Title:
Does High Quality Childcare Narrow the Achievement Gap at Two Years of Age?

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Background / Context:
Description of prior research and its intellectual context.

Much attention has been given to the achievement gap between poor and non-poor children at the beginning of kindergarten (e.g. Burchinal et al., 2006; Duncan et al., 2007; Farkas, 2009; Farkas & Hibel 2008; Fryer & Levitt, 2004). In response, state and federal preschool programs targeted to 3- to 5-year-olds were created and implemented to provide these children with the types of experiences that promote academic skills. Evaluations of these programs indicate some succeed in promoting academic skills (Gormley, Phillips, & Gayer, 2008; Mashburn et al., 2008; Puma et al., 2005; Wong, Cook, Barnett, & Jung, 2008), but most fail to eliminate the class-based achievement gap. This is at least partly because middle class children enter preschool programs with higher levels of skills on average and often show gains in their preschool years similar to those demonstrated by low-income children in these enrichment programs (e.g., Howes et al., 2008).

Attempting to eliminate the achievement gap with programs targeted at preschoolers may therefore need to be reconsidered for earlier intervention. Preliminary evidence for this position comes from findings that a class-based achievement gap exists as early as two years of age (Hillemeier et al. 2009; Halle et al., 2009). The question then arises: Do high quality non-parental child care experiences during the infant and toddler period narrow the achievement gap between poor and non-poor children at two years of age? This paper uses the ECLS-B data to address this question.

Purpose / Objective / Research Question / Focus of Study:
Description of the focus of the research.

We use the ECLS-B, a nationally-representative study of children born in 2001 to report the child care arrangements and quality characteristics for 2-year olds in the United States and to estimate the effects of differing levels of child care quality on two-year old children's cognitive development. Our goal is to test whether high quality infant care can help close early achievement gaps between low-income children and their middle and high-income age-mates.

Setting:
Description of the research location.

Non-parental child care quality was observed in the setting in which the child spent the most amount of care time – a provider's home or a center. Assessments of children's cognitive ability and observations of interactions with their mothers were carried out by ECLS-B staff in the homes of study children. All other data used in this study was collected via parent surveys, which were administered in children's homes.

Population / Participants / Subjects:
Description of the participants in the study: who, how many, key features or characteristics.

The Early Childhood Longitudinal Study—Birth Cohort (ECLS-B) is a nationally representative, longitudinal cohort study of U.S. children born in 2001 (see http://nces.ed.gov/ECLS/birth). This cohort is based on birth certificate records and includes oversamples of Asian and Pacific Islanders, Native Americans and Alaska Natives, low birth weight (1,500–2,500g) and very low birth weight (less than 1,500g) children, and twins. Approximately 9 (in years 2001–2002) and 24 months after the children's births (in 2003) comprehensive data was collected on study children via parent survey and observational measures. Table 1 presents key demographic information for the entire ECLS-B sample (in the column labeled "Overall"), poor children (about 46% of the sample using the 1.85 poverty threshold), and not poor children (note: weighted data is presented; reported Ns are rounded to the nearest 50 per IES/NCES reporting guidelines for the ECLS-B). Across the measures reported in Table 1, which include cognitive development at 9 and 24 mos., maternal education, child ethnicity, and family structure, significant poor-not poor differences were observed.

TABLE 1 ABOUT HERE

The sample for our focal independent variable, the ECLS-B Child Care Observation (CCO), was drawn from study children who were in 10 or more hours per week of non parental care. Children who lived in Alaska or Hawaii, were in the American Indian supplement PSUs, or in a care setting where the language spoken was one other than English or Spanish were not eligible for observation. All eligible cases where the child lived in poverty and spent the most hours per week in a center-based care arrangement were included in the CCO sample with certainty. All other eligible cases were subsampled at rates designed to reduce the variability in probabilities of selection. Table 2 presents information on child care type and hours at 24 months for the entire sample. Poor children were in parent-only or relative care at higher rates than not poor children and were in non-relative or center care at lower rates than not poor children.

TABLE 2 ABOUT HERE

In total, 1400 children were in the CCO sample, 43% of whom were poor, as reported in Table 2. Using a widely accepted convention for categorizing child care quality level from the ITERS and FDCRS scales, we found that the differences in care quality were large and significant between poor and non-poor children. A much higher percentage of poor children were in low quality care (43% vs. 16% of not poor children), Compared to not poor children, poor children were in both medium and high quality care at significantly lower rates (69% vs. 48% and 15% vs. 9% for medium and high quality).

Intervention / Program / Practice:
Description of the intervention, program or practice, including details of administration and duration.

The ECLS-B assessed children's early experience along a variety of dimensions, but there was no exogenous intervention. We were particularly interested in ratings of 24 month child care quality that were carried out by ECLS-B staff. Child care was assessed with either the ITERS if the child was in center care or the FDCRS if the child was in non-parental family care or other home-based care

Research Design:
Description of research design (e.g., qualitative case study, quasi-experimental design, secondary analysis, analytic essay, randomized field trial).

We conducted secondary data analysis on the ECLS-B. Multiple regression analysis was used to account for sociodemographic and other control variables that may be correlated with infant child care quality.

Data Collection and Analysis:
Description of the methods for collecting and analyzing data.

Collection Methods:

As noted above, the (ECLS-B) is a nationally representative, longitudinal cohort study of U.S. children born in 2001 (see http://nces.ed.gov/ECLS/birth). Asian and Pacific Islanders, Native Americans and Alaska Natives, low birth weight (1,500–2,500g) and very low birth weight (less than 1,500g) children, and twins were oversampled. Weights provided by NCES correct for this oversampling and allow findings to be generalized to the U.S. population of children born in 2001. At 9 (in years 2001–2002) and 24 months after the children's births (in 2003) comprehensive data was collected on study children via parent survey and observational measures. One-to-one assessments of children's cognitive ability via the Bayley Scales of Infant Development – Short Form (BSID-SF) were carried out by ECLS-B staff in the child's home as were observations of interactions between children and their mothers. Child care observations were carried out by ECLS-B staff in the settings in which the study child's primary care took place – either in the child's, a relative's, or a non-relative's home; or a child care center. Other measures that we use as control variables were collected via parent surveys, which were administered in children's homes.

Analysis:

We ran a residualized change model predicting children's cognitive development (using the BSID-SF) at two years of age based on their 9-month BSID-SF, observed quality of child care during the two year old period (medium or high, with low as the reference), whether they were not poor, and an interaction between child care quality and whether the child was not poor. The model was estimated with controls for demographic and family characteristics, SES, maternal characteristics, and child care characteristics (type and number of hours) using the following equation:

γ_i (24 month cognitive score) $= \beta_0 + \beta_1$ (9 month cognitive score)$_i + \beta_2$ (whether medium quality care)$_i + \beta_3$ (whether high quality care)$_i + \beta_4$ (whether not poor)$_i + \beta_5$ (whether medium quality X whether not poor)$_i + \beta_6$ (whether high quality X whether not poor)$_i + \dots \beta_p \chi_{ip}$(controls) $+ \varepsilon_i$.

Because child care quality was observed for only a fraction of the ECLS-B sample, we imputed child care quality scores for children in non-parental care and estimated our residualized change model on fully imputed data.

Findings / Results:
Description of the main findings with specific details.

We present the results of our residualized change model analysis of the effects of differing child care quality on cognitive development at 24 months in Table 3. The first column shows the results for the subsample of children whose 24 month child care quality was observed while the second column presents combined results for the full sample, which includes children

whose child care quality was observed and those whose quality was imputed. Independent variables were centered at the mean of the sample, which allows the main effects terms to be interpretable in the presence of interactions. The reference categories in Table 3 are poor children in low quality care.

TABLE 3 ABOUT HERE

Across the two samples we find significant positive effects of medium quality care (vs. low quality) on cognitive development at two years of age. High quality care showed a positive effect on cognitive development but was significant only in the combined observed and imputed sample (second column). There was no evidence of an interaction between high quality infant care and family poverty; that is, the effect of high quality care on cognitive performance at two years of age was similar for poor and non-poor children.

In the observed sample, children gained 3.75 points (p<.01) more on the BSID-SF when they were in medium versus low quality care, an effect size of .35. There was no evidence of a differential effect of medium versus low quality care for not poor children. High quality care was positively associated with higher BSID-SF scores, but was non-significant and again, the effect was similar for poor and not-poor children. In the combined observed and imputed sample, we found significant positive main effects of medium (d=.21) and high quality (d=.43) care vs. low quality care. In both cases, there were no differential effects of care for not-poor children. In the combined observed and imputed sample, we found that being in parent-only care versus low quality care did not impact cognitive development and that the effect was similar for poor and not poor children. Despite finding no differential effects of care on whether kids were poor, there was a small but significant positive main effect of not being poor on cognitive development (d=.08).

FIGURE 1 ABOUT HERE

We graphically present the adjusted means based on the Table 3 regression results for both the observed only and the combined observed and imputed data in Figure 1. For not poor children, the adjusted means from the two models show a linear growth pattern associated with moving from low to medium to high quality child care. Poor children also appear to show a linear effect of increasing child care quality on cognitive development in the combined observed and imputed model. In the observed only model, there is a clear positive effect associated with being in medium or high quality care versus low, but it is a non-linear association, with a larger effect for medium than high quality.

Conclusions:
Description of conclusions, recommendations, and limitations based on findings.

We found positive effects of high quality infant care on cognitive performance at two years of age. However, non-poor parents typically purchase such care for their children, and as a result low-income children are currently in lower quality care than non-poor children. This quality-of-care discrepancy has likely contributed to the two year achievement gap. Thus, were public funding to increase the supply of high quality care for low-income children, equalizing the quality of care between poor and non-poor children, the cognitive gap at two years of age would likely decline. However, since we found that both poor and non-poor children experience the same impact of such care, the provision of equal quality care for poor and non-poor children, cannot, by itself, compensate for the other disadvantages experienced by low-income infants.

Appendices

Not included in page count.

Appendix A. References

References are to be in APA version 6 format.

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Appendix B. Tables and Figures
Table 1. Family and Child Characteristics

		Overall	Poor	Not Poor	Test for Poor/Not Poor Differences
Bayley Mental Scale Score 24 mos	N	8900	4200	4700	
	M	127.1	124.39	129.41	p<.001
	(sd)	(10.65)	(10.23)	(10.45)	
Child and Family Characteristics[a]	N	8900	4100	4800	
Family Income 24m(> 1.85 poverty threshold)	%	54%	0%	100%	p<.001
Maternal Education	N	8900	4200	4700	p<.001
Less than HS Diploma	%	18%	33%	5%	
HS Diploma	%	31%	41%	22%	
Some College	%	27%	22%	30%	
Bachelor's Plus	%	25%	4%	43%	
Child Race	N	8900	4200	4700	p<.001
Black	%	14%	21%	7%	
Hispanic	%	25%	36%	16%	
Other	%	7%	7%	7%	
White	%	54%	35%	79%	
Child Gender (% male)	%	51%	51%	51%	ns
Single mother 9m	%	19%	32%	8%	p<.001
First-born status	%	40%	35%	44%	p<.001
Number of siblings	M	.99	1.2	.82	p<.001
	(sd)	(1.11)	(1.26)	(.92)	
English Spoken at home	%	81%	73%	89%	p<.001
Maternal Sensitivity at 9 mos (NCATS)	N	7600	3500	4100	
	M	34.68	33.48	35.64	p<.001
	(sd)	(4.51)	(4.48)	(4.29)	
Child's Birthweight Status	N	8900	4200	4700	
Low Birthweight	%	6%	7%	5%	p<.001
Very Low Birthweight	%	1%	2%	1%	p<.001
Child's Age at 24 mo. data collection	N	8900	4200	4700	
	M	24.38	24.44	24.34	p<.05
	(sd)	(1.19)	(1.26)	(1.12)	
Bayley Mental Scale Score 9 mos	N	8900	4200	4700	
	M	76.76	76.49	76.98	ns
	(sd)	(9.81)	(10.17)	(9.48)	

Notes: Weighted Means using ECLS-B weight *W2C0*. Per NCES reporting guidelines, all Ns were rounded to the nearest 50.

Table 2. Child Care Characteristics at 24 Months

|		Overall	Poor	Not Poor	Test for Poor/Not Poor Differences
Type of Care	N	8900	4200	4700	p<.001
Parental care only	%	51%	58%	45%	
Relative Care	%	19%	20%	17%	
Non-Relative Care	%	15%	10%	19%	
Center Care	%	16%	12%	19%	
Hrs/Week Center Care	N	8900	4200	4700	
	M	15.97	13.94	17.71	p<.001
	(sd)	(19.45)	(19.20)	(19.49)	
Child Care Quality	N	1400	600	800	
Low Quality Observed Care (1-3)	%	26%	43%	16%	p<.001
Medium Quality Observed Care (>3-5)	%	61%	48%	69%	p<.001
High Quality Observed Care (>5-7)	%	13%	9%	15%	p<.001
ITERS Total	N	600	250	350	
	M	4.24	4.16	4.29	ns
	(sd)	(.99)	(1.01)	(.97)	
FDCRS Total	N	800	300	500	
	M	3.47	2.96	3.82	p<.001
	(sd)	(1.02)	(.97)	(.90)	

Notes: Weighted Means using ECLS-B weight *W2C0* for variables with N of 8900 and *W22P0* for observed quality variables. Per NCES reporting guidelines, all Ns were rounded to the nearest 50.

Table 3. Weighted Non-Imputed and Imputed Regressions Predicting Bayley Mental Scale at 24 Mos.

	1. Only Observed Data		2. Observed and Imputed Data	
	B(SE)	Effect Size	B(SE)	Effect Size
Medium Quality Care (vs. Low)	3.75***	.35	2.52***	.21
	(.74)		(.55)	
Medium Quality X Not Poor	-0.05	-.005	0.54	.05
	(1.72)		(.78)	
Hi Quality Care (vs. Low)	2.26	.21	4.53***	.43
	(1.29)		(.82)	
Hi Quality X Not Poor	3.26	.31	0.94	.09
	(2.85)		(1.05)	
Not Poor	-0.69	-.06	0.88*	.08
	(.94)		(.33)	
Parent Only Care (vs. Low Quality)			-0.76	-.07
			(.66)	
Parent Only Care X Not Poor			0.33	.03
			(.55)	
Constant	126.32**		125.41***	
SE	(-.73)		(.17)	
N	1200		10700	

Notes: All independent variables were centered at the mean of the sample. Regression 1 was weighted using the 24 month child care weight *W22P0* and standard errors were calculated using the appropriate PSU and stratum variables. Regression 2 was weighted using the 9 month weight *W1R0* and standard errors were calculated using the appropriate PSU and stratum variables. Effect sizes were calculated using the standard deviation of reported for the Bayley in the "Overall" column of Table 1(10.65). Controls include 9-month Bayley, child's ethnicity, gender, and age, Mother's education, maternal sensitivity (NCATS), family structure (whether single mother), whether low or very low birth weight, whether home language is English, whether first born, number of siblings, hours of care, and type of care (non significant). Per NCES reporting guidelines, all Ns were rounded to the nearest 50.

Figure 1. Adjusted Means and Standard Errors for Bayley Mental Scale Score at 24 Months
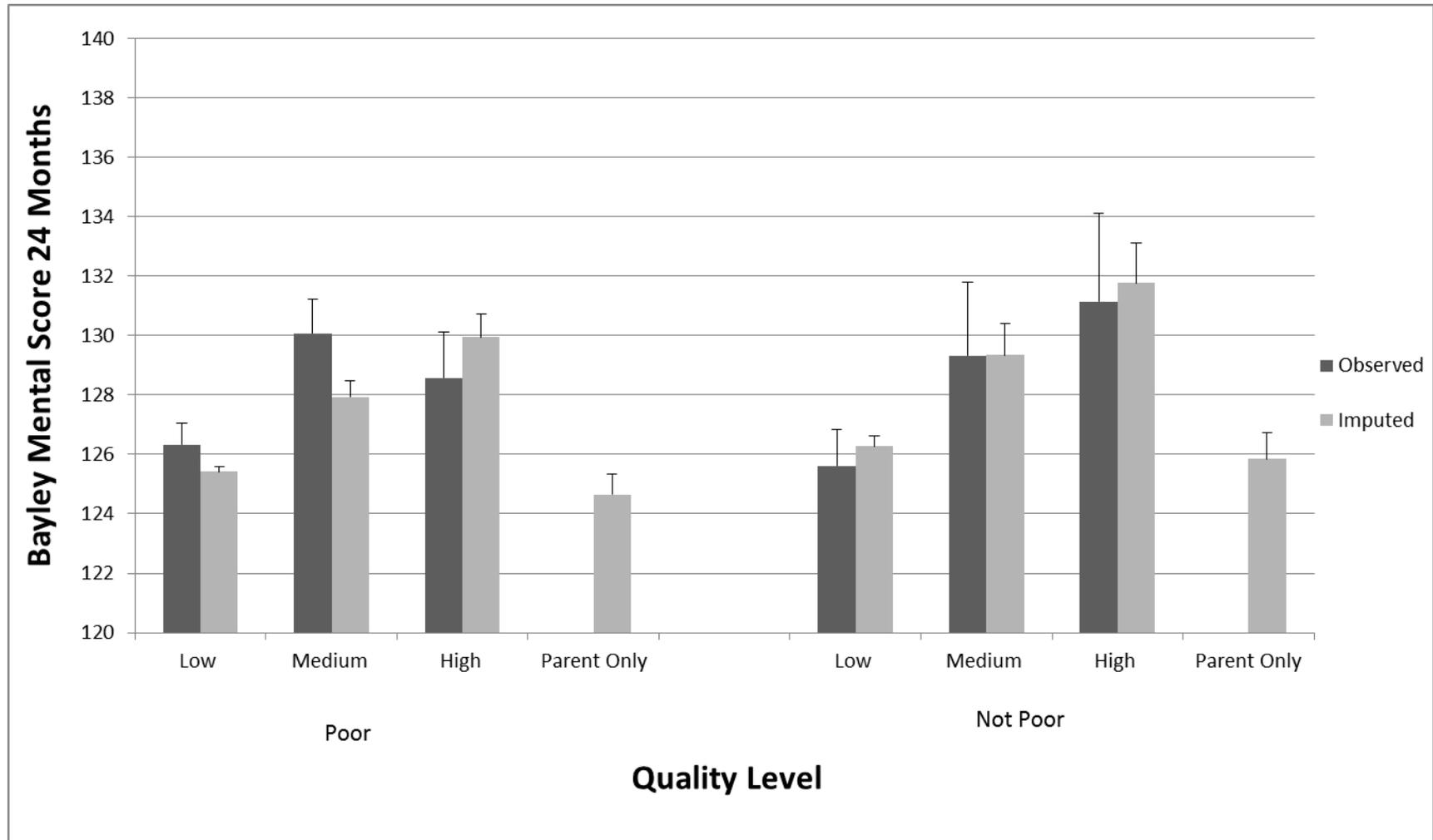
Notes: Adjusted means for observed data were computed from regression 1 of Table 3 and adjusted means for imputed were computed from regression 2 of Table 3. Lines represent standard errors.