Picture vocabulary growth in students with and without disabilities in an early childhood program that targets poor families

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Purpose

To test the effectiveness for children with disabilities of a highly resourced data-driven Birth-5 early care and education program that targets children at risk of school failure because of socioeconomic factors.

Background

Educare Central Maine is a partnership between the Waterville, ME, public schools, Kennebec Valley (ME) Community Action Program Early/Head Start, and the philanthropic community. The Educare Learning Network is a partnership between the Ounce of Prevention Fund, the Buffett Early Childhood Fund, other national philanthropies, and public-private partners in more than a dozen states across America.

Educare Central Maine serves children from birth till kindergarten entry.

The 21 schools in the Educare Learning Network seek to close the achievement gap for children from families at risk because of socioeconomic factors. The Educare model is based on research from early childhood development, education, social work, and other allied fields. Four core features compose the Educare model: data utilization, embedded professional development, high-quality teaching practices, and intensive family engagement.

Some families, whose income is over the eligibility threshold, tuition their children to Educare Central Maine.

Figure 1. A child at Educare Central Maine. See https://www.youtube.com/watch?v=xkZXatJeZEo&list=PLHAnNxoFzX20bePE1JFZh61qmwj3-2PZ1&index=1&t=1m34s

Methods

We administered the Peabody Picture Vocabulary Test (PPVT-4) to children at Educare Central Maine at age 3, the fall of their first year in Head Start (unless that was within 6 months of their age-3 assessment date), and every spring thereafter. We analyzed PPVT-4 standard scores with linear mixed models with censoring (Vaida & Liu, 2012). (Random effect: child. Fixed effects: presence of IFSP/IEP, income classification, gender, years in Educare, and the interactions of years in Educare with the other fixed effects). Censoring was imposed for standard scores < 65 in order to accommodate 7 very low PPVT scores (0.8% of sample).

We also used survival analysis to determine median ages that children entered and exited Educare and median duration they were enrolled.

Analyses covered seven school years (2010-11 through 2016-17).

Results

Table 1 presents demographic information about the sample.

	# Children	%
Total	323	100
Disability Status		
No Disability Plan	283	88
IFSP/IEP	40	12
Gender		
Female	150	46
Male	173	54
Race		
White	279	86
Biracial/multiracial	37	11
Black/African-American	4	1
Asian	2	1
American Indian/Native American	1	0
Ethnicity		
Not Hispanic/Latine	308	95
Hispanic or Latine	15	5
Primary Language		
English	322	98
Other	1	0

Table 1. Demographic information About Sample of Children with PPVT-4 Scores.

There were 910 PPVT-4 assessments contributing to the analysis (2.8 data points per child). Figure 2's spaghetti plot shows PPVT-4 standard score vs months in Educare, gender, income status, and disability status. Horizontal lines on these plots would represent age-appropriate gains. Positive slopes represent gains that are faster than expected based on chronological age.

Table 2 presents coefficient table from censored linear mixed models with interactions. Because interactions were not significant ($x^2(3) = 1.56$, $p = .67$), model was re-fit without interactions (results also in Table 2).

Table 2. Coefficient table from censored linear mixed models fit to Figure 2's PPVT-4 data. Intercept refers to PPVT-4 score at entry (0 months) for income-eligible girl with IFSP/IEP. *$p < .05$.

	Interactions			No Interactions		
Fixed Effect	**Coef**	**SE**	**z**	**Coef**	**SE**	**z**
(Intercept)	91.33	2.23	40.94*	93.06	1.78	52.39*
Months in Educare	0.31	0.10	3.18*	0.19	0.03	6.07*
No Disability Plan	14.26	2.19	6.52*	12.26	1.67	7.34*
Over-income	9.04	2.30	3.94*	7.64	1.71	4.47*
Male	-3.45	1.44	-2.40*	-3.07	1.10	-2.78*
Months × No Disab Plan	-0.13	0.09	-1.41			
Months × Over-income	-0.08	0.08	-0.90			
Months × Male	0.02	0.06	0.36			
Random Effect						
SD(Child)	8.48			8.50		
SD(Residual)	7.64			7.65		

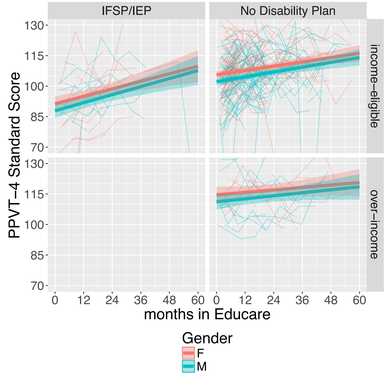

Figure 2. Spaghetti plot of PPVT-4 standard score vs months in Educare, by gender, income status, and disability status. Data are redacted from small-*n* panel (lower left: over-income children with IFSP/IEP) in order to protect privacy. Each strand of spaghetti (thin lines) represents data from a single child. Heavy lines and ribbons represent predicted scores (fixed effects) and 95% confidence intervals from Table 2's censored linear mixed model with interactions.

Survival analyses considered entrance and exit dates from 441 children (including children still too young to have had their first PPVT-4 assessment at time of analysis). Table 3 shows key results from these analyses. While median age at exit was just over 5 years old, and some children entered at less than 1 month old, the median age at entry was 33 months old (shortly before the transition from Early Head Start to Head Start). Thus, while nominal maximum time in Educare was 5 years, the median time in Educare was just under 2 years.

Table 3. Median age at entry, time in Educare, and age at exit, by disability status.

	Median in Months		
Group	**Age at Entry**	**Time in Educare**	**Age at Exit**
All Children	33.7	21.4	60.5
Children with IFSP/IEP	32.6	23.6	61.7
Children without Disability Plan	33.7	21.2	60.4

Figure 3 summarizes predicted PPVT-4 scores for a 50:50 mix of girls and boys, by months in Educare, income, and disability status.

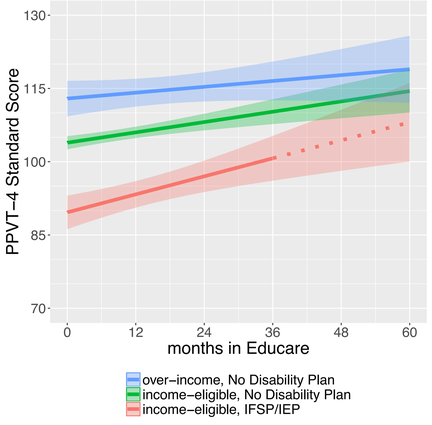

Figure 3. Predicted standardized PPVT-4 scores and confidence intervals, by months in Educare, income, and disability status, for Table 2's model with interactions. Predictions average over gender, for 50:50 mix of girls and boys. Dashed portion of income-eligible IFSP/IEP line represents the region based on very sparse data.

To summarize results at key landmarks:

- Children gain an average of 0.19 points per month (2.3 points per year) in standardized score.
- The rate of gain for children IFSP/IEPs is at least as fast as the rate of gain for children without disabilities.
- At median time in Educare (21.4 months), children have gained an average of 4.1 standard PPVT-4 points.
- At 36 months in Educare, children have gained an average of 7.0 standard PPVT-4 points.
- At the nominal maximum of 60 months in Educare, children have gained an average of 11.6 standard PPVT-4 points.
  - For children without disabilities, this estimate is fairly reliable.
  - However, because the sample includes very few PPVT-4 assessments from children with disabilities when time in Educare exceeded 36 months, this is essentially an extrapolation for children with disabilities.

Discussion

In a highly resourced Birth-5 program for children at risk, children with IFSP/IEPs gain vocabulary scores at least as fast as children without disabilities.

Connection to Conference Theme ("Lift Your Voice!")

Educare serves as a demonstration program and a platform for research and policy change. Parent involvement is a core component of the model. Parents are involved in program aspects and in policy implications, as they choose. For example, this year, a parent of a child with special needs testified to the state legislature against proposed cuts to the state-funded portion of Head Start programs and cited her child's progress at Educare.

Figure 4. Kaitlyn Paulette, parent of a child at Educare Central Maine testifying at Maine State Legislature to joint hearing of Appropriations Committee and Health and Human Services Committee, February 24, 2017. See https://www.youtube.com/watch?v=a4wpfDu3l7E&list=PLHAnNxoFzX20bePE1JFZh61qmwj3-2PZ1&index=7

Reference

Vaida, F., & Liu, L., (2012). lmec: linear mixed-effects models with censored responses. R package version 1.0. https://CRAN.R-project.org/package=lmec

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