergarten is included to represent factors that may be contributing to types of child care decisions.[15] With regard to the maternal employment status variable, full-time work is defined as 35 or more hours per week and working less than 35 hours but more than zero is classified as part-time work. Finally, receipt of cash assistance or food stamps or participation in WIC is included to capture access to and knowledge of government programs.

[12] Information from the following two survey questions is used to create this variable. "Now I want to ask you about child care centers, nursery schools or pre-kindergarten programs {CHILD/TWIN} may attend, not including Head Start programs. Is {CHILD/TWIN} now attending a day care center, nursery school, preschool, or pre-kindergarten program on a regular basis?" "Head Start is a federally sponsored preschool program primarily for children from low-income families. Is {CHILD/TWIN} currently attending Head Start on a regular basis?"

[13] Children were screened using 15 items from the Pre-Language Assessment Scales to determine whether they could be assessed using the English language. If they answered at least one of the 15 items correctly, they were assessed in English. Because of this rather low bar, only a small number of children were unable to be assessed in English.

[14] Because assessments were adaptive, not all children received all of the items on the exam. Hence, the ECLS-B computed scaled scores based on the full-set of test items using IRT. These scaled scores represent the number of items children would have likely answered correctly if they were given all of the questions (85 for reading and 71 for math).

[15] The ECLS-B question is "Now I'm going to ask you how important you think it is for any child to know or do certain things to be ready for kindergarten. Would you say essential, very important, somewhat important, not very important, or not at all important? How important do you think it is that a child speaks English." A response of "essential" or "very important" is coded as important.

Another variable we examine is the scale score from direct assessment of the child. Specifically, the cognitive scale score measured at age 2 is included in our regression models to capture the developmental status of the child, which parents may factor into their decision making on the type of care arrangement to use at age 4. The child's cognitive development is measured through the Bayley Short Form-Research Edition (BSF-R) Mental Scale, which was designed for use in the ECLS-B. The BSF-R is adapted from the Bayley Scales of Infant Development, Second Edition (BSID-II) (Bayley, 1993), which is a standardized assessment of children's cognitive and physical development from birth to 42 months of age. The BSF-R consists of a cognitive scale (31 items) to directly assess children's early cognitive and language ability by tapping into items regarding early communication skills, expressive and receptive vocabulary, listening comprehension, and early problem solving skills. The cognitive score ranges from 0 to 178. In order to preserve sample size, we created quartiles of children's scores on this assessment and include a missing indicator.

In our regressions examining use of nonparental care, we also examine indicators of state policies related to child care supply and affordability. We include variables for the percentage of four-year-old children enrolled in a state preschool program and the percentage of four-year-olds enrolled in Head Start within the state to capture the supply of the two primary publicly subsidized early care and education programs. Both variables are taken from the National Institute for Early Education Research's (NIEER) 2006 annual state preschool yearbook (Barnett et al., 2006). Measurement occurred for children considered to be four years old during the 2005-2006 school year, so the state enrollment percentages are closely aligned with the timing of the ECLS-B four-year-old cohort, most of whom were surveyed in 2005-2006. We also include two variables to capture child care subsidy and price levels for families in each state. The first is the income eligibility limit for child care assistance for a family of three as a percent of state median income, as reported for fiscal year 2006-2007 in state Child Care and Development Fund plans (Barnett et al., 2006). The second is the average price of care for a preschool-age child in center-based care as a percentage of state median two-parent income. Data were collected through a nationwide survey by the National Association of Child Care Resource & Referral Agencies (NACCRRA) in 2006 in which state resource and referral networks reported the average annual fees for center-based child care for a four-year-old child (NACCRRA, 2007).

In our regressions examining use of higher-quality care (Table D5), we include six additional state policy variables in order to capture factors specifically associated with center-based care quality. These variables include 2005 state-level child care licensing requirements for the following: maximum staff:child ratio for four-year-olds; flag for whether a state regulates maximum group size for four-year-olds; maximum group size (coded as actual number or zero if no group size regulation in state); center director must have a minimum qualification of a Child Development Associate (CDA) credential; center teacher must have a minimum qualification of completing child care vocational training program, early childhood education clock hours, or CDA credential; and the state requires at least one teacher in the program or class to be qualified at a higher level (master teacher). Information is collected from the National Association for Regulatory Administration's (NARA) 2005 Child Care Licensing Study (NARA, 2006) and its associated state data profiles available online at http://www.naralicensing.org/2005_Licensing_Study.

Early care and education characteristics

As part of the Early Care and Education Provider (ECEP) Survey, home-based and center-based caregivers were asked to report about their characteristics (e.g., education, years of experience, and race/ethnicity) and about the care provided (e.g., care type and organization sponsorship). The ECEP was a telephone survey conducted with the provider who cared for the child the most amount of time. In the few cases that a child

spent an equal amount of time in two or more types of care, the care provider was randomly selected to participate in the survey.

In addition to the ECEP Survey, a subset of centers was randomly selected to participate in the direct observation portion of the ECLS-B.[16] The visit included administration of the ECERS-R, which is a tool for capturing quality in center-based classrooms serving preschool-age children ages 30 months or older. The ECERS-R captures quality in the following domains: space and furnishings, personal care routines, language-reasoning, activities, interaction, program structure, and parents and staff. Because the ECERS-R was only administered in the preschool wave, children who did not begin kindergarten until 2007-08 are missing ECERS-R data. The ECERS-R consists of 43 items; however, six items related to staff and parents were omitted for the ECLS-B. Included with the ECLS-B are the total scale score and subscale scores, and means for these scores are listed in Table B3. Each ECERS-R scale has a minimum of 1, representing inadequate quality, and a maximum of 7, representing excellent quality.

In our regression analyses, we measure quality using the total ECERS-R score and a teaching and interactions subscale score, which is intended to capture process quality. In some analyses, we code high-quality care as equal to 1 if the ECERS-R score is five or above. Center quality is typically divided into structural and process dimensions. Some research suggests that an ECERS-R subscale including items measuring teaching activities and teacher interactions may be a somewhat better indicator of settings associated with cognitive gains (Howes et al., 2008). Thus, we also replicated this Teaching and Interactions (T&I) subscale for the national data where we had all measures available. The T&I score was created by the authors following guidelines for inclusion of 11 items reported in Clifford et al. (2005) to include ratings for items such as staff-child interactions, informal use of language, interactions among children, encouraging children to communicate, and using language to develop reasoning skills.

Analysis Samples

In order to address our research questions, several analysis samples were created. The analysis samples used to address the first few research questions that relate to descriptive characteristics and use of nonparental care primarily rely on the third and fourth waves of data. The analysis samples used to address the final research question also include data on kindergarten outcomes from the final two waves of data collection. The first general guideline followed in creating each analysis sample was that an observation needed valid information for all variables with the exception of birth weight, age two cognitive score, mother's employment, and size of residential area, for which we included missing indicators. To preserve sample, we included missing data indicator variables for covariates where information is missing at 1.5 percent or higher. In the preschool analysis, we also excluded those who are missing information on when they entered school.

The kindergarten sample uses the same guidelines with some additions. Here we describe exclusions from the kindergarten sample with the approximate number of children excluded in parentheses. First, children who are missing information on their type of care arrangements or timing of entry into kindergarten are excluded, including children who were not surveyed in the kindergarten wave due to attrition (3,800). Children who did not enter kindergarten in either 2006-07 or 2007-08 are excluded (300). This group consisted of children who either went straight to first grade or were being homeschooled. Children who

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[16] Only English- and Spanish-speaking child care providers were eligible for observation.

were redshirted (i.e., parents opted for the child to start kindergarten in 2007-08 instead of 2006-07 when first eligible) are also excluded, as well as those that are missing information on this decision (300). Finally, we excluded children who had missing values for variables for which we did not create indicators, including parental nativity and language (1,350). For rounded sample sizes associated with each analysis and ECLS-B weights applied, please refer to the corresponding tables in Appendix D.

A significant exclusion criterion is the presence of a resident father survey from which to identify a father's language and nativity status in a two-parent household. In our descriptive statistics and regressions predicting use of nonparental care, we use a weight that adjusts for missing information from the resident father interview. In our regressions for kindergarten skills, the kindergarten wave weight we use does not adjust for that. Thus, we ran a regression to examine whether certain child or family characteristics are associated with being excluded from our regressions because of missing data among children who were in the kindergarten wave of data collection. We find that black children are less likely than white children to be excluded, older children are more likely to be excluded (perhaps because we exclude children who redshirt), and children in the West region are more likely to be excluded than children in other regions. Other child race/ethnicities, gender, maternal education, and household poverty are not associated with being excluded from our sample.

Table B1.
ECLS-B child and household descriptive characteristics in year before kindergarten by subgroup

	Children of Immigrants			Native (d)
	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	Native (d)
Early care and education arrangement				
Parental care only	28.8%[cd]	20.6%	16.3%[a]	14.9%[a]
Any nonparental care	71.2%[cd]	79.4%	83.7%[a]	85.1%[a]
Any center-based care	59.8%[bcd]	72.2%[a]	75.2%[a]	77.9%[a]
Primary nonparental care				
Relative care	9.8%	8.7%	8.6%	10.0%
Non-relative care in child's home	0.8%	0.6%	2.4%	1.6%
Non-relative care in another home	4.7%	1.7%[d]	5.3%	5.7%[b]
Center-based care	55.1%[bcd]	65.5%[a]	66.5%[a]	66.1%[a]
Multiple care arrangements (none primary)	0.8%	2.9%	0.9%	1.6%
Child characteristics				
Age in months	56.3[c]	55.6	55.2[a]	55.6
Race/ethnicity				
White	1.9%[bcd]	10.7%[acd]	39.1%[abd]	74.2%[abc]
Black	3.2%[cd]	3.7%[cd]	9.5%[ab]	10.2%[ab]
Hispanic	89.6%[bcd]	65.5%[acd]	34.3%[abd]	10.7%[abc]
Other	5.3%[bc]	20.1%[ad]	17.2%[ad]	4.9%[bc]
Asian	5.1%[bd]	19.6%[ad]	7.1%[ad]	0.2%[bc]
Female gender	42.3%	48.4%	47.8%	49.3%
Birth weight				
Low birth weight	4.5%[d]	5.9%	7.5%	7.1%[a]
Normal birth weight	93.1%	93.8%[d]	92.3%	91.6%[b]
Missing birth weight	2.5%	0.3%[d]	0.2%[d]	1.3%[bc]
Multiple birth	1.9%[d]	2.0%[d]	2.6%[d]	3.7%[abc]
Cognitive score at two years of age				
Quartile 1 (lowest)	30.1%[cd]	29.3%[cd]	19.5%[abd]	13.0%[abc]
Quartile 2	27.5%[cd]	28.0%[cd]	16.5%[ab]	19.5%[ab]
Quartile 3	17.6%[d]	18.9%[d]	26.7%	26.9%[ab]
Quartile 4 (highest)	11.6%[cd]	16.7%[cd]	33.0%[ab]	34.3%[ab]
Missing score	13.2%[cd]	7.1%	4.3%[a]	6.2%[a]
Maternal characteristics				
Mother's education				
Less than high school diploma	58.6%[bcd]	20.2%[acd]	9.7%[ab]	7.7%[ab]
High school diploma	29.4%	27.0%	22.1%	26.6%
Some college	7.4%[bcd]	24.1%[acd]	33.7%[ab]	33.3%[ab]
Bachelor's degree	4.5%[bcd]	28.7%[a]	34.4%[a]	32.4%[a]
Maternal age in years	31.8[cd]	32.4[c]	34.0[ab]	33.1[a]
Mother's employment				
Full time	36.0%	36.8%	44.9%	39.3%
Part time	12.0%[cd]	13.8%[d]	21.3%[a]	22.4%[ab]
Not employed	51.8%[c]	49.1%[cd]	33.8%[ab]	37.8%[b]
Missing employment information	0.2%	0.4%	0.1%[d]	0.5%[c]
Household characteristics				
Partner/spouse lives in household	94.8%[d]	92.6%[d]	89.9%	86.5%[ab]
Total persons in household	5.1[bcd]	4.7[ad]	4.5[a]	4.5[ab]
Total siblings age 0-5 in household	1.3	1.3	1.3	1.3
Income-to-poverty ratio				
100% or below	48.0%[bcd]	23.3%[acd]	11.2%[ab]	15.7%[ab]
101%-130%	24.2%[bcd]	10.0%[a]	6.7%[a]	6.9%[a]
131%-185%	18.8%[d]	18.1%[d]	11.3%	12.1%[ab]
Over 185%	9.0%[bcd]	48.5%[acd]	70.7%[ab]	65.3%[ab]
Received welfare or food stamps	18.7%	11.7%[d]	11.3%[d]	21.7%[bc]

	Children of Immigrants			Native (d)
	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	
Received WIC	57.4%[bcd]	41.0%[acd]	22.8%[ab]	25.1%[ab]
Frequency of reading to child at age two				
Daily	16.2%[bcd]	33.4%[acd]	55.7%[ab]	55.6%[ab]
3 to 6 times per week	20.4%	23.5%	22.1%	25.3%
1 to 2 times per week	50.5%[cd]	40.5%[cd]	19.3%[ab]	17.2%[ab]
Zero times per week	13.0%[bcd]	2.6%[a]	2.9%[a]	2.0%[a]
Believes knowing English is important skill	85.0%	82.7%[d]	82.9%[d]	89.8%[bc]
Region of household				
Northeast	10.7%[c]	17.7%	23.5%[a]	16.4%
Midwest	15.4%[d]	10.9%[d]	12.9%[d]	26.2%[abc]
South	36.5%	37.4%	35.3%	38.0%
West	37.4%[d]	34.0%[d]	28.2%[d]	19.4%[abc]
Urbanicity				
City: population at least 50,000	83.0%[bd]	92.8%[acd]	77.2%[bd]	62.9%[abc]
Town: population between 2,500 and 49,999	8.8%	4.0%[cd]	9.2%[b]	13.0%[b]
Rural: population less than 2,500	2.6%[cd]	1.7%[cd]	9.7%[abd]	21.0%[abc]
Missing urbanicity	5.6%	1.5%	3.8%	3.0%
Child test scores				
Math kindergarten score	-0.512[bcd]	0.055[a]	0.172[a]	0.188[a]
Reading kindergarten score	-0.565[bcd]	0.022[a]	0.217[a]	0.120[a]
Unweighted N	250	600	450	3200

SOURCE: ECLS-B.

NOTES: Means are weighted using W4123DO. Percent of children who are Asian is a subset of percent of children with other race/ethnicity. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data. The total sample size for kindergarten test scores is approximately 250 children smaller than the sample size reported. Difference in mean is statistically significant at the 5 percent level of significance from [a]Isolated subgroup, [b]Non-Isolated subgroup, [c]English-Speaking subgroup, or [d]Native subgroup.

Table B2.
ECLS-B ECE arrangements and provider characteristics in year before kindergarten by subgroup

	Children of Immigrants			
	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	Native (d)
ECE arrangements and preferences				
Characteristics are very or somewhat important in choosing arrangement				
Location	96.7%[d]	92.0%	93.9%	93.2%[a]
Cost	95.7%	96.3%	95.2%	95.4%
Flexible hours	96.6%[bcd]	87.2%[acd]	78.6%[ab]	80.1%[ab]
Small class size	98.2%[b]	94.8%[ac]	98.1%[b]	96.8%
Prepares for kindergarten	97.9%	96.3%	96.8%	97.0%
Caregiver speaks English	98.9%[bc]	96.1%[a]	92.7%[ad]	98.5%[c]
Caregiver is same race	61.8%[bcd]	31.9%[acd]	18.9%[ab]	18.4%[ab]
Caregiver speaks same native language as child	81.1%[bcd]	51.5%[acd]	70.9%[abd]	91.1%[abc]
Knew caregiver	66.8%[bcd]	48.3%[acd]	34.3%[ab]	36.6%[ab]
Difficulty finding wanted arrangement:				
A lot	6.2%	6.1%	10.7%	7.1%
Some	5.1%[bcd]	15.4%[a]	14.4%[a]	13.3%[a]
A little	12.7%	12.2%	14.5%	11.4%
No difficulty	41.2%[d]	42.9%[d]	45.9%[d]	54.9%[abc]
Have not found or looked for care	34.8%[bcd]	23.4%[acd]	14.6%[ab]	13.3%[ab]
Feel there are good choices for care	47.9%[bcd]	63.4%[acd]	74.3%[ab]	72.1%[ab]
Cannot rate choices of care because did not look for care	31.0%[bcd]	17.2%[ad]	11.8%[a]	10.1%[ab]
Unweighted N	250	600	450	3150
Primary caregiver characteristics				
Race/Ethnicity				
White	33.0%[bcd]	49.6%[acd]	65.0%[abd]	80.1%[abc]
Black	10.2%	8.8%	6.5%	10.0%
Hispanic	52.9%[bcd]	34.5%[acd]	22.1%[abd]	6.3%[abc]
Other	3.8%	7.1%	6.3%	3.6%
Education level				
Bachelor's degree or some post- BA	52.6%	59.9%[d]	61.3%[d]	50.0%[bc]
Has early care and education associate's degree or higher	48.8%	59.5%[d]	51.5%	49.2%[b]
Has Child Development Associate credential	32.8%	36.1%[cd]	20.8%[b]	24.5%[b]
Years experience	11.3	12.1	12.2	13.0
Teacher's primary language is English	65.1%[cd]	70.4%[cd]	84.0%[abd]	96.4%[abc]
Teacher's primary language with children is English	67.9%[bcd]	88.3%[ad]	93.5%[ad]	99.1%[abc]
Hours per week of care provided to child	22.5	22.6	21.9	21.6
Days per week of care provided to child	4.7[cd]	4.6[cd]	4.4[ab]	4.2[ab]
Care characteristics				
Center type				
Head Start	18.3%[cd]	14.7%[cd]	6.4%[ab]	7.8%[ab]
Public school prekindergarten	37.0%[cd]	26.2%[cd]	14.4%[ab]	14.3%[ab]
Other	25.0%[bcd]	50.7%	61.6%[a]	58.5%[a]
Not applicable (non-center-based provider)	19.6%[b]	8.4%[acd]	17.7%[b]	19.3%[b]
Child to adult ratio	5.7	6.5	6.49	6.1
Unweighted N	150	350	300	2200

SOURCE: ECLS-B.

NOTES: Means are weighed using W4123DO for ECE arrangements and preferences section and W4234J0 for the caregiver and care characteristics. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data. Difference in mean is statistically significant at the 5 percent level of significance from [a]Isolated subgroup, [b]Non-Isolated subgroup, [c]English-Speaking subgroup, or [d]Native subgroup.

Table B3.
ECLS-B center quality measures in year before kindergarten by subgroup, ECERS-R

| | Children of Immigrants | | | Native (d) |
	Isolated (a)	Non-Isolated (b)	English-Speaking (c)	
Total score	4.5	4.8	4.6	4.5
Learning activities	4.0	4.2	4.0	3.8
Furnishing and display	4.6	5.0	4.7	4.6
Interaction	5.5	5.7	5.9[d]	5.5[c]
Personal care routines	3.9	4.2[c]	3.6[b]	3.9
Program structure	4.7	5.1	5.0	4.9
Listening and talking	4.9	5.2	5.1	5.0
Teaching and interactions subscale	5.2	5.6	5.7	5.4
Unweighted N	50	100	50	500

SOURCE: ECLS-B.

NOTES: Means are weighted using W43P0. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data. Difference in mean is statistically significant at the 5 percent level of significance from [a]Isolated subgroup, [b]Non-Isolated subgroup, [c]English-Speaking subgroup, or [d]Native subgroup.

Appendix C: Methods

For the first research question, describing differences between the four subgroups in terms of their use of nonparental care, and child, maternal, and household characteristics, we perform t-tests to determine whether the weighted mean for each subgroup is statistically different from each of the other subgroups using a significance level of 0.05. For complete descriptive statistics, including sample sizes associated with each analysis and specific ECLS-B weights applied, please refer to Tables A1-A3 for California data and Tables B1-B3 for U.S. data.

Analysis of Use of Nonparental Care

For our second research question, we use weighted probit regression models to analyze which child and family factors are associated with the use of any nonparental care the year before school entry (sample size is 953 for California sample and 4,950 rounded for U.S. sample). Then, conditional on using nonparental care, we look at which factors are associated with using center-based care, and also using home-based care as primary care arrangement compared to center-based care (sample size is 811 for California and 4,250 rounded for U.S. sample). Next, we look at which factors are associated with using Head Start care[17] compared to other center care, conditional on using nonparental care and having a household income at or below 130 percent of the federal poverty threshold (sample size is 850 rounded for U.S. sample). We then examine factors related to using higher-quality center-based care conditional on using center-based care in the U.S. sample only (sample size is 900 rounded). Using both datasets for the first two research questions allows us to identify how California prekindergarten experiences compare to national experiences. Our primary model for the second objective is shown in Equation 1:

$$Y_i = \alpha + \beta\, LG_i + \gamma\, CH_i + \delta\, MT_i + \mu HH_i + f ST_i + \varepsilon_i \qquad\qquad (1)$$

Y_i represents the dependent variable for child i; LG_i includes three categorical variable indicating the child's parent's nativity-language subgroup; CH_i is a vector of child characteristics; MT_i is a vector of the child's maternal characteristics; HH_i is a vector of the child's household characteristics, and ST_i is a vector of state-level child care policies in the models using national data. ε_i is an error term. We recognize that issues of child care supply are also relevant for use of nonparental care, but supply data are not readily available to include in this study. Marginal effects are calculated at the means of the independent variables. All ECLS-B probit models adjust standard errors to account for children living in the same state. All probit model estimates are weighted using provided weights

Sensitivity analyses

We conducted several sensitivity analyses for our regressions. First, we created alternate coding for the Isolated and Non-Isolated subgroups—Isolated if parents do not speak English very well, Non-Isolated if parents speak English very well. Results for Isolated children were qualitatively similar. We also included state fixed effects in linear probability models using the national data, and results were very similar to our probit models without state fixed effects. In the regressions predicting use of high-quality center care using

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[17] Head Start status is reported by the center director.

the national data, we explored other state-level variables related to quality, such as the NIEER State Preschool Yearbook benchmarks, separately and with composite measures. Results were unchanged from models using the NARA state policy variables.

Analysis of School Entry Skills

For our third research question, we used ECLS-B data in weighted ordinary least squares (OLS) regressions to examine the associations between center-based care use and kindergarten cognitive skills for all children and for the four subgroups separately. We cannot use the California data for this objective because it is not longitudinal and no developmental assessments were collected. Dependent variables include a child's score on two direct cognitive assessments measuring early reading and mathematics skills.

Our goal is to estimate the relationship between early care and education participation at time t - 1 (in the year before kindergarten entry) and child developmental outcomes, Y, at time t (at kindergarten entry):

$$Y_{it} = \alpha + \beta\ ECE_{i(t-1)} + \gamma\ X_{i(t-1)} + \varepsilon_{it} \qquad\qquad (2)$$

Like previous studies, the model includes a set of rich child, maternal, and household control variables to capture as many of the observable factors that may influence child development beyond participation in an early care and education program. Some of those factors may be fixed (e.g., child gender or race/ethnicity), while other factors may vary through time and are measured as of time $t - 1$ or earlier.[18] However, parents do not randomly choose to use center-based care, and this could result in potential selection bias affecting our results. Though we control for a set of child and family characteristics thought to be associated with choice of care and cognitive skills, these findings should be viewed as correlational. Estimates are weighted using ECLS-B–provided weights. All regression models adjust standard errors to account for children living in the same state.

Finally, we explored the relationship between center-based care quality and the same child outcomes examined in Equation 2. Unlike previous studies using the ECLS-K, the ECLS-B has the advantage of observational measures of early care and education program quality with which to examine the relationship between quality and child-readiness outcomes, albeit for the smaller sample of children where such observational measures were collected. Since quality is only relevant for those children participating in early care and education, we focused on the subsample of children in center-based care and estimated a regression of the following form:

$$Y_{it} = \alpha + \beta\ QUALITY_{i(t-1)} + \gamma\ X_{i(t-1)} + \varepsilon_{it} \qquad\qquad (3)$$

where we use a binary indicator of whether the ECERS-R score or the teaching and interactions ECERS-R subscale are five or above as our measure of early care and education program quality. In the same way that selectivity may be a concern in estimating Equation 2, families are also expected to choose early care and education programs based on various dimensions of quality, which would bias the estimated coefficient if Equation 3 is estimated by OLS. Thus, we discuss results based on OLS estimation, which we view as descriptive given the potential for selectivity bias.

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[18] We also include one covariate from the kindergarten year, the number of months since September at the time of the kindergarten assessment, to capture exposure to the kindergarten curriculum that could affect scores but is not attributable to prekindergarten care use.

Sensitivity analyses

We conducted several sensitivity analyses for our regressions predicting kindergarten cognitive skills. We included state fixed effects in our models, and results were unchanged. Second, we limited our sample in all subgroups to children at or below 185 percent of the poverty level, which more closely matches our Isolated children. As we expected, the coefficient for the Native subgroup increased and narrowed the difference between Isolated and Native effects, but Isolated remained larger. We also examined care type as a categorical variable for parent-only, home-based, and center-based rather than as a binary variable. We believe that the three-category variable limited cell sizes for our smaller subgroups to an extent that prevented precise estimates, so these findings (not shown) should be viewed as suggestive. It may be that for Isolated and Non-Isolated subgroups, the effects of center participation compared to any type of non-center care are driven more by differences between center-based and home-based care than by differences in center-based and parent-only care.

We also examined the issue of potential selection bias. Estimation of Equation 2 using Ordinary Least Squares regression may produce biased estimates if unobserved factors in the error term, ε_{it}, that affect child developmental outcomes also affect the decision to participate in nonparental care or an early learning program prior to school entry. One strategy for producing unbiased estimates is to use IV estimation. This requires identifying one or more variables that determine early care and education participation, but otherwise do not directly determine the developmental outcomes, Y. In a working paper (Cannon, Jacknowitz, & Karoly, 2012), we use a set of four state-level variables, described in Appendix B, as instruments in a first-stage equation that predicts early care and education participation using a linear probability model. Equation 2 is then estimated in a second-stage equation. We examine Isolated and Native subgroups only. Results from those models suggest that OLS results may underestimate the relationship between center-based care and kindergarten skills. However, we do not find significant differences between effects for Isolated and Native children, suggesting these subgroups of children receive similar benefits from center-based care use.

Appendix D: Regression Results

Use of Nonparental and Center-Based Care

Table D1 presents full regression results for the California and U.S. models examining differences between use of any center-based care and no center care use in the year before school entry. This is an exemplar of the full set of covariates in subsequent models.

Table D2 presents summary results for subgroup effects for California and U.S. models examining differences between use of any center-based care and use of only home-based care among users of regular nonparental care in the year before school entry.

Table D3 presents summary results for subgroup effects for U.S. models examining differences between use of Head Start care and use of other center-based care among low-income users of regular center-based care in the year before school entry. Measurement of Head Start use is based on center director report. The California model included too few Isolated children using Head Start care to produce reliable results, so we report results only from the U.S. sample.

Table D4 presents summary results for subgroup effects for California and U.S. models examining differences between use of home-based care as the primary care type and center-based care as primary care type among users of regular nonparental care in the year before school entry.

Table D5 presents summary results for subgroup effects for the U.S. model examining differences between use of higher-quality care and use of lower-quality care among users of center-based care in the year before school entry. Dependent variables include ECERS-R total score of 5 or above, indicating "good" quality, and ECERS-R Teaching and Interactions score of 5 or above.

Table D1.
Full model exemplar: Use of any nonparental care year before school entry

	California	U.S.
	Marginal Effect (Standard Error)	Marginal Effect (Standard Error)
Nativity-language subgroup		
Isolated immigrant parent (omit Native)	0.047	0.018
	(0.080)	(0.024)
Non-Isolated immigrant parent	0.040	-0.010
	(0.073)	(0.020)
English-Speaking immigrant parent	0.001	-0.015
	(0.087)	(0.040)
Child characteristics		
Child race/ethnicity		
Hispanic (omit white)	0.094	0.000
	(0.072)	(0.019)
Black	0.013	0.038
	(0.096)	(0.027)
Other	-0.106	-0.010
	(0.108)	(0.032)
Female gender	0.060	-0.027+
	(0.046)	(0.014)
Age in months at preschool survey		0.005**
		(0.002)
Birth is twin/multiple		0.036+
		(0.017)
Maternal characteristics		
Maternal education level		
Less than high school degree (omit Bachelor's degree)	-0.130	-0.294**
	(0.108)	(0.048)
High school degree	-0.051	-0.159**
	(0.101)	(0.033)
Some college	-0.066	-0.089**
	(0.090)	(0.025)
Mother's age in years	0.005	0.002**
	(0.003)	(0.001)
Household characteristics		
Household income-to-poverty ratio		
100% or below (omit Over 185%)	-0.107	-0.064*
	(0.114)	(0.030)
101%-130%	-0.122	-0.119**
	(0.124)	(0.042)
131%-185%	0.023	-0.081**
	(0.087)	(0.031)
Ratio missing	-0.282*	
	(0.157)	
Partner/spouse lives in household	-0.175**	-0.054*
	(0.039)	(0.020)
Total persons in household	-0.038**	-0.016**
	(0.016)	(0.005)
Total children age 0-5 in household	0.127**	-0.010
	(0.043)	(0.012)
Received welfare or food stamps	-0.093	0.023
	(0.102)	(0.024)
Received WIC	-0.151+	0.007
	(0.102)	(0.023)
California regions		
Central counties (omit North)	0.139*	
	(0.054)	
Los Angeles County	0.055	
	(0.066)	

	California	U.S.
Other southern counties	-0.038	
	(0.079)	
Other counties	0.140+	
	(0.043)	
Read to child 3 to 6 times per week (omit Read to child daily)		-0.009
		(0.017)
Read to child 1 to 2 times per week		0.008
		(0.021)
Read to child zero times per week		-0.035
		(0.059)
Believes knowing English is important skill		0.001
		(0.023)
U.S. regions		
Northeast (omit West)		0.079**
		(0.017)
Midwest		0.045*
		(0.021)
South		0.000
		(0.026)
Urbanicity		
Town: pop. between 2,500 & 49,999 (omit City 50,000 plus)		0.070**
		(0.016)
Rural: pop. less than 2,500		-0.029+
		(0.016)
Urbanicity missing		-0.071
		(0.054)
State-level variables		
Percent enrolled in state preschool		0.164**
		(0.058)
Percent enrolled in Head Start		0.026
		(0.210)
Child care subsidy income eligibility as percent SMI		0.123*
		(0.060)
Average center price as percent SMI		-0.520
		(0.439)
Unweighted N	953	4,450

SOURCES: RAND California Preschool Study and ECLS-B.

NOTES: Estimates are marginal effects from probit models. Robust standard errors are in parentheses—U.S. model clusters standard errors at the state level. Regressions are weighted. Not all covariates in U.S. model are available in the California data. Unweighted U.S. sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data. SMI = state median income.

** $p<0.01$, * $p<0.05$, and + $p<0.10$

Table D2.
Use of any center-based care among users of nonparental care year before school entry

	California	U.S.
	Marginal Effect (Standard Error)	Marginal Effect (Standard Error)
Isolated immigrant parent (omit Native)	-0.046	0.012
	(0.086)	(0.028)
Non-isolated immigrant parent	-0.150+	0.015
	(0.110)	(0.015)
English-speaking immigrant parent	-0.144	-0.003
	(0.111)	(0.022)
Unweighted N	811	3,800

SOURCES: RAND California Preschool Study and ECLS-B.

NOTES: Estimates are marginal effects from probit models. Robust standard errors are in parentheses—U.S. model clusters standard errors at the state level. Regressions are weighted. Not all covariates in U.S. model are available in the California data. Additional covariates include those listed in Table D1 as well as an indicator of maternal full-time employment. Unweighted U.S. sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data.

** p<0.01, * p<0.05, and + p<0.10.

Table D3.
Use of Head Start among low-income users of center care year before school entry

	U.S.
	Marginal Effect (Standard Error)
Isolated immigrant parent (omit Native)	0.101
	(0.067)
Non-isolated immigrant parent	0.058
	(0.115)
English-speaking immigrant parent	0.302*
	(0.118)
Unweighted N	850

SOURCE: ECLS-B.

NOTES: Based on director-reported Head Start status. Includes children whose household incomes are under 130 percent of federal poverty level, and who use center care. Estimates are marginal effects from probit models. Clustered standard errors at the state level are in parentheses. Regressions are weighted. Additional covariates include those listed in Table D1, as well as an indicator of maternal full-time employment. Unweighted U.S. sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data.

** p<0.01, * p<0.05, and + p<0.10

Table D4.
Use of home-based care as primary arrangement among users of nonparental care year before school entry

	California	U.S.
	Marginal Effect (Standard Error)	Marginal Effect (Standard Error)
Isolated immigrant parent (omit Native)	0.009	-0.019
	(0.113)	(0.027)
Non-isolated immigrant parent	0.177	-0.071**
	(0.125)	(0.019)
English-speaking immigrant parent	0.077	-0.019
	(0.113)	(0.027)
Unweighted N	811	3,800

SOURCES: RAND California Preschool Study and ECLS-B.

NOTES: Estimates are marginal effects from probit models. Robust standard errors are in parentheses—U.S. model clusters standard errors at the state level. Regressions are weighted. Not all covariates in U.S. model are available in the California data. Additional covariates include those listed in Table D1 as well as an indicator of maternal full-time employment. Unweighted U.S. sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data.

** p<0.01, * p<0.05, and + p<0.10

Table D5.
Use of higher-quality care among users of center-based care year before school entry

	ECERS-R Total Score 5 or Above	ECERS-R T&I Score 5 or Above
	Marginal Effect (Standard Error)	Marginal Effect (Standard Error)
Isolated immigrant parent (omit Native)	-0.140	-0.012
	(0.087)	(0.114)
Non-isolated immigrant parent	0.080	0.118+
	(0.093)	(0.060)
English-speaking immigrant parent	-0.041	0.188**
	(0.087)	(0.037)
Unweighted N	900	900

SOURCE: ECLS-B.

NOTES: Estimates are marginal effects from probit models for U.S. children who entered kindergarten in fall 2006. Clustered standard errors at the state level are in parentheses. Regressions are weighted. Additional covariates include those listed in Table D1 as well as an indicator of maternal full-time employment and variables indicating 2005 state-level policy requirements for group size, staff:child ratio, master teacher, and director and teacher education. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data. ECERS-R = Early Childhood Center Environment Rating Scale - Revised; T&I = Teaching and Interactions subscale.

** $p<0.01$, * $p<0.05$, and + $p<0.10$

Relationship Between Center-Based Care Use and Kindergarten Academic Skills

Table D6 presents summary results for the effects of center-based care use compared to no center care use (either parent-only care or home-based care) on children's kindergarten early reading and mathematics scores, which are standardized so that coefficients may be interpreted as effect sizes. Coefficients and standard errors for center use effects on reading scores are presented in the first set of columns, and results from the mathematics models are presented in the second set of columns. The first row of results represents all children in the sample and additional rows represent stratified results for each subgroup of children.

Table D7 presents similar results as Table D6 but the dependent variable is center-based care use compared to home-based care use, and the sample is restricted to children who use regular nonparental care in the year before school entry.

Results in Tables D6 and D7 show that the coefficients for Isolated and other subgroups of children are not significantly different from each other in either table.

Table D8 presents summary results for the effects of using higher-quality center care compared to lower-quality center care on children's kindergarten early reading and mathematics scores. The key predictors are ECERS-R total score of 5 or above, indicating "good" quality, and ECERS-R Teaching and Interactions score of 5 or above. No significant effects are found in these models. Some point estimates are large and negative, which is counterintuitive, but may be due to small sample sizes and lack of precise estimates.

Table D9 presents full results for Table D6 regressions for reading scores for the four subgroups of children. This provides an exemplar of the full set of covariates used in regressions for Tables D6 through D8.

Table D6.
Effect of center-based care use compared to non-center use on kindergarten scores

	Reading	Mathematics
	Center Coefficient (Standard Error)	Center Coefficient (Standard Error)
All children (N=4,950)	0.157**	0.090*
	(0.032)	(0.034)
Isolated children (N=300)	0.257*	0.035
	(0.116)	(0.129)
Non-Isolated children (N=600)	0.181+	0.125
	(0.103)	(0.115)
English-Speaking children (N=400)	0.123	0.226*
	(0.103)	(0.103)
Native children (N=3,650)	0.147**	0.087*
	(0.038)	(0.037)

SOURCE: ECLS-B.

NOTES: Clustered standard errors at the state level are in parentheses. Regressions are weighted using WKR0. Scores are standardized with a mean of 0 and standard deviation of 1. Additional covariates include those listed in Table D9. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data.

** $p<0.01$, * $p<0.05$, and + $p<0.10$

Table D7.
Effect of center-based care use compared to home-based nonparental care use on kindergarten scores

	Reading	Mathematics
	Center Coefficient (Standard Error)	Center Coefficient (Standard Error)
All children (N=4,250)	0.154**	0.057
	(0.041)	(0.041)
Isolated children (N=200)	0.393*	-0.063
	(0.169)	(0.195)
Non-Isolated children (N=500)	0.403**	0.387**
	(0.191)	(0.118)
English-Speaking children (N=350)	-0.051	0.051
	(0.145)	(0.132)
Native children (N=3,150)	0.138**	0.056
	(0.037)	(0.042)

SOURCE: ECLS-B.

NOTES: Includes children with any regular nonparental care use. Clustered standard errors at the state level are in parentheses. Regressions are weighted using WKR0. Scores are standardized with a mean of 0 and standard deviation of 1. Additional covariates include those listed in Table D9. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data.

** $p<0.01$, * $p<0.05$, and + $p<0.10$

Table D8.
Effect of ECERS-R score on kindergarten scores among users of center-based care

Outcome Variable	ECERS-R Total Score 5 or Higher	ECERS-R T&I Score 5 or Higher
	Center Coefficient (Standard Error)	Center Coefficient (Standard Error)
All children (N=750)		
Reading score (standardized)	0.003	-0.001
	(0.089)	(0.113)
Mathematics score (standardized)	0.091	0.089
	(0.084)	(0.110)
Isolated children (N=50)		
Reading score (standardized)	-0.209	-0.039
	(0.377)	(0.319)
Mathematics score (standardized)	0.222	0.181
	(0.355)	(0.218)
Non-Isolated children (N=100)		
Reading score (standardized)	-0.451	-0.616
	(0.407)	(0.377)
Mathematics score (standardized)	-0.415	-0.363
	(0.343)	(0.286
English-Speaking children (N=50)		
Reading score (standardized)	-0.123	0.251
	(0.283)	(0.460)
Mathematics score (standardized)	0.141	0.208
	(0.384)	(0.559)
Native children (N=550)		
Reading score (standardized)	0.044	-0.012
	(0.097)	(0.109)
Mathematics score (standardized)	0.168+	0.107
	(0.097)	(0.110)

SOURCE: ECLS-B.

NOTES: Estimates are coefficients from an Ordinary Least Squares model. Includes the subsample of children with a direct center observation in wave 3 who entered kindergarten in 2006. Clustered standard errors at the state level are in parentheses. Regressions are weighted using WK3P0. Additional covariates include those listed in Table D9. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data. T&I = Teaching and Interactions subscale.

** $p<0.01$, * $p<0.05$, and + $p<0.10$.

Table D9.
Full model results for center use compared to non-center use: Reading score

Independent Variable	Isolated	Non-Isolated	English-Speaking	Native
	Coefficient (Standard Error)	Coefficient (Standard Error)	Coefficient (Standard Error)	Coefficient (Standard Error)
Center-based care use	0.257*	0.181+	0.123	0.147**
	(0.116)	(0.103)	(0.103)	(0.038)
Child characteristics				
Race/ethnicity (omitted white)				
Black		-0.199	0.551**	0.002
		(0.316)	(0.139)	(0.060)
Hispanic	-0.508+	-0.377+	-0.028	-0.035
	(0.250)	(0.209)	(0.157)	(0.050)
Other		0.125	0.402*	-0.094
		(0.163)	(0.173)	(0.089)
Female gender	0.182+	-0.029	0.103	0.029
	(0.103)	(0.146)	(0.161)	(0.036)
Low birth weight (omitted normal weight)	-0.171	-0.214	-0.241	-0.076*
	(0.141)	(0.144)	(0.151)	(0.036)
Missing birth weight	-0.185	0.288	0.271	0.155
	(0.408)	(0.242)	(0.206)	(0.180)
Age two cognitive score (omitted quartile 4)				
Quartile 1 (lowest)	-0.465*	-0.223	-0.286*	-0.504**
	(0.223)	(0.209)	(0.140)	(0.057)
Quartile 2	-0.466*	-0.057	-0.204	-0.390**
	(0.223)	(0.170)	(0.151)	(0.053)
Quartile 3	-0.106	-0.064	0.135	-0.179**
	(0.230)	(0.216)	(0.126)	(0.036)
Missing score	-0.192	-0.301+	-0.106	-0.273*
	(0.292)	(0.168)	(0.238)	(0.109)
Birth month	-0.026	-0.043**	-0.042*	-0.043**
	(0.018)	(0.015)	(0.020)	(0.008)
Months since September at kindergarten assessment	0.256**	0.131**	0.174**	0.208**
	(0.069)	(0.026)	(0.040)	(0.020)
Entered kindergarten in 2007	0.417+	0.534**	0.766**	0.568**
	(0.245)	(0.173)	(0.196)	(0.074)
Maternal characteristics				
Mother's age in years	0.004	0.022	-0.025*	0.002
	(0.013)	(0.014)	(0.010)	(0.003)
Maternal education (omitted BA degree)				
Less than high school degree	-0.378*	-0.372*	-0.894**	-0.397**
	(0.139)	(0.151)	(0.233)	(0.077)
High school degree		-0.261	-0.537**	-0.344**
		(0.187)	(0.177)	(0.066)
Some college		-0.077	-0.274	-0.260**
		(0.166)	(0.183)	(0.062)
Household characteristics				
Partner/spouse lives in household	0.048	-0.205+	0.366+	0.167**
	(0.106)	(0.117)	(0.198)	(0.052)
Total persons in household	0.030	-0.030	0.002	-0.071**
	(0.045)	(0.041)	(0.047)	(0.013)
Total children age 0-5 in household	-0.210*	0.007	-0.067	0.047+
	(0.091)	(0.095)	(0.075)	(0.027)
Income-to-poverty ratio (omitted over 185%)				
100% or below	-0.051	-0.392*	-0.729**	-0.185**
	(0.159)	(0.166)	(0.174)	(0.051)
101%-130%		-0.273	-0.109	-0.096
		(0.195)	(0.184)	(0.069)

Table D9 *(continued)*

	Isolated	Non-Isolated	English-Speaking	Native
131%-185%		-0.151	-0.077	-0.059
		(0.171)	(0.182)	(0.043)
Read to child 3 to 6 times per week (omitted daily)	0.199	0.056	-0.204	-0.140**
	(0.179)	(0.186)	(0.145)	(0.045)
Read to child 1 to 2 times per week	0.243	-0.144	-0.076	-0.223**
	(0.148)	(0.116)	(0.105)	(0.055)
Read to child zero times per week	0.545*	-0.398+	0.759**	-0.304*
	(0.212)	(0.199)	(0.184)	(0.118)
Urbanicity (omitted city population at least 50,000)				
Town: population between 2,500 and 49,999	0.234	0.163	-0.398**	-0.065
	(0.163)	(0.225)	(0.121)	(0.058)
Rural: population less than 2,500	-0.353	0.440	-0.205	-0.114*
	(0.427)	(0.312)	(0.171)	(0.049)
Urbanicity missing	-0.433*	0.263	0.233	-0.027
	(0.185)	(0.369)	(0.166)	(0.081)
Constant	-0.602	0.097	0.781+	0.286+
	(0.540)	(0.511)	(0.444)	(0.153)
Unweighted N	300	600	400	3,650
R-squared	0.417	0.324	0.484	0.353

SOURCE: ECLS-B.

NOTES: Clustered standard errors at the state level are in parentheses. Regressions are weighted using WKR0. Scores are standardized with a mean of 0 and standard deviation of 1. For Isolated regressions, child race/ethnicity, maternal education, and income are binary variables owing to small cell sizes. Unweighted sample sizes are rounded to the nearest 50 per NCES guidelines governing restricted-use data.

** $p<0.01$, * $p<0.05$, and + $p<0.10$

Appendix E: Prior Research on Early Learning Programs

An extensive body of research has documented the gains in cognitive and socio-emotional development associated with high-quality early learning programs, although very little of this research has focused specifically on immigrant children or subgroups of immigrant children. Evidence of effectiveness comes from experimental and quasi-experimental evaluations of both smaller scale demonstration programs such as Perry Preschool (Schweinhart et al., 2005), as well as larger-scale publicly funded programs such as the Chicago Child-Parent Centers (CPC) (Reynolds et al., 2002), Head Start (U.S. Department of Health and Human Services, 2005), and various state-funded prekindergarten programs (Gormley and Gayer, 2005; Wong et al., 2008; Hustedt, Barnett and Jung, 2007; Hustedt et al., 2008, 2009; Lipsey et al., 2011). These studies have found sizeable impacts on measures of school readiness, primarily for measures of cognitive development (e.g., pre-reading and pre-math skills), for both targeted programs serving disadvantaged children and universal programs serving more diverse populations of children. The evaluated programs include both one-year preschool programs (e.g., most of the state-funded prekindergarten programs), as well as those that begin serving children two years prior to kindergarten entry (e.g., Perry Preschool, Chicago CPC, and Head Start). Two of the evaluations with long-term follow-up data—Perry Preschool and Chicago CPC—also find meaningful longer-term benefits in terms of improved educational and labor market outcomes, and reduced incidence of criminal behavior. The findings of individual studies have been reinforced through meta-analysis (Camilli et al., 2010), although some meta-analyses have documented that there may be important dosage effects and thresholds in the relationship between early care and education program quality and developmental outcomes (Zaslow et al., 2010).

Another strand of the literature has used observational data to assess the relationship between early care and education experiences and measures of school readiness.[19] For example, Loeb et al. (2007) used data from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) and estimate that participation in any center-based care in the year before kindergarten increases math and reading scores measured at the start of the kindergarten year. The effects were somewhat larger for English-proficient Latino children and for children with very low family income (below 50 percent of poverty) and very low parental education. At the same time, unfavorable effects of early care and education participation were found for a composite measure of social behavior. In two related studies, Magnuson, Meyers, and Waldfogel (2004) and Magnuson, Ruhm, and Waldfogel (2007) also use the ECLS-K but estimated the effect of what parents described as "prekindergarten" programs on assessments at kindergarten entry, the spring of the kindergarten year, and the spring of first grade. Their estimates showed that the favorable effects of prekindergarten participation at kindergarten entry persisted through the spring, but that they had faded by the end of the next year, although not for more disadvantaged children. They also found negative effects on behavioral outcomes that tended to persist through first grade.

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[19] A related body of research has examined the relationship between ECE program quality and child developmental outcomes for representative samples of children in ECE environments and identified some of the dimensions of quality that appear to matter most for developmental gains. For reviews and meta-analyses of this research see Bowman, Donovan, and Burns (2001), Kelley and Camilli (2007), and Weber and Trauten (2008).

In addition to the ECLS-K, research using the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development has also examined the effects of nonparental care on child development, although the focus of that research is on child care more generally (starting from birth), rather than early learning programs in the year or two before school entry (see, for example, NICHD Early Child Care Research Network (ECCRN), 2000; 2005; and NICHD ECCRN and Duncan, 2003). While the experimental and quasi-experimental studies discussed above employed methods that allow for strong causal inference, these observational studies using the ECLS-K and other surveys have generally not attempted to address the issue of selectivity, beyond the inclusion of controls for child and family background characteristics.

Throughout this literature there has been little focus on specific subgroups of children and first or second generation immigrant children are no exception. According to Census data, almost a quarter of U.S. children under age six were either born abroad themselves (first generation) or were U.S. born to one or both parents who were born abroad (second generation), with most children in the latter group (Karoly and Gonzalez, 2011). Karoly and Gonzalez (2011) documented the lower rates of participation in nonparental care arrangements on the part of immigrant children, although some of this gap could be explained by such as the higher rates of poverty and lower levels of maternal education, two factors that tend to depress the use of nonparental care. Their study also examined data from California, which suggested that quality may be modestly lower in center-based settings for preschool-age immigrant children compared with those for their native counterparts, but the gaps were not large enough to be statistically significant in their sample.

Other research has begun to explore the relationship between early learning experiences and subsequent education outcomes specifically for immigrant children, with findings that suggest that the benefits for immigrant children are comparable to, if not stronger than, those found for disadvantaged children more generally. For example, as part of the quasi-experimental evaluation of Oklahoma's universal preschool program, Gormley et al. (2005) found effects as large for Latinos as other racial-ethnic groups. Moreover, in a more focused look at Latino children, Gormley (2008) documented that effects of participating in Oklahoma's one-year program were largest for those whose parents spoke Spanish at home or whose parents were born in Mexico. The gains were also larger for children tested in Spanish compared with those tested in English.

Immigrant children have also been the focus of research using the ECLS-K. Magnuson, Lahaie, & Waldfogel (2006) examined associations between attendance in a center-based preschool program and school readiness for children of whose mothers were foreign born. While they found positive effects for the immigrant children of preschool participation on measures of reading and math skills, the effect sizes were modest (about 0.2) and no different from those for native children. Participation in Head Start also increased English-language proficiency at kindergarten entry, especially for those immigrant children whose mothers who did not complete high school. Like the Oklahoma evaluation, the study found evidence, although not statistically significant, of effects on English proficiency and academic readiness for immigrant children whose mothers only spoke a language other than English. Crosnoe (2007) also used the ECLS-K but found smaller effects of early care and education participation on kindergarten readiness measures for the sample of Mexican-origin immigrant children (first or second generation). One drawback for both of these studies is that the ECLS-K provides only limited retrospective data about preschool participation, with little detail on quality measures or caregiver characteristics. As with the other ECLS-K studies discussed above, neither study attempted to control for possible selectivity into preschool participation beyond controlling for observed child and family background factors.

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