

The Effect of 4K Attendance on Kindergarten Literacy

MAJOR FINDINGS

1. *When controlling for demographic differences, students who attended 4K in MMSD have significantly higher kindergarten PALS scores and are significantly less likely to be below grade-appropriate benchmarks relative to students who did not attend 4K in MMSD.*
2. *Students attending 4K in MMSD are more likely to be students of color, from low-income families, and from families with lower education levels relative to those not attending 4K in MMSD.*

Because 4K in MMSD appears to have a positive effect on kindergarten literacy and because MMSD 4K programs serve a disproportionate number of students from traditionally low-performing groups, 4K shows promise in closing achievement gaps.

This report includes an estimation of the effect of four-year-old kindergarten (4K) attendance on kindergarten academic performance, measured through the Fall 2012 administration of the Phonological Awareness Literacy Screening (PALS), given to Madison Metropolitan School District (MMSD) kindergarteners.

Background information. The Madison Metropolitan School District implemented a universal 4K program beginning during the 2011-12 school year. Nearly 2,000 students participated in the program, which includes 4K sites at several MMSD elementary schools, as well as many other sites around the community.

The Phonological Awareness Literacy Screening (PALS) is designed to identify students who are performing below grade level expectations on a variety of literacy measures, including phonological awareness, alphabet knowledge, knowledge of letter sounds, spelling, concept of word, and word recognition in isolation. Student scores on subtests in these areas are combined into a composite score which is used to determine whether the student is below grade level expectations. Falling below grade level expectations was designed to correspond to approximately the bottom quartile of students in Virginia, where the test was designed. MMSD began administering PALS in the Fall of 2012 to all kindergarten students.

Data. Data comes from the Fall 2012 PALS administration. Students included were enrolled in kindergarten in MMSD on the third Friday in September 2012. Students were identified as having attended 4K in MMSD if they were enrolled in a district-sponsored 4K program on the third Friday in September 2011. English Language Learner (ELL), free/reduced lunch, and special education designations come from students' kindergarten years. PALS scores were available for 2164 of 2257 kindergarten students. The average summed score was about 59 and approximately 15% of students fell below grade-appropriate benchmarks by scoring below 28.

Findings. Students who attended 4K in MMSD and those who did not showed similar performance on the Fall 2012 PALS, both in terms of average scores and percentages falling short of benchmarks. Performance varied among demographic groups.

	Below Benchmark		Average Summed Score	
	MMSD 4K	Not MMSD 4K	MMSD 4K	Not MMSD 4K
Total	15.5%	15.2%	58.3	61.0
African American	20.9%	32.2%	49.0	42.9
Hispanic	35.4%	33.3%	40.3	46.3
Asian	8.6%	18.8%	66.3	57.5
White	4.9%	3.8%	69.9	71.1
Two or more races	8.4%	26.4%	62.7	53.6
ELL services	27.0%	25.4%	48.3	51.7
Free/reduced lunch	25.0%	29.6%	46.4	45.6
Special education	37.1%	54.2%	45.1	27.8
College-educated parent	3.8%	3.0%	73.3	73.9
Single parent	23.6%	25.2%	48.7	49.7

Bold represents significance at 95% confidence, determined using t-tests.

However, comparing these groups of students without accounting for demographic differences is inappropriate because MMSD kindergarteners who attended 4K in MMSD and those who did not are, on average, demographically different, as shown in the table below.

	MMSD 4K	Not MMSD 4K
African American	19.54%	12.52%
Hispanic	22.12%	15.07%
Asian	9.09%	8.68%
White	39.96%	53.00%
Two or more races	9.09%	9.96%
ELL services	31.14%	22.48%
Free/reduced lunch	55.29%	42.66%
Special education	8.28%	3.83%
College-educated parent	40.71%	48.91%
Single parent	29.85%	35.89%

To control for these demographic differences, it is more appropriate to conduct regressions estimating the effect of 4K attendance on relevant outcomes. For this report, I tested the effect of 4K attendance on the likelihood that a student would be identified as below grade-appropriate benchmarks, as well as on overall PALS scores. In each regression, I controlled for gender, race, ELL status, free/reduced lunch status, special education status, parent education, and whether the student lives in a single parent household. Regression tables are available at the end of this document.

The first regression revealed that students attending 4K in MMSD were significantly less likely to be identified as failing to meet age-appropriate benchmarks. Holding demographics constant, 4K attendance in MMSD reduced a student's chances of failing to meet benchmarks by about 5.5% on average.

A regression to test the effect of 4K attendance on PALS scores yielded positive results but was unusable because of outliers and biases in estimation for high and low performers. To correct for these biases, I conducted a robust regression, which again yielded statistically significant positive results of 4K attendance. Holding demographics constant, 4K attendance in MMSD would be expected to increase a student's PALS composite score by an average of about 2.7 points. Given that the average score for MMSD kindergarteners is approximately 59, this effect is relatively small, but it also is unlikely to be random.

Conclusions

These data suggest that attending 4K in MMSD has a statistically significant positive impact on students' literacy in kindergarten, as measured by PALS performance. These results represent only the first look at 4K effectiveness in MMSD and future analyses might yield different results as the first cohort of MMSD 4K students progresses on to higher grades. Nonetheless, these early results are encouraging and suggest that 4K in MMSD has made an immediate and observable impact on kindergarten student literacy.

PALS Odds of Scoring Below Benchmark

		Coefficients		
4K in Madison	0.002	-0.035	-0.052	-0.055
Female		-0.065	-0.054	-0.057
African American		0.198	0.103	0.081
Hispanic		0.308	0.182	0.131
Asian		0.079	0.003	0.003
Two or more races		0.108	0.049	0.020
ELL			0.056	0.051
Free/Reduced Lunch			0.135	0.041
Special Education			0.231	0.218
College-educated parent				-0.057
Single parent				0.032
_cons	0.152	0.097	0.057	0.304







Bold represents significance at 95% confidence.

PALS Summed Score

		Coefficients		
4K in Madison	-3.044	1.070738	2.124	2.694
Female		5.600463	4.851	4.908
African American		-24.9294	-10.457	-7.411
Hispanic		-31.0283	-13.947	-7.932
Asian		-6.07453	3.744	3.790
Two or more races		-11.6684	-2.548	0.419
ELL			-4.691	-4.892
Free/Reduced Lunch			-20.615	-10.872
Special Education			-12.378	-11.728
College-educated parent				6.462
Single parent				-2.787
_cons	62.027	68.29228	72.839	44.874

Bold represents significance at 95% confidence.

These tables show the resulting coefficients from regressions using scoring below grade-appropriate PALS benchmarks and summed PALS scores as dependent variables. The first column of numbers refers to a regression using only MMSD 4K attendance to predict PALS performance. The second column refers to a regression with added gender and race controls. The third column refers to a regression with added controls for ELL status, free/reduced lunch status, and special education status. The fourth column adds controls for parent education and whether the student lives in a single parent household. Displaying these regression coefficients side-by-side illustrates the point that the estimated effect of 4K changes as we account for additional demographic variables and differences between 4K and non-4K students.

African American	
Hispanic	
Asian	
White	
Two or more races	
All Students	

These sparklines show PALS score distributions by race/ethnicity. The far left of each sparkline represents the minimum score of 0 and the far right represents the maximum score of 102. The vertical red bar represents the grade-appropriate benchmark score of 28.