MONTGOMERY COUNTY PUBLIC SCHOOLS

Evaluation Research Brief

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Early Entrance to Kindergarten, Student Academic Performance, and Behaviors Related to Learning Skills

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Executive Summary

When to enroll a child in kindergarten is an issue of great concern to parents and teachers. Whether or not giving a child an extra year before beginning kindergarten improves academic performance is a controversial issue with inconclusive answers (Perry, 2010).

This Montgomery County Public Schools (MCPS) evaluation study examined how students who entered kindergarten through Early Entrance to Kindergarten (EEK) performed academically and behaviorally, compared to their slightly older age-eligible peers in the same grade, as well as their same age peers who were eligible for EEK but entered kindergarten a year later (delayed) by parental choice. The study results can help parents and educators make informed decisions about early kindergarten entrance before a child reaches the age of five.

Background

Maryland State Department of Education (MSDE) regulation requires that children must be 5 years old before or on September 1, to be eligible to enter kindergarten. Local boards of education are required to adopt a policy permitting a child who turns five between September 2 and October 15 to be screened in order to determine eligibility for early entrance to kindergarten. Entrance is granted if the child demonstrates capabilities warranting early admission. The policies and procedures for determining whether or not a child gains early admission to kindergarten are determined by the local school system (MSDE, 2010).

In MCPS, children who turn five between September 2 and October 15 are eligible to apply for the EEK process. Parents or guardians can submit their EEK application between February 1 and June 30. MCPS EEK guidelines (MCPS, 2006) are provided every year to schools with kindergarten programs (See Appendix A). A guide to parents about the EEK is available online (MCPS, 2011).

During annual kindergarten orientation, an EEK applicant must be individually administered screening assessments that are in conjunction with observations in development domains by designated staff. A school team comprised of the principal, teachers, and professional staff members reviews the EEK application, parent checklist, observation, and assessment data in order to gauge a child's academic performance and developmental level. Students who meet or exceed the established criteria in all assessment areas are recommended for early entrance to kindergarten.

Methodology

Research Questions

This study addressed the following three evaluation questions:

1. Who were the EEK students in MCPS from 2007–2008 to 2010–2011?
2. How did the EEK students perform academically in kindergarten and Grade 2, compared with their slightly older peers in the same grade? Was there any difference in learning skills for the two groups by 2011?
3. How did the EEK students perform academically in kindergarten and Grade 2, compared with their peers of same age who did not apply for EEK but entered kindergarten a year later by parental choice? Was there any difference in learning skills for the two groups by 2011?

Samples

The analytical sample to address the first evaluation question included all MCPS students who entered kindergarten through the EEK process from 2007–2008 to 2010–2011.

The samples used to answer the second and third evaluation questions consisted of one study group and two comparison groups who remained in MCPS by 2011. The study group was called the EEK group, and the two comparison groups were called the Older group and the Delayed group.

Students with incomplete measures were excluded. Demographic characteristics and school readiness at the beginning of kindergarten were controlled statistically so the study group and the two comparison groups were similar except for their age at kindergarten entrance.

The EEK group was made up of students who turned five between September 2 and October 15, 2007, and were admitted to kindergarten in 2007–2008 through the EEK process. This cohort was chosen because it was the first EEK group with data available through Grade 2, after MSDE developed its early entrance policy.

The Older group was the first comparison group including students who reached age five between July 15 and September 1, 2007, and entered kindergarten through regular age of entry procedures in 2007–2008. The students in this group were slightly older than their EEK counterparts in the same grade.

The Delayed group was the second comparison group including students who reached age five between September 2 and October 15, 2007. Students in this group did not enter kindergarten through EEK, but began kindergarten a year later by parental choice. This delayed group belonged to the 2008–2009 kindergarten cohort.

Measures

Each year, every incoming kindergartener is administered the Maryland Model for School Readiness (MMSR) during the first six weeks of a school year. MCPS students in kindergarten through Grade 2 take the MCPS Assessment Program in Primary Reading (AP-PR) in fall, winter, and spring. Grade 2 students also take TerraNova Comprehensive Tests of Basic Skills Second Edition (TN/2) and InView annually in the spring.

MMSR. The MMSR assesses seven developmental domains of kindergarteners: personal and social development, language arts literacy, mathematical thinking, scientific thinking, social studies, the arts, and physical development (MSDE, 2009). The MMSR has been used in Maryland since 2001 to gauge the school readiness profiles of all kindergarteners across the state. The MMSR classifies student school readiness profiles into three groups: developing readiness, approaching readiness, and fully ready. Students who obtain a composite score below 50 are developing readiness; those who score between 50 and 70 are approaching readiness; and those who score higher than 70 are fully ready for school. The MMSR scores were used to control for school readiness at the beginning of kindergarten.

MCPS AP-PR. The MCPS AP-PR is a research-based and locally developed assessment used to measure important concepts and skills in MCPS Grades pre-K–2 reading curriculum. Percentages of students meeting or exceeding reading benchmarks in kindergarten (Level 4 and Level 6) as well as percentages of students meeting Grade 2 reading benchmark at Level M, were used as academic outcome measures.

TN/2. TN/2 is a norm-referenced test assessing skills in reading, language, mathematics, language mechanics, and mathematics computation (CTB/McGraw-Hill, 2002a). The 50th percentile rank on TN/2 is the national average, while the 70th percentile rank in reading is one of the MCPS early indicators of college readiness. The scale scores for TN/2 reading, language arts, and mathematics were used as academic outcome measures.

InView. InView is a standardized norm-referenced test focusing on critical quantitative processes rather than learned mathematic skills (CTB/McGraw-Hill, 2002b). The Analogy subtest is a nonverbal measure of a student's skill to differentiate relationships among pictures. Students need to recognize the relationship between two pictures presented and then determine the parallel relationship with a new pair of pictures. The Quantitative Reasoning subtest measures the ability to think about numbers and to solve problems through the reasoning process, systematic logic, induction, and deduction. InView scale scores were used as cognitive reasoning outcome measures.

Report Card. The MCPS Elementary Report Card is available to every student in Grades 1–5 for four marking periods in a school year. There are two different kinds of report cards in MCPS in 2011, namely standard-based and traditional. Since most schools use a traditional report card, students with standard-based report cards were excluded when learning skills were examined. Of the 183 EEK students in 2007–2008 who stayed in MCPS by Grade 2, 133 had traditional report cards.

On the traditional report card, teachers rate a student's learning skills with four letters (I = independently, L = with limited prompting, F = with frequent prompting and R = rarely) in areas such as homework, classwork, engaging in learning tasks, cooperation with others, following rules, and exercising self-

control. The author of the brief calculated an overall score including teacher's ranking of learning skills in four marking periods of 2010–2011. Appendix B describes how overall learning skill scores were calculated. The computed scores of learning skills were used as behavior outcome measures.

Analytical Procedures

In addition to descriptive information, a propensity score matching method (Rosenbaum & Rubin, 1983) was used to control for initial differences for students in the EEK and two comparison groups. A propensity score was generated by a logistic regression model for every student who had data on school readiness, gender, race/ethnicity, and participation in English for Speakers of Other Languages (ESOL) and Free and Reduced-price Meals System (FARMS) services at the beginning of kindergarten. School readiness was controlled by the MMSR composite scores. Based on proximity of their propensity scores, the EEK kindergarteners were matched with students in the comparison groups.[1]

After matching, chi-square tests were used to examine the proportion of EEK students meeting reading benchmarks in kindergarten and Grade 2, compared with the slightly older and delayed groups separately. T-tests were used to examine if the EEK group differed significantly from the comparison groups on TN/2, InView, and learning skills. Analyses of Variance (ANOVA) were conducted to detect interaction among subgroups between EEK and comparison groups.

Results

The results are presented in the order of the evaluation questions. First, the EEK students in MCPS are described, followed by comparison between the EEK and the older group and delayed group, respectively.

EEK Students from 2007 to 2010

This section addresses the first evaluation question: Who were the EEK students in MCPS from 2007–2008 to 2010–2011?

As shown in Table 1, there were 863 EEK students from 2007 to 2010. Across four years, 63.6% of the EEK students were female, 27.6% were Black or African American, 26.8% were Asian, 11.4% were Hispanic/Latino and 34% were White. Among the EEK students, 21.1% received ESOL services, and 18.9% received FARMS services. More information about EEK students can be found in Appendix C. Because the EEK group had very few American Indian or Alaskan Native and special education students, results for these two groups are not presented after Table 1.

Table 1
Percentage of MCPS Early Entrance Kindergarten Students From 2007 to 2010

	2007	2008	2009	2010	Total
Total N	247	223	206	187	863
Gender					
Female	66.8	63.2	58.7	65.2	63.6
Male	33.2	36.8	41.3	34.8	36.4
Race					
AM	0.0	0.9	0.0	0.5	0.3
AS	26.3	23.8	30.1	27.3	26.8
BL	27.1	24.7	30.1	28.9	27.6
HI	14.6	13.5	8.7	7.5	11.4
WH	32.0	37.2	31.1	35.8	34.0
Services					
ESOL	23.9	19.7	24.3	15.5	21.1
FARMS	23.1	18.4	15.0	18.2	18.9
SPED	0.4	1.3	2.4	1.6	1.4

Note. AM = American Indian or Alaskan Native; AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System; SPED = special education.

EEK Group and Their Older Peers

This section answers the second evaluation question: How did the EEK students perform academically in kindergarten and Grade 2, compared with their slightly older peers in the same grade? Was there any difference in learning skills for the two groups by 2011?

Table 2 presents the characteristics of EEK students in 2007 and their slightly older peers after propensity score matching. The two matched groups were close in demographic characteristics.

[1] Nearest neighbor matching was conducted without replacement.

Table 2
Characteristics of EEK Students in 2007 and Their Slightly Older Peers after Propensity Score Matching

	EEK Group		Older Group	
	N	%	*N*	%
Total	183		183	
Gender				
Female	122	66.7	127	69.4
Male	61	33.3	56	30.6
Race				
AS	52	28.4	48	26.2
BL	44	24.0	42	23.0
HI	27	14.8	28	15.3
WH	60	32.8	65	35.5
Services				
ESOL	46	25.1	46	25.1
FARMS	39	21.3	36	19.7

Note. AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

School Readiness for EEK and Older Groups. Table 3 shows MMSR mean scores between the EEK group and their slightly older peers. The MMSR mean scores for the two groups were not significantly different (p value = .884). This indicates that the EEK group was very similar to the older group on school readiness at the beginning of kindergarten.

Table 3
MMSR Mean Scores for EEK and Older Groups After Matching

	N	Mean	SD	*t*	*p* value
EEK Group	183	79.2	9.9		
Older Group	183	79.4	9.4	-.15	.884

Note. SD = standard deviation; Degree of freedom =3 64.

Academic Performance of EEK and Older Groups. Since EEK students and their slightly older peers were similar in demographics and school readiness, academic performance in kindergarten and Grade 2 were studied to find out if there were significant differences between the two groups.

As shown in Table 4, 97.8% of EEK students met kindergarten reading benchmark at Level 4, significantly higher ($p \leq .01$) when compared with 91.3% of their slightly older peers. It is worth noting that a significantly higher percentage of male students, Black or African American students, and FARMS students in the EEK group met kindergarten reading benchmarks at Level 4, compared with their slightly older peers of the same grade (p values $\leq .05$ or .01).

About 83.1% of EEK students met Level 6, significantly higher ($p \leq .01$), when compared with 69.9% of their slightly older peers (Table 4). A significantly higher percentage of male students, Black or African American students, ESOL, and FARMS students in the EEK group met kindergarten reading benchmarks at Level 6 (p values $\leq .05$ or .01).

As shown in Table 4, no significant differences were detected between EEK students and their slightly older peers in meeting Grade 2 reading benchmark at Level M, and no significant differences were detected for the subgroups. This means that EEK students and their older peers performed at the same level in Grade 2 reading.

Table 4
Percentage of EEK and Older Groups Who Met or Exceeded Kindergarten Reading at Level 4 and Level 6, and Grade 2 Reading Benchmark

All	EEK Group % Met	Older Group % Met	*N*	x^2
K Reading Benchmark at Level 4				
All	97.8	91.3	366	7.62**
Female	98.4	93.7	249	3.51
Male	96.7	85.7	117	4.53*
AS	98.1	100.0	100	.93
BL	97.7	78.6	86	7.67 **
HI	100	85.7	55	4.16
WH	96.7	95.4	125	.13
ESOL	97.8	89.1	92	2.85
FARMS	97.4	83.3	75	4.40*
K Advanced Reading at Level 6				
All	83.1	69.9	366	8.76**
Female	82.0	71.7	249	3.70
Male	85.2	66.1	117	5.90*
AS	86.5	79.2	100	.96
BL	88.6	59.5	86	9.57**
HI	74.1	57.1	55	1.74
WH	80.0	75.4	125	.38
ESOL	78.3	56.5	92	4.95*
FARMS	76.9	52.8	75	4.82*
G2 Reading Benchmark at Level M				
All	84.7	80.9	366	.94
Female	86.1	79.5	249	1.86
Male	82.0	83.9	117	.08
AS	90.4	91.7	100	.05
BL	86.4	71.4	86	2.90
HI	74.1	67.9	55	.26
WH	83.3	84.6	125	.04
ESOL	80.4	73.9	92	.56
FARMS	76.9	69.4	75	.54

Note. AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System; Degree of freedom = 1 for chi-square tests.

* Statistically significant p value $\leq .05$.

** Statistically significant p value $\leq .01$.

Table 5 shows mean scale scores of Analogy and Quantitative Reasoning on InView for the EEK students and their slightly older peers in Grade 2. On InView Analogy, EEK students scored significantly higher (p value ≤ .01). Both genders, Black or African American students, White students, and students receiving ESOL services in the EEK group performed significantly higher than their peers in the older group (p values ≤ .05 or .01).

On InView Quantitative Reasoning, no significant differences were detected between the EEK and older groups (Table 5). This means that the EEK and older groups performed at the same level in reasoning in Grade 2.

Table 5
Mean Scale Scores of Analogy and Quantitative Reasoning for EEK and Older Groups on InView[2]

	EEK Group	Older Group		
All	Mean	Mean	*SE*	*F*
Analogy				
All	412	390	8.36	6.98**
Female	409	389	8.79	5.00*
Male	416	392	12.2	4.01*
AS	432	436	13.6	.09
BL	394	351	13.9	9.38**
HI	407	388	16.0	1.39
WH	417	386	14.8	4.39*
ESOL	412	373	13.4	8.39**
FARMS	416	388	14.5	3.78
Reasoning				
All	406	401	7.55	.32
Female	403	399	7.93	.28
Male	408	404	11.1	.15
AS	446	439	12.3	.37
BL	397	373	12.5	3.52
HI	376	386	14.4	.50
WH	403	407	13.3	.08
ESOL	397	391	12.1	.26
FARMS	399	398	13.1	.01

Note. *SE* = standard error; AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.
*Statistically significant p value ≤ .05.
** Statistically significant p value ≤ .01.

On TN/2, EEK students scored significantly higher in language arts than their older peers (p value ≤ .05) (Table 6). No significant differences were found in reading and mathematics between the two groups.

Across student groups, female and Black or African American students in the EEK group performed significantly higher than their older peers in language arts and mathematics (p values ≤ .05 or .01) (Table 6). ESOL students in the EEK group performed significantly higher in reading and language arts, compared with their peers in the slightly older group (p value ≤ .05).

Table 6
Mean Scale Score in Reading, Language Arts, and Mathematics on TN/2 for EEK and Older Groups[3]

	EEK Group	Older Group		
All	Mean	Mean	*SE*	*F*
Reading				
All	627	623	4.52	.58
Female	630	626	4.75	.74
Male	623	620	6.62	.17
AS	636	637	7.37	.02
BL	623	609	7.51	3.85
HI	618	621	8.63	.13
WH	629	626	7.97	.15
ESOL	624	610	7.23	3.88*
FARMS	622	622	7.83	.00
Language Arts				
All	636	624	4.87	6.05*
Female	640	627	5.12	7.10**
Male	632	621	7.14	2.09
AS	649	641	7.95	.99
BL	629	610	8.10	5.44*
HI	624	617	9.30	.57
WH	643	629	8.60	2.71
ESOL	633	615	7.80	5.25*
FARMS	631	621	8.44	1.42
Mathematics				
All	598	589	5.41	2.83
Female	594	582	5.69	5.00*
Male	601	596	7.93	.48
AS	616	621	8.83	.26
BL	586	568	9.00	3.89*
HI	586	574	10.3	1.51
WH	603	593	9.55	1.20
ESOL	595	583	8.66	1.90
FARMS	595	589	9.37	.44

Note. *SE* = standard error; AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.
*Statistically significant p value ≤ .05.
** Statistically significant p value ≤ .01.

[2] Additional results can be found in Table D1 of Appendix D.

[3] Additional results can be found in Table D1 of Appendix D.

Learning Skills of EEK and Older Groups. Of the 183 students in the EEK group, 133 had a traditional report card. As shown in Table 7, their mean score of learning skills was not significantly different than their slightly older peers (p value = .829). This suggests that the EEK students and their slightly older peers were also similar on nonacademic indicators as measured by the report cards of four marking periods, when students were 8 years old in 2010–2011. Additional analyses showed there was no significant subgroup difference between the EEK group and their slightly older peers.

Table 7
Mean Scores of Learning Skills Based on Report Card for EEK and Older Groups in 2010–2011

	N	Mean	SD	*t*	*p* value
EEK Group	133	87.6	11.7		
Older Group	146	87.3	10.8	.217	.829

Note. SD = standard deviation; Degree of freedom = 277.

EEK Group and Delayed Group

This section answers the third evaluation question: How did the EEK students perform academically in kindergarten and Grade 2, compared with their peers of same age who did not apply for EEK but entered kindergarten a year later by parental choice? Was there any difference in learning skills for the two groups by 2011?

Table 8 shows the characteristics of EEK students in 2007 and their peers in the Delayed group after propensity score matching. The two matched groups were similar in demographic characteristics.

Table 8
Characteristics of EEK and Delayed Groups in 2007 After Propensity Score Matching

	EEK Group		Delayed Group	
	n	%	*n*	%
Total	183		183	
Gender				
Female	122	66.7	121	66.1
Male	61	33.3	62	33.9
Race				
AS	52	28.4	54	29.5
BL	44	24.0	40	21.9
HI	27	14.8	27	14.8
WH	60	32.8	61	33.3
Services				
ESOL	46	25.1	41	22.4
FARMS	39	21.3	37	20.2

Note. AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

School Readiness for EEK and Delayed Groups. Table 9 shows that MMSR mean scores between the EEK and delayed groups are not significantly different (p value = .348). This means that that the EEK group was very similar to the delayed group on school readiness at the beginning of kindergarten.

Table 9
MMSR Mean Scores for EEK and Delayed Group After Matching

	N	Mean	SD	*t*	*p* value
EEK Group	183	79.2	9.9		
Delayed Group	183	80.2	9.2	-.94	.348

Note. SD = standard deviation.

Academic Performance of EEK and Delayed Groups. Since EEK students and those in the delayed group were similar in demographics and school readiness, academic performance in kindergarten and Grade 2 were studied to find out if there were significant differences between the two groups.

As shown in Table 10, a significantly higher percentage of EEK students met kindergarten reading benchmark (p value $\leq$ .01). In addition, significantly higher percentages of female and FARMS students in the EEK group met kindergarten reading benchmark, compared with their peers in the Delayed group (p value $\leq$ .05 or .01).

At kindergarten Level 6 or Grade 2 Level M, no significant differences in reading were detected for students in the EEK and Delayed groups (Table 10). No significant differences were found for subgroups. This suggests that the EEK and Delayed groups were similar in advanced reading level in kindergarten as well as in meeting the Grade 2 reading benchmark.

Table 10
Percentage of EEK and Delayed Groups Who Met or Exceeded Kindergarten Reading at Level 4 and Level 6, and Grade 2 Reading Benchmark

All	EEK Group % Met	Delayed Group % Met	*N*	x^2
K Reading Benchmark at Level 4				
All	97.8	89.6	366	10.4**
Female	98.4	87.6	243	10.8**
Male	96.7	93.5	123	.67
AS	98.1	100.0	106	1.05
BL	97.7	87.5	84	3.30
HI	100.0	81.5	54	5.51
WH	96.7	86.9	121	3.82
ESOL	97.8	90.2	87	2.30
FARMS	97.4	81.1	76	5.39*
K Advanced Reading at Level 6				
All	83.1	86.0	354	.57
Female	82.0	83.2	235	.06
Male	85.2	91.4	119	1.08
AS	86.5	90.7	106	.47
BL	88.6	81.1	81	.91
HI	74.1	78.3	50	.12
WH	80.0	89.3	116	1.91
ESOL	54.5	45.5	84	.01
FARMS	76.9	70.6	73	.38
G2 Reading Benchmark at Level M				
All	84.7	82.7	351	.25
Female	86.1	81.7	231	.83
Male	82.0	84.7	120	.17
AS	90.4	90.2	103	.00
BL	86.4	81.6	82	.35
HI	74.1	80.0	52	.26
WH	83.3	77.8	114	.56
ESOL	80.4	81.6	84	.02
FARMS	76.9	68.6	74	.65

Note. AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System; Degree of freedom = 1 for chi-square tests.

*Statistically significant *p* value ≤ .05.

** Statistically significant *p* value ≤ .01.

Table 11 shows FARMS students in the EEK group performed significantly higher than their peers in the Delayed group on InView Analogy test in Grade 2 ($p \leq .05$). No other significant differences were detected on InView Analogy between the EEK students and the Delayed group in Grade 2.

On InView Quantitative Reasoning, no significant differences were detected between the EEK and Delayed groups (Table 11). This means that the EEK and Delayed groups performed at the same level in reasoning in Grade 2.

Table 11
Means Scale Scores of Analogy and Quantitative Reasoning for EEK and Delayed Groups on InView[4]

All	EEK Group Mean	Delayed Group Mean	*SE*	*F*
Analogy				
All	412	395	9.17	3.55
Female	409	397	9.88	1.34
Male	416	393	13.2	3.06
AS	432	419	14.4	.82
BL	394	365	15.4	3.61
HI	407	384	17.7	1.74
WH	417	413	16.2	.05
ESOL	412	389	14.9	2.36
FARMS	416	385	15.6	3.97*
Reasoning				
All	406	406	7.99	.01
Female	403	401	8.60	.08
Male	408	412	11.5	.11
AS	446	440	12.5	.23
BL	397	380	13.4	1.60
HI	376	396	15.4	1.82
WH	403	408	14.1	.13
ESOL	397	400	12.9	.07
FARMS	399	398	13.6	.01

Note. SE = standard error; AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

*Statistically significant *p* value ≤ .05.

** Statistically significant *p* value ≤ .01.

On TN/2, no significant differences were found between the EEK group and their peers in the Delayed group (Table 12). This means that the EEK students performed at the same level as their peers in the Delayed group on TN/2 reading, language arts, and mathematics. Additionally, no significant subgroup differences were identified on TN/2.

[4] Additional results can be found in Table D2 of Appendix D.

Table 12
Mean Scale Scores in Reading, Language Arts, and Mathematics on TN/2 for EEK and Delayed Groups[5]

All	EEK Group Mean	Delayed Group Mean	*SE*	*F*
Reading				
All	627	625	4.48	.17
Female	630	630	4.82	.00
Male	623	620	6.47	.28
AS	636	629	7.03	1.14
BL	623	619	7.57	.34
HI	618	624	8.62	.50
WH	629	628	7.89	.03
ESOL	624	623	7.25	.00
FARMS	622	616	7.63	.58
Language Arts				
All	636	632	5.01	.65
Female	640	635	5.40	.88
Male	632	629	7.24	.17
AS	649	646	7.87	.11
BL	629	624	8.47	.30
HI	624	621	9.65	.12
WH	643	638	8.83	.41
ESOL	633	627	8.11	.47
FARMS	631	630	8.54	.03
Mathematics				
All	598	594	5.93	.41
Female	594	594	6.38	.00
Male	601	594	8.56	.71
AS	616	617	9.30	.00
BL	586	580	10.0	.35
HI	586	578	11.4	.01
WH	603	602	10.4	.54
ESOL	595	587	9.59	.69
FARMS	595	590	10.1	.26

Note. SE = standard error; AS = Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.
*Statistically significant p value $\leq .05$.
** Statistically significant p value $\leq .01$.

Learning Skills of EEK and Delayed Group. No significant differences in learning skills were found for EEK students and those in the Delayed group. This suggests that the EEK students and their peers in the Delayed group were similar on nonacademic indicators at the age of 8 years old in 2010–2011. Additional analyses showed there were no significant subgroup differences between the EEK group and the Delayed group.

Table 13
Mean Scores of Learning Skills Based on Report Card for EEK and Delayed Groups in 2010–2011

	N	Mean	SD	*t*	*p* value
EEK Group	133	87.6.	11.7		
Older Group	144	90.0	8.6	-1.897	.059

Note. SD = standard deviation.

Conclusion

A body of literature that examined age effects on achievement found initial achievement differences in favor of older kindergarten children, but the effect faded over time (Perry, 2010; Yesil-Dagli, 2007; Kurderk & Sinclair, 2001; Stipek and Byler, 2001; Crone & Whitehurst, 1999). Some long-term studies found no difference between early kindergarten entrants and their older classmates in labor market outcomes such as wages, employment, and home ownership (Dobkin & Ferreira, 2009).

Compared to their slightly older peers, significantly higher percentages of EEK students met the kindergarten reading benchmark and advanced level, and scored higher on the InView Analogy test and TN/2 language arts by Grade 2. The EEK Black or African American students consistently performed higher than their slightly older peers in kindergarten and Grade 2.

Compared to their peers of the same age who chose to enter kindergarten a year later, a significantly higher percentage of EEK students met the kindergarten reading benchmarks. FARMS students in the EEK group scored significantly higher than their peers of the Delayed group on InView Analogy test in Grade 2.

In addition to higher or similar academic performance in kindergarten and Grade 2, the EEK students had similar learning skills as their slightly older and delayed peers based on teacher's rating on report cards when they were 8 years old in 2010–2011.

In summary, students who were admitted through the MCPS early entrance to kindergarten process performed better or equally as well academically and behaviorally as measured by standardized tests and learning skills, when compared with their older peers in the same grade and the delayed peers of the same age who entered kindergarten a year later by parental choice.

[5] Additional results can be found in Table D2 of Appendix D.

The results of this study did not show advantages for the delayed kindergarten entrance. This may be due to the fact that the EEK students were screened for school readiness before their entrance to kindergarten. The success of EEK students may be credited to the careful screening of the EEK students in MCPS and the instructional support from K–Grade 2 in MCPS. Based on this study, it is reasonable to conclude that if students are school ready, delaying entrance to kindergarten does not provide them academic or behavioral advantages in the early years of their schooling.

Recommendations

Based on this study, the following recommendations are suggested:

- Continue to screen students carefully for early entrance kindergarten with the MCPS guidelines.
- Communicate the results to teachers and parents so they can make informed decisions.

Limitation

Despite rigorous statistical control with propensity score matching, this study employed a quasi-experimental design. The EEK group and two comparison groups may have some preexisting differences on factors not included in the propensity model. If so, this may consequently threaten the internal validity of the findings (Gay & Airasian, 2000; Shadish, Cook, & Campbell, 2002). As a result, causal conclusions about the impacts of EEK on student academic achievement and behaviors may not be definitively inferred from the results. However, use of propensity scores greatly improved the internal validity of the study.

The study used only the 2007–2008 EEK cohort because it is the first cohort with available data after Maryland changed its kindergarten entrance policy. If additional cohorts can yield similar results, generalizability of the study results can be greatly improved.

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Appendix A

MCPS Guidelines for Early Entrance to Kindergarten

1. Students must be age 5 by September 1 in order to be eligible for entry to kindergarten.
2. Parents of children whose birth dates occur within a six-week period beyond the state's prescribed admission date, who seek early entrance to kindergarten, must submit the following documents to support their child's application:
    a. MCPS Form 271-6: *Application for Early Entrance to Kindergarten Program*. Parents will be notified that these forms are available.
    b. MCPS Form 271-6: *Application for Early Entrance to Kindergarten Program: Parent Checklist* of the skills identified as Maryland Model for School Readiness (MMSR) indicators.
    c. Parental verification that the student is well and able to be assessed on the day of screening.
3. In addition, parents may wish to submit any of the following optional items as part of the application:
    a. Prior preschool attendance reports, records, and evaluations that address academic, social, emotional and physical maturity, motor development, learning skills, and capabilities warranting early admission
    b. Formal student evaluations completed by outside professionals
4. Applications for early entrance to kindergarten will only be accepted from February 1 to June 30.
5. Screening process
    a. The Division of Early Childhood Programs and Services, in conjunction with principals, is responsible for managing the screening process for early entrance to kindergarten.
    b. Screening procedures will be used to assess academic, social, emotional and physical maturity, motor development, learning skills, and capabilities warranting early admission. Procedures to be used include standardized instrument(s), observational and MCPS primary assessments completed by staff, and information from parents.
    c. Screening instruments must include:
        - Reading/Language Arts Assessment
        - Mathematics Assessment
        - Observational Assessment aligned with the MMSR indicators, including physical well-being and motor development, personal and social development, language and literature, and mathematical thinking
6. No later than the end of the second week of school, parents whose children are admitted through the early entrance process will be required to participate in an early entrance conference with the school to review grade level expectations for the student and family.

Appendix B

Construction of Overall Learning Skill Score Based on 2010–2011 Traditional Report Cards

In MCPS, parents receive four report cards in a school year. Most schools use a traditional report card, while a few schools use a standard-based report card. Since the two types of report cards are different, only the traditional report card was used to construct a composite learning skill score. On the traditional report card, there is a section for learning skills (non-academic indicators) consisting of the eight items below:

1. Completion of homework
2. Completion of classwork
3. Engagement in learning tasks
4. Uses of feedback to improve learning
5. Cooperation with others towards a common goal
6. Showing consideration for others
7. Following oral and written directions
8. Exercising self-control

Teachers rated students on each of the above skills with letters I, L, F, R and NI in 2010–2011. The researchers assigned 1–4 points to each skill.

I = independent	(4 points)
L = limited prompting	(3 points)
F = frequent prompting	(2 points)
R = rarely	(1 point)
NI = not enough information	

On Learning Skills 4 and 6 (uses of feedback to improve learning and showing consideration for others), most teachers indicated that they did not have enough information to judge their students. To construct a composite learning skill score for a school year, the researchers summed up all the points for each skill across four marking periods, excluding Learning Skills 4 and 6 due to lack of sufficient information. As a result, the overall learning skill score is based on six out of eight learning skills. The constructed composite score is the sum of the points for the six items across four marking periods, with a maximum score of 96.

The reliability of the constructed composite score is .89, as measured by Cronbach's alpha which is considered high based on accepted criteria in research (Nunnally, 1978).

Appendix C

Characteristics of MCPS Kindergarten Students Enrolled Through Early Entrance to Kindergarten

	2007–2008		2008–2009		2009–2010		2010–2011		Total	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Total	247		223		206		187		863	
Gender										
Female	165	66.8	141	63.2	121	58.7	122	65.2	549	63.6
Male	82	33.2	82	36.8	85	41.3	65	34.8	314	36.4
Race/Ethnicity										
AS	65	26.3	53	23.8	62	30.1	51	27.3	231	26.8
BL	67	27.1	55	24.7	62	30.1	54	28.9	238	27.6
HI	36	14.6	30	13.5	18	8.7	14	7.5	98	11.4
WH	79	32.0	83	37.2	64	31.1	67	35.8	293	34.0
Services										
ESOL	59	23.9	44	19.7	50	24.3	29	15.5	182	21.1
FARMS	57	23.1	41	18.4	31	15.0	34	18.2	163	18.9
SPED	1	.4	3	1.3	5	2.4	3	1.6	12	1.4

Note. American Indian or Alaskan Native students were included in the total but not reported separately; AS =Asian; BL = Black or African American; HI = Hispanic/Latino; WH = White; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System; SPED = special education.

Appendix D

Table D1
ANOVA Results for InView Analogy and Quantitative Reasoning and TN/2 Reading, Language Arts, and Mathematics for EEK Students and Their Slightly Older Peers in Grade 2

Source	*df*	*F*	*p value*	Partial Eta Squared
InView Analogy				
EEK	1	2.786	.096	.008
Race x EEK	6	8.465	.000	.126
Gender x EEK	2	.371	.690	.002
FARMS x EEK	2	.254	.776	.001
ESOL x EEK	2	3.981	.020	.022
Error	352			
InView Reasoning				
EEK	1	1.309	.253	.004
Race x EEK	6	11.740	.000	.167
Gender x EEK	2	.319	.727	.002
FARMS x EEK	2	.861	.424	.005
ESOL x EEK	2	3.099	.046	.017
Error	352			
TN/2 Reading				
EEK	1	.014	.908	.000
Race x EEK	6	3.792	.001	.061
Gender x EEK	2	1.735	.178	.010
FARMS x EEK	2	1.356	.259	.008
ESOL x EEK	2	8.911	.000	.048
Error	352			
TN/2 Language Arts				
EEK	1	9.716	.002	.027
Race x EEK	6	4.962	.000	.078
Gender x EEK	2	1.757	.174	.010
FARMS x EEK	2	1.304	.273	.007
ESOL x EEK	2	3.934	.020	.022
Error	352			
TN/2 Math				
EEK	1	7.227	.008	.020
Race x EEK	6	10.373	.000	.150
Gender x EEK	2	3.550	.030	.020
FARMS x EEK	2	.324	.723	.002
ESOL x EEK	2	1.354	.260	.008
Error	352			

Note. EEK = Early Entrance Kindergarten; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Table D2
ANOVA Results for InView Analogy and Quantitative Reasoning and TN/2 Reading, Language Arts and Mathematics for EEK Students and Their Delayed Peers in Grade 2

Source	*df*	*F*	*p value*	Partial Eta Squared
InView Analogy				
EEK	1	3.551	.060	.010
Race x EEK	6	4.555	.000	.075
Gender x EEK	2	.361	.697	.002
FARMS x EEK	2	1.249	.288	.007
ESOL x EEK	2	.433	.649	.003
Error	337			
InView Reasoning				
EEK	1	.008	.929	.000
Race x EEK	6	10.012	.000	.151
Gender x EEK	2	.883	.414	.005
FARMS x EEK	2	1.586	.206	.009
ESOL x EEK	2	1.707	.183	.010
Error	337			
TN/2 Reading				
EEK	1	.165	.685	.000
Race x EEK	6	1.554	.160	.027
Gender x EEK	2	3.246	.040	.019
FARMS x EEK	2	4.811	.009	.028
ESOL x EEK	2	.589	.556	.003
Error	336			
TN/2 Language Arts				
EEK	1	.650	.421	.002
Race x EEK	6	3.940	.001	.066
Gender x EEK	2	1.921	.148	.011
FARMS x EEK	2	1.126	.326	.007
ESOL x EEK	2	1.435	.240	.008
Error	336			
TN/2 Math				
EEK	1	.412	.522	.001
Race x EEK	6	6.205	.000	.100
Gender x EEK	2	.617	.540	.004
FARMS x EEK	2	.764	.467	.005
ESOL x EEK	2	1.540	.216	.009
Error	336			

Note. EEK = Early Entrance Kindergarten; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.