Office of the Superintendent of Schools
MONTGOMERY COUNTY PUBLIC SCHOOLS
Rockville, Maryland

August 22, 2018

<u>MEMORANDUM</u>

To: Members of the Board of Education

From: Jack R. Smith, Superintendent of Schools

Subject: Early Learning Initiatives (07-17-18-02 and 07-17-18-03)

Follow-up 07-17-18-02

During the Early Learning Initiatives discussion, Board members requested the following information:

Question

Please provide the number of current sites that provide Head Start/pre-K services.

Response

During the 2018–2019 school year, there will be 64 school sites with prekindergarten and/or Head Start programs in 153 classrooms in Montgomery County Public Schools (MCPS). Attachment A includes a list of schools and programs.

Question

Please provide the number of sites that MCPS had providing Head Start/pre-K services prior to 2018 (3–5 years of data).

Response

During the last five-year period, there have been up to 63 sites with Head Start/pre-K programs in MCPS. At the end of the 2015–2016 school year, the locally funded pre-K class at Takoma Park Elementary School was relocated to Montgomery Knolls Elementary School, which already had a Head Start program. This reduced the number of sites from 63 to 62. Please refer to the following chart for specific data.

School Year	Number of Sites
2013–2014	63 sites in 141 classrooms
2014–2015	63 sites in 141 classrooms
2015–2016	63 sites in 143 classrooms
2016–2017	62 sites in 147 classrooms
2017–2018	62 sites in 149 classrooms

Question

Please provide comparison data of student achievement for students of similar demographics who attend MCPS' early childhood education programs versus those that do not attend a program.

Response

In the 2011 study, *Evaluating Effects of Full-day Head Start Model on Academic Performance at the End of Grade 1* (Attachment B), the Office of Shared Accountability (OSA) released data that compared the performance of Grade 1 students with pre-K or Head Start experience in MCPS to their peers who did not have a MCPS pre-K or Head Start experience. According to the 2011 study:

> African American and White students, and students receiving FARMS, English for Speakers of other languages (ESOL) and special education services who attended the full-day class model attained the Grade 1 reading benchmark at higher rates than counterparts without MCPS pre-K experience. For the White, ESOL, and special education students, the differences in attaining the Grade 1 reading benchmark between the full-day Head Start model and similar students without MCPS pre-K experiences were statistically significant and large enough to be educationally meaningful, indicating the full-day Head Start model had the desired impact. The remaining subgroups performed at similar levels between the two groups (p. vii).

Similarly, the 2011 OSA study indicated:

> When compared to students similar to Head Start eligible students who did not attend MCPS pre-K offerings, the students who attended the full-day Head Start model outperformed their peers on rates of attaining the mathematics proficiency in Grade 1. At the subgroup level, positive and meaningful effects were noted for male, African American, and ESOL students who attended the full-day Head Start model. For the remaining subgroups the performance of students who attended full-day Head Start was at the same level as their peers who did not attend MCPS pre-K (p. 21).

Question

Please provide information regarding MCPS' community outreach efforts for these programs.

Response

Community outreach efforts include the following—
- The registration process for the new school year begins in late February–early March of each year. This is when the Early Childhood Unit in the Division of Title I and Early Childhood Programs and Services begins its targeted community outreach in collaboration with a variety of stakeholders and community service providers.
- Family service workers distribute flyers and information at laundromats, ethnic groceries, clinics, clothing centers, etc.
- The grantee, Community Action Agency, posts full-color ads at 10 strategically selected Metrobus stops and inside Ride On buses, displays registration information on 311 monitors in County buildings, and publishes information in their monthly newsletter.
- Direct mailings are sent to—
  - Community agencies including pediatricians and other low-income/children's health providers, churches, and religious institutions;
  - All MCPS school locations and offices;
  - All Montgomery County Department of Recreation Community Centers and Aquatic Centers (two times during the spring and summer); and
  - All Montgomery County Public Library branches.
- Information is posted on the MCPS website, in *QuickNotes*, on MCPS TV, and a sample Connect-ED message is sent to participating schools.
- A bilingual staff member participates in interviews on Spanish-speaking radio.
- E-mail messages are sent with information to community partners such as Linkages to Learning, Child Welfare, Homeless Service Providers, the Gilchrist Immigrant Resource Center, Montgomery County Infants and Toddlers, Child Link, and Child Find.
- Registration is held at participating elementary schools, community centers, and other community locations.

Question

What is the percentage of those students enrolled in MCPS pre-K programs who are FARMS eligible? Also provide demographic information for these students.

Response

During the 2017–2018 school year, 4.22 percent or 124 of the 2,936 children enrolled in pre-K, Head Start, or Pre-K Plus classes were not eligible for Free or Reduced-price Meals System (FARMS) services. When families apply for pre-K programs, they submit proof of income.

After the school year begins, staff members in the Division of Food and Nutrition Services verify the information submitted on the FARMS applications and it may be determined that some families' income exceeds the determined income level and do not qualify for FARMS services.

However, children for whose families are determined to exceed the income level required for FARMS services may remain enrolled in the pre-K programs for the full school year. The following table indicates the number and percentages of children enrolled in pre-K programs who are FARMS and not FARMS eligible. The data are disaggregated by ethnicity.

Children Enrolled in pre-K Programs Who Are/Are Not FARMS Eligible

Ethnicity	All		FARMS		Not FARMS	
	Number (Percent)					
American Indian or Alaskan Native	64	2.18%	57	1.94%	7	0.24%
Asian or Pacific Islander	215	7.32%	209	7.12%	6	0.20%
Black or African American	1,040	35.42%	1,003	34.16%	37	1.26%
White	91	3.10%	86	2.93%	5	0.17%
Hispanic/Latino	1,526	51.9%	1,457	49.63%	69	2.35%
Native Hawaiian or Other Pacific Islander	-	-	-	-	-	-
Two or More Races	-	-	-	-	-	-
Total	**2,936**	**100%**	**2,812**	**95.78%**	**124**	**4.22%**

Question

How does MCPS ensure that income eligible families receive information about, and participate in, MCPS pre-K program?

Response

MCPS implements a comprehensive approach to ensure that income-eligible families receive information about early childhood education programs.

- Direct mailings are sent to—
    - Families receiving income supports (Temporary Cash Assistance and Supplemental Nutrition Assistance Program) through the Department of Health and Human Services;
    - Families with three- and four-year-olds participating in Housing Opportunities Commission programs; and
    - Families of three- and four-year-olds receiving child care subsidies (Maryland Child Care Subsidy Program and County Working Parents' Assistance).

- Information is distributed to partners, including the Silver Spring and Gaithersburg Judy Centers; Women, Infants, and Children; Early Head Start Programs; Family Services, etc.
- MCPS Early Childhood staff attends fairs and conferences, such as Champions for Children, the School Community United in Partnership conference, African American Health Initiative Community Baby Shower, Interfaith Clothing Center, Gaithersburg Book Festival, Stewartown Community Day, Georgian Court Community Day, etc.
- Informational e-mail messages are sent to all employees in the Montgomery County Department of Health and Human Services.

Follow-up 07-17-18-03

During the Early Learning Initiatives discussion, Dr. Smith requested that Board members receive the Excel criteria, as well as the slide information regarding kindergarten through Grade 8 cohorts with 75 percent retention rate.

Response

MD EXCELS Criteria

Maryland Excellence Counts in Early Learning and School Age Care (MD EXCELS) is a tool that provides Child Care Centers, School-Age Child Care Programs, Family Child Care Homes, and Public Prekindergarten programs with a framework to ensure high quality early care and education. The framework is based on five core disciplines: Compliance, Professional Development, Accreditation, Developmentally Appropriate Activities, and Administrative Practices.

The following programs require Maryland State Department of Education Accreditation and MD EXCELS Level 5 ratings:

- Prekindergarten Expansion Grant-funded classes and Judith P. Hoyer Early Child Care and Family Education Centers (Judy Centers*):
    - Bel Pre Elementary School
    - Clopper Mill Elementary Schools
    - JoAnn Leleck Elementary School at Broad Acres
    - Rolling Terrace Elementary School*
    - Summit Hall Elementary School*
    - Washington Grove Elementary School*
    - Weller Road Elementary School

There are five quality rating levels in the MD EXCELS ratings system. The requirements for each rating level vary depending on the type of early care and education program. In MCPS, pre-K and Head Start programs use the school-age checklist to meet Level 5 requirements. The following table includes information for MD EXCELS ratings one through five.

MD EXCELS Ratings

MARYLAND EXCELS Level	Rating Criteria
Level 5	• Children's developmental progress assessed with multiple measures and linked to curriculum • Staff meet highest levels of training and experience: o All Prekindergarten teachers hold a current teaching certificate from the state of Maryland with an endorsement for Early Childhood Pre-K to Grade 3. At least 50% of Pre-K teachers hold an Advanced Professional Certificate.
Level 5 (continued)	• Continuous quality improvement process informed by independent assessors. o Program Improvement Plan addressing any Classroom Assessment Scoring System (CLASS) domain score below 5.0, any accreditation/validation standard not met; and school readiness goals and objectives, with a statement that includes the process of program improvement. • State or national accreditation achieved • 5+ opportunities for families to engage in the program • State recommended curriculum used • Family-teacher conferences held at least twice per year • Licensed and inspected to determine safety, cleanliness, proper supervision of children, and staff qualifications • Activities support each and every child's individual needs
Level 4	• Children's developmental progress measured and linked to curriculum • Staff have higher levels of training and experience: o All Prekindergarten teachers hold a current teaching certificate from the state of Maryland with an endorsement for Early Childhood Pre-K to Grade 3. • Continuous quality improvement process informed by independent assessors • 4+ opportunities for families to engage in the program • Activities aligned with a state-recommended curriculum • Family-teacher conferences held at least twice per year • Licensed and inspected to determine safety, cleanliness, proper supervision of children, and staff qualifications • Activities support each and every child's individual needs

MARYLAND EXCELS Level	Rating Criteria
Level 3	• Children's developmental progress measured • Staff have increased training and experience: o The Director and at least 60% of lead staff hold: a current Maryland Child Care Staff Credential at Level 3 or higher; an Administrator Credential at Level 1 or higher; or the equivalent credential training for that level. • 3+ opportunities for families to engage in the program • Activities informed by early learning guidelines • Family-teacher conferences held at least once a year • Licensed and inspected to determine safety, cleanliness, proper supervision of children, and staff qualifications • Activities support each and every child's individual needs
Level 2	• Children's developmental progress observed • 2+ opportunities for families to engage in the program • Activities informed by early learning guidelines • Family-teacher conferences held at least once a year • Licensed and inspected to determine safety, cleanliness, proper supervision of children, and staff qualifications • Activities support each and every child's individual needs
Level 1	• Licensed and inspected to determine safety, cleanliness, proper supervision of children, and staff qualifications • Activities support each and every child's individual needs • Family-teacher conferences

K–8 Cohorts with 75 Percent Retention Rate

Attachment C is slide 51 of the slide presentation that was shared with the Board of Education at its meeting on September 25, 2017, during the Evidence of Learning presentation. The information identifies the retention rate for students in kindergarten through Grade 8. Of the total number of students in Grade 8 during the 2017–2018 school year, 18.5 percent were enrolled in prekindergarten.

If you have questions, please contact Dr. Maria V. Navarro, chief academic officer, at 240-740-3040.

JRS:MVN:NTH:mec

Attachments
Copy to:
 Executive Staff
  Mr. Ikheloa

Division of Title I and Early Childhood Programs and Services
2018-2019 Head Start and Pre-Kindergarten Locations

	ID	School	Federal Head Start Sessions Capacity 3's	Sessions	Capacity 4's	Sessions	Pre-K Capacity	Sessions	Fullday Capacity	Fullday Session	Pre-k Plus Capacity	Sessions	FY 2018
1	607	Bells Mill Elementary School			20	1	0	0					full day HS
2	304	*JoAnn Leleck Elementary School*			20	1	51	3			20	1	full day HS, pk+, pk 60->51 pep collab
3	559	Brown Station Elementary School ♦ (pm)			20	1	60	3					full day HS
4	706	Clearspring Elementary School			20	1	20	1					full day HS
5	100	Clopper Mill Elementary School			20	1	40	2			20	1	full day HS, pk++
6	747	Drew Elementary School			20	1	40	2					full day HS
7	303	Fairland Elementary School			20	1	20	1					full day HS
8	797	Harmony Hills Elementary School			20	1	40	2					full day HS
9	774	Highland Elementary School			20	1	40	2					full day HS
10	786	Georgian Forest Elementary School			20	1	40	2					full day HS
11	817	Glenallan Elementary School♦ (am)			20	1	0	0					full day HS
12	805	*Kemp Mill Elementary School*			20	1	0	0	20	1			full day HS, 2 half day -->1 full day prek
13	210	Maryvale Elementary School	15	1	20	1	40	2					full day HS
14	776	Mont.Knolls Elementary School ♦ (am/pm)			20	1	60	3					full day HS
15	791	New Hamp.Est. Elementary School	15	1	60	3	45	2					full day HS
16	771	*Rolling Terrace Elementary School (Judy Ctr)*			20	1	40	2			20	1	full day HS, add pk+
17	110	S. Christie McAuliffe Elementary School			20	1	0	0					full day HS
18	564	South Lake Elementary School			20	1	40	2					full day HS
19	563	*Summit Hall Elementary School (Judy Ctr)*			20	1	40	2			20	1	full day HS, add pk+
20	206	Twinbrook Elementary School			20	1	40	2					full day HS
21	772	Viers Mill Elementary School ♦ (am/pm)			20	1	40	2					full day HS
22	552	Wash.Grove Elementary School ♦ (pm) (Judy Ctr)			20	1	60	3			20	1	full day HS, pk++
23	561	*Watkins Mill Elementary School*			20	1			20	1			full day HS, half day--> full day prek
24	777	Weller Road Elementary School ♦ (pm)			20	1	40	2			40	2	full day HS, pk+, pk++
25	788	Wheaton Woods Elementary School			20	1	40	2					full day HS
26	207	Beall Elementary School	15	1	0	0	20	1					
27	229	College Gardens Elementary School (mixed age)			17	1	0	0					
28	756	East Silver Spring Elem. School (mixed age) ♦			17	1	40	2					
29	242	Ride Elementary School	15	1	0	0	40	2					
30	569	Strawberry Knoll Elementary School /4 hr ♦ * (pm)			14	1	20	1					
31	790	*Arcola Elementary School*							20	1			add full day prek
32	780	Bel Pre Elementary School					80	4			20	1	prek+
33	518	*Brooke Grove Elementary School*							20	1			half day-->full day prek
34	807	Brookhaven Elementary School ♦ (am/pm)					40	2					
35	309	Burnt Mills Elementary School					40	2					
36	159	Carson Elementary School					40	2					
37	511	*Cashell Elementary School*							20	1			half day-->full day prek
38	111	Daly Elementary School					40	2					
39	566	*Fields Road Elementary School*							20	1			half day-->full day prek
40	770	*Flora M. Singer Elementary School*							20	1			half day-->full day prek
41	549	Flower Hill Elementary School					40	2					
42	803	*Forest Knolls Elementary School*					0	0	20	1			2 half day --> 1full day prek
43	106	Fox Chapel Elementary School					40	2					
44	553	Gaithersburg Elementary School					40	2					
45	313	Galway Elementary School					40	2					
46	767	*Glen Haven Elementary School ♦ (pm)*					0	0	20	1			2 half day -->1 full day prek
47	334	Greencastle Elementary School ♦ (pm)					40	2					
48	305	Jackson Road Elementary School ♦ (pm)					40	2					
49	108	Lake Seneca Elementary School ♦ (pm)					40	2					
50	793	*Macdonald Knolls Early Childhood Center*					0	0	80	4			add 4 full day prek (60-general, 20-reserve for PEP)
51	158	*McNair Elementary School*							20	1			half day-->full day prek
52	556	Mill Creek Towne Elementary School					20	1					
53	769	*Oakland Terrace Elementary School ♦ (am)*							20	1			half day-->full day prek
54	312	Page Elementary School					40	2					
55	514	Resnik Elementary School					40	2					
56	773	*Rock Creek Forest Elementary School*							20	1			half day-->full day prek
57	795	Rock View Elementary School					40	2					
58	307	Roscoe Nix Elementary School					40	2					
59	794	Rosemary Hills Elementary School					40	2					
60	555	Rosemont Elementary School (Judy Ctr)					40	2					
61	779	Sargent Shriver Elementary School					40	2					
62	568	Stedwick Elementary School					40	2					
63	558	Whetstone Elementary School ♦ (pm)					40	2					
64	337	William B. Gibbs, JR Elementary School ♦					40	2					
		Total for HeadStart and Pre-K	60	4	588	30	1896	95	320	16	160	8	

Total Head Start	**648**	
Head Start Funded Level	**648**	Grand Total — **3024**
MCPS serves:	**648**	*2376* — *3024*

♦ Preschool Special Education Collaboration Sites 2017-2018   * Intensive Needs
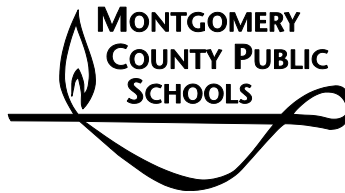
MONTGOMERY
COUNTY PUBLIC
SCHOOLS

Evaluating Effects of Full-day Head Start Model on Academic Performance at the End of Grade 1

Office of Shared Accountability

December 2011

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Montgomery County Public Schools

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Executive Summary

This study is the fourth in a series of studies on the impact of the full-day Head Start prekindergarten program in Montgomery County Public Schools (MCPS). Prekindergarten (pre-K) and Head Start programs are located in 62 of 130 elementary schools in Montgomery County. These MCPS prekindergarten and Head Start programs offer a high-quality educational experience to income-eligible children in order to provide them with the foundational knowledge and skills necessary for school success in kindergarten and beyond. The pre-K and Head Start programs are integral components of the MCPS *Early Success Performance Plan*, designed to provide necessary supports for all students to achieve at high levels and address the pervasive achievement gap among student groups.

MCPS offers three types of pre-K formats: 1) full-day Head Start model, 2) half-day Head Start model, and 3) MCPS partial-day model. In 2007, shortly after implementing full-day kindergarten, MCPS looked to expand pre-K instruction for its most vulnerable students. As a Head Start delegate, MCPS already operated Head Start programs and employed Head Start staff. This made it easier for MCPS to offer its Title I schools the opportunity to expand an existing half-day Head Start program to a full-day Head Start model. During the 2007–2008 and 2008–2009 school years, MCPS, with the help of federal Title I funds, operated 13 full-day Head Start classes, and in 2009–2010 that expanded to 21 classes in 19 schools. The intent of MCPS was to provide more instructional time for children living at or below the federal poverty threshold.

These MCPS pre-K models are designed to be effective and high-quality preschool programs and provide early education services to children who are eligible for Free and Reduced-price Meals System (FARMS) services. Each format of pre-K classes provides scientifically based and literacy-focused instruction five days a week for approximately 180 days per year. Classes are taught by state-certified early childhood education teachers with the support of paraeducators. The class ratio is two adults per class of 20 children. Within each format, the MCPS pre-K curriculum and instructional program is designed to promote children's cognitive, physical, social, and emotional development. Teaching teams use an interdisciplinary, whole-child approach, with emphasis on language, literacy, and mathematics. The MCPS pre-K and Head Start programs also provide children with lunch at no cost, health care, social services, and transportation.

The purpose of this study was to examine the effects of increased instructional time through the full-day Head Start model on students' academic performance at the end of Grade 1. The performance of full-day Head Start students was compared with: 1) students who attended the half-day Head Start classes, 2) students who attended the MCPS partial-day model, and 3) a sample of students similar to Head Start students in demographic characteristics without MCPS pre-K experience.

The Assessment Program in Primary Reading (MCPSAP-PR) and MCPS Mathematics Assessment Program (MCPSAP-PM) are the primary modes of monitoring performance in reading and mathematics in Grade 1. These assessments are used as both formative and summative benchmarks. Therefore, this study examined the impact of the full-day Head Start

model on the students' rate of attaining the Grade 1 reading benchmark and proficiency in Grade 1 mathematics while statistically controlling for preexisting and demographic characteristics in Grade 1.

The treatment group in this study comprised students from the 2007–2008 full-day Head Start model who completed full-day kindergarten in 2008–2009 and Grade 1 in 2009–2010. The comparison groups were as follows:

1. *Half–day Head Start*. Students who attended half-day Head Start classes, completed full-day kindergarten in 2008–2009, and completed Grade 1 in 2009–2010.
2. *MCPS partial-day model*. Students who attended the MCPS partial-day model, completed full-day kindergarten in 2008–2009, and completed Grade 1 in 2009–2010.
3. *No MCPS pre-K experience Grade 1 peers.*[1] Students similar to students in the treatment group based on propensity score but who did not attend any MCPS pre-K models, completed full-day kindergarten in 2008–2009, and completed Grade 1 in 2009–2010.

A quasi-experimental design was utilized to examine the Grade 1 performance of students who attended the full-day Head Start model relative to the established Grade 1 performance benchmarks and to the performance of students in the comparison groups. Three different analytical procedures were applied: 1) descriptive analyses, 2) logistic regression models of performance levels on the MCPSAP-PR and MCPSAP-PM, and 3) analyses of covariance (ANCOVA) for mathematics unit assessment scores.

Summary of Findings

The findings are presented by evaluation questions.

How did students in the full-day Head Start model perform on the Grade 1 reading assessments compared with a) grade-level peers who attended the half-day Head Start and MCPS partial-day models and b) similar peers without MCPS pre-K experiences? Did the effects of the full-day Head Start model on reading performance vary by student subgroups?

Compared to their peers in the three comparison groups, the expectation was that students who attended the full-day Head Start model would be performing a) on par with or better than their half-day Head Start and MCPS partial day grade-level peers (no achievement gap) or b) better than similar peers without MCPS pre-K experiences at the end of Grade 1. **Overall, the findings indicated that the performance of the full-day head Start students on rates of attaining the Grade 1 reading benchmark met or exceeded these expectations.**

Students in the Full-day Head Start Model vs. Students in the Half-day Head Start Model

- Overall, students who attended the full-day Head Start model attained the Grade 1 reading benchmark (78.2%) at similar rates as their peers in half-day Head Start (80.8%). Further analyses indicated that there were no statistically significant differences between

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[1] Will exclude students included in any of the comparison groups.

the proportions of students attaining the Grade 1 reading benchmark when comparing students who attended the full-day and half-day Head Start models.

- Subgroup level analyses provided evidence of educationally meaningful effect of participating in full-day Head Start classes for White students. White students who attended the full-day Head Start model attained the Grade 1 reading benchmark at a higher rate.

Students in the Full-day Head Start Model vs. Students in the MCPS Partial-day Model

- Overall, students who attended the full-day Head Start model attained the Grade 1 reading benchmark at similar rates as their peers who attended the MCPS partial-day model. More than three fourths of students who attended the full-day Head Start model (78.2%) or MCPS partial-day model (79.9%) attained the Grade 1 reading benchmark.

- For most subgroups, the performance rates for students who attended the full-day Head Start model were similar to those of their counterparts in the MCPS partial-day model with the exception of White and special education students. The moderate effect sizes indicated that the performance of special education students who attended the full-day model was significantly higher than that of their counterparts in the MCPS partial-day model ($d = 0.43$). Conversely, the performance of White students who attended the full-day Head Start model lagged behind that of their counterparts in the MCPS partial-day model ($d = -0.57$).

Students in the Full-day Head Start Model vs. Students Without MCPS pre-K Experience

- Overall, students who attended the full-day Head Start model (78.2%) attained the Grade 1 reading benchmark at comparable rates with similar peers (75.1%) without MCPS pre-K experiences.

- African American ($d = 0.12$) and White ($d = 0.32$) students, and students receiving FARMS ($d = 0.11$), English for Speakers of other languages (ESOL) ($d = 0.18$), and special education ($d = 0.15$) services who attended the full-day class model attained the Grade 1 reading benchmark at higher rates than counterparts without MCPS pre-K experience. For the White, ESOL, and special education students, the differences in attaining the Grade 1 reading benchmark between the full-day Head Start model and similar students without MCPS pre-K experiences were statistically significant and large enough to be educationally meaningful, indicating the full-day Head Start model had the desired impact. The remaining subgroups performed at similar levels between the two groups.

How did students in the full-day Head Start model perform on the Grade 1 mathematics assessments compared with a) grade-level peers who attended the half-day Head Start and MCPS partial-day models and b) similar peers without MCPS pre-K experiences? Did the effects of the full-day Head Start model on mathematics performance vary by student subgroups?

Compared to their peers in the three comparison groups, the expectation was that students who attended the full-day Head Start model would be performing a) on par with or better than their half-day Head Start and MCPS partial day grade-level peers (no achievement gap) or b) better than similar peers without MCPS pre-K experiences at the end of Grade 1. **Overall findings indicated that the performance of the full-day head Start students on rates of attaining proficiency in Grade 1 mathematics met or exceeded these expectations.**

Students in the Full-day Head Start Model vs. Students in the Half-day Head Start Model

- The majority of students who attended the full-day Head Start model (74.0%) or the half-day Head Start (77.1%) attained proficiency in Grade 1 mathematics. Further analyses indicated that these two groups performed at the same level because the differences in performance between the two groups were not statistically significant.

- At the subgroup levels, the performance of students who attended the full-day Head Start model was mixed and varied by subgroups. Most of subgroups performed at the same level as their counterparts who attended the half-day Head Start model. At the same time, the performance of Hispanic, White, FARMS, and special education students who attended the full-day Head Start model lagged behind that of their counterparts who attended the half-day Head Start model. The differences in performance for these three subgroups were large enough to be meaningful in educational settings.

Students in the Full-day Head Start Model vs. Students in the MCPS Partial-day Model

- Overall, the rates of attaining proficiency in Grade 1 mathematics were comparable between students who attended the full-day Head Start model (74.0%) and students who attended the MCPS partial-day model (75.5%).

- Subgroup analyses provided evidence that when compared to students in the MCPS partial-day model, African American ($d = 0.21$), Asian American ($d = 0.24$), and White ($d = 0.22$) students in the full-day Head Start model outperformed their counterparts on the level of attaining mathematics proficiency in Grade 1. These differences were large enough to be meaningful in an educational setting.

Students in the Full-day Head Start Model vs. Students Without MCPS pre-K Experience

- Overall, compared to the performance of similar students without MCPS pre-K experience, full-day Head Start students outperformed their peer in rates of attaining mathematics proficiency. The effect sizes were large enough to be practically meaningful in an educational setting ($d = 0.17$).

- Most of the subgroups in the full-day Head Start class outperformed their counterparts without MCPS pre-K experience on the rates of attaining proficiency in Grade 1 mathematics. The small to moderate effect sizes indicated that male ($d = 0.31$), African American ($d = 0.25$), and ESOL ($d = 0.29$) students outperformed their counterparts without MCPS pre-K experience in rates of attaining mathematics proficiency by end of Grade 1. These effects sizes are practically meaningful in an educational setting indicating that full-day Head Start classes had the desired impact. The performance of White, Asian, Hispanic, female, FARMS, and special education students in the two groups was comparable.

Recommendations

1. Examine areas needing improvement as early as kindergarten for students impacted by poverty by establishing processes to review and use Maryland Model for School Readiness (MMSR) data at the school and program level. Understanding patterns of strengths and areas needing improvement among students impacted by poverty, beyond what is measured through reading and mathematics assessments, is critical to a) improving the pre-K instructional program, b) preparing students for continued achievement in subsequent grade levels, and subsequently closing the achievement gaps between them and their grade-level peers. In time, understanding of the areas needing improvement by the instructional team will be critical to preparing students to readily access MCPS Curriculum 2.0/Integrated Elementary Curriculum (EIC) (MCPS, 2011b). The MCPS Curriculum 2.0 is expected to be more rigorous and blends reading, language arts, and mathematics instruction with lessons in science, social studies, music, art, and physical education in a way that spurs creativity and critical thinking skills.

2. Develop an action plan to review and synthesize the findings from the series of four studies on the impact of the Head Start full-day prekindergarten (pre-K) program in Montgomery County Public Schools with a goal to: a) identify areas needing improvement in the pre-K and kindergarten instructional programs and b) establish strategies for instituting changes to ensure continuous improvement.

3. Refocus future studies to include the examination of students' instructional experiences as they transition from pre-K to successive grade levels. Most of the current research is on impact of Head Start or prekindergarten programs and does not provide data on the nature and the quality of the kindergarten or first grade instructional programs or the schools attended by students after their Head Start year. This creates the need to understand how kindergarten and early elementary programs are structured to enable teachers and schools to actually build on the gains from Head Start programs.

4. Confirm the patterns of the findings in this report with at least one more cohort of students who attended the full-day Head Start model.

5. Evaluate the long-term impact of the full-day pre-K program in succeeding grades. This is crucial because the Grade 1 reading and mathematics unit assessments (MCPSAP-PR and MCPSAP-PM) are not administered in standardized settings. These assessments are designed

to capture specified dimensions of students' academic achievement in reading and mathematics. By Grade 2, various standards assessments that capture a variety of areas are administered to all Grade 2 students globally (e.g., TerraNova 2nd Edition and Inview). These assessments administered in Grade 2 would provide more consistent, reliable, and additional information on the lasting effects of the full-day Head Start model on a comprehensive set of educational outcomes.

Evaluating Effects of Full-day Head Start on Academic Performance at the End of Grade 1

Nyambura Susan Maina, Ph.D.

This evaluation was requested by the Divisions of Title I Programs (DTP) and Early Childhood Programs. This study was designed to examine the effects of the full-day Head Start model on academic performance at the end of Grade 1 for the 2007–2008 prekindergarten (pre-K) class.

Background

The Montgomery County Public Schools (MCPS) pre-K and Head Start programs are integral components of the MCPS *Early Success Performance Plan* which focuses on closing the achievement gaps among student subgroups (MCPS, 2005). The *Early Success Performance Plan* addresses Goal 2 of the MCPS strategic plan, *Our Call to Action: Pursuit of Excellence*—Provide an effective instructional program (MCPS, 2010a).

MCPS offers three types of pre-K formats: 1) a full-day Head Start model, 2) a half-day Head Start model and 3) a MCPS partial-day model. In 2007, shortly after implementing full-day kindergarten, MCPS looked to expand pre-K instruction for its most vulnerable students. As a Head Start delegate, MCPS already operated Head Start programs and employed Head Start staff. This made it easier for MCPS to offer its Title I schools the opportunity to expand an existing half-day Head Start program to a full-day Head Start model.

Title I legislation provides federal funds to help students in schools with high economic needs to achieve high academic standards. During the 2007–2008 and 2008–2009 school years, MCPS, with the help of federal Title I funds, operated 13 full-day Head Start classes, and in 2009–2010 that expanded to 21 in 18 schools (Appendix A). The intent of MCPS was to provide more instructional time for children living at or below the federal poverty threshold (Gayl, Young, & Patterson, 2010; MCPS, 2007).

Each MCPS pre-K model provides a high-quality, literacy-based instructional program, including art, music, and physical education, to income-eligible students based on the federal requirement for low family income and at-risk 4-year-old children (Appendix B). In addition, full- and half-day Head Start class models also offer access to health, dental, and other support services in order to meet families' needs. The additional instructional time in full-day Head Start classes is expected to: 1) allow students to experience a more integrated school day with in-depth study of the MCPS pre-K curriculum, 2) promote school readiness, and 3) contribute to the narrowing of achievement gaps related to school readiness at the start of kindergarten and subsequent grade levels (Gormley, Gayer, & Phillips, 2005; MCPS, 2010a).

Another component of the *Early Success Performance Plan* is full-day kindergarten classes at all elementary schools (MCPS, 2005). MCPS met the *Bridge to Excellence in Public Schools Act* of 2002 requirement of providing full-day kindergarten in all elementary schools in FY 2007, one full school year prior to the mandate (Maryland State Department of Education [MSDE], 2010).

The universal full-day kindergarten program operates six hours a day. In full-day kindergarten, a minimum of 90 minutes is devoted to literacy, and 60 minutes is dedicated to mathematics each day. Students in MCPS pre-K programs and those without MCPS pre-K experience receive the same high-

quality kindergarten instruction as defined by the MCPS kindergarten curriculum for art, mathematics, music, physical education, reading/language arts, science, and social studies (MCPS, 2010b).

As students proceed to Grade 1, the content in reading language arts is guided by the Maryland English Language Arts Content Standards (2008) and the Common Core State Standards for English Language Arts (MCPS, 2010c). MCPS elementary reading/language arts program reflects the integrated nature of a balanced literacy program: a) balanced literacy: listening, speaking, reading, and writing; b) reading: constructing meaning from a text; and c) writing: communicating meaning. Further, the MCPS curriculum is designed to provide challenge for all learners. Grade 1 students receive 2 hours and 20 minutes of reading language arts instruction daily. The MCPS Grade 1 end-of-year benchmark is for students to read a Level 16 text with 90 percent or higher accuracy and achieve a score of 4 or higher on oral comprehension. Since 2006, the percentage of all Grade 1 students meeting the benchmark continues to increase (MCPS, 2011a).

In mathematics, students in Grade 1 use mathematics to model real world situations. Students receive 60 minutes of mathematics instruction daily. The mathematics curriculum at each grade level is organized into units of instruction. Throughout all units, students will apply concepts and skills to solve problems, communicate and reason mathematically, and make mathematical connections. Each unit assessment measures a student's level of understanding of mathematics content taught in that unit. Summary information is reported based on the student's performance over the course of all units taught during the school year. In addition, some students have the opportunity to work on above-grade-level mathematics or Math 2.

Review of Literature on the Impact of Full-day Pre-K on Grade 1

A limited number of studies are available on the impact of full-day Head Start models beyond the preschool year because full-day pre-K programs are relatively recent. Even though increasingly larger numbers of American children attend full-day kindergarten programs, the full-day Head Start models are less common.

Two quasi-experimental studies (Maina & Modarresi, 2010; Zhao, Modarresi, & Liu, 2009) compared the effect of the full-day Head Start model with half-day class models on students' academic performance and mastery of basic skills at the end of pre-K. Findings indicated that students who attended full-day Head Start classes demonstrated greater mastery of basic skills at the end of pre-K than did their peers in half-day Head Start or MCPS partial-day pre-K programs. A follow-up study of one cohort examined the performance of full-day Head Start pre-K participants at the end of kindergarten (Zhao & Modarresi, 2010). Overall, the additional instructional time in the full-day Head Start pre-K program was associated with a positive lasting impact on students' reading skills at the end of kindergarten. Students in the full-day Head Start pre-K program were more likely to meet or exceed the specified kindergarten reading benchmark by the end of kindergarten than those in the half-day Head Start pre-K program, those in the MCPS partial-day pre-K, and peers with no prior MCPS pre-K experience. The three groups, however, performed at the same level in mathematics by the end of kindergarten.

One recent quasi-experimental study examined the relationships between students' attendance at full-day, half-day, or no preschool and first grade reading achievement for 214 urban, low socioeconomic status public first grade students of mixed ethnicities (Valenti & Tracey, 2009). The results indicated that by the middle of first grade, students who completed one year of full-day preschool significantly outperformed students who did not attend preschool. Students who completed one year of full-day preschool also outperformed students who completed half-day preschool, although not to a significant degree. In

addition, students who completed half-day preschool outperformed students who did not attend preschool, although not to a significant degree (Valenti & Tracey, 2009).

The findings from Valenti and Tracey (2009) differed somewhat from those of a national *Head Start Impact Study* (Puma et al., 2010). The *Head Start Impact Study* used a nationally representative sample of 84 grantee/delegate agencies that included nearly 5,000 newly entering, eligible 3- and 4-year-old children who were randomly assigned to either: 1) a Head Start group that had access to Head Start program services or 2) a control group that did not have access to Head Start but could enroll in other early childhood programs or non-Head Start services selected by their parents. The evidence from the national *Head Start Impact Study* suggested that the Head Start children and the control group children were at the same level on many of the measures studied in first grade. On the other hand, this national study did not show how the performance of Head Start students compared to state-funded prekindergarten (Guernsey, 2010; Center on the Developing Child at Harvard University, 2010). Also the achievement levels of both groups of children in the national study, as measured by standardized national assessments, fell significantly short of national averages.

Taken together, these studies addressed the impact of full-day pre-K on first grade performance and provide mixed evidence of the effectiveness of full-day Head Start models beyond the preschool year. Notably, many of these studies do not provide data on the quality of the kindergarten or first grade programs that Head Start children attended after their Head Start years. Overall, the findings point to the need for more studies and stronger emphasis on how kindergarten and early elementary programs are structured to enable teachers and schools to actually build on the gains from Head Start programs. Furthermore, to better understand the impact of pre-K on later school success, more and better data collection on the quality of classroom experiences from pre-K through Grade 3 is recommended (Guernsey, 2010; Center on the Developing Child at Harvard University, 2010).

Scope of the Evaluation

Purpose of the Study

The purpose of this study was to examine the effects of the full-day Head Start model on academic performance at the end of Grade 1. Specifically, the study compared Grade 1 academic performance of students who attended the full-day Head Start model in 2007–2008 with: 1) students who attended the half-day Head Start class model, 2) students who attended the MCPS partial-day model, and 3) a sample of students without MCPS pre-K experiences[2] who were similar to Head Start eligible students.

Evaluation Questions

The following questions guided the study:

1. How did students in the full-day Head Start model perform on the Grade 1 reading assessments compared with: a) students who attended the half-day Head Start and MCPS partial-day models and b) similar peers without MCPS pre-K experiences?

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[2] It is possible that these students had participated in non-MCPS pre-K experiences but that information is not on record.

2. Did the effects of the full-day Head Start model in reading performance vary by student subgroups?

3. How did students in the full-day Head Start model perform on the Grade 1 mathematics assessments compared with: a) students who attended the half-day Head Start and MCPS partial-day models and b) similar peers without MCPS pre-K experiences?

4. Did the effects of the full-day Head Start model in mathematics performance vary by student subgroups?

Methodology

Evaluation Design

A quasi-experimental design was applied to this study because students were not randomly assigned to the full-day Head Start model. Eligibility for full-day and half-day Head Start classes was based solely on federal requirements for low-family income, age, and residency.

Examining the effects of the full-day Head Start model two years later (at the end of Grade 1) necessitated comparing the performance of students in the full-day Head Start model with three comparison groups. These comparison groups were: 1) students who attended the half-day Head Start model, 2) students who attended the MCPS partial-day model, and 3) a sample of similar peers who did not participate in any MCPS pre-K offerings in 2007–2008. These groups were selected on the basis of relevance to the goals of the study.

It was hypothesized that the academic outcomes for students in the full-day Head Start model, when adjusted for preexisting differences (Free and Reduced-price Meals System [FARMS], English for Speakers of Other Languages [ESOL], special education services, and race/ethnicity) would be comparable or higher than the half-day Head Start and MCPS partial-day models. Further, the academic performance for full-day Head Start students would be expected to be higher than that for similar peers without MCPS pre-K experience. Having test scores comparable to the scores for the half-day class models and better than those of similar students with no MCPS pre-K would indicate an added effect of attending the full-day Head Start model.

Study Sample

Participants in this study are students who completed Grade 1 in 2009–2010. To ensure students had similar educational experiences after pre-K, all students in the study also had completed full-day kindergarten in MCPS prior to enrolling in Grade 1. Students retained in Grade 1 were excluded.

Analytical Samples

The treatment group in this study comprises students who attended the 2007–2008 full-day Head Start model who completed full-day kindergarten in 2008–2009 and Grade 1 in 2009–2010.

The comparison groups were as follows:

1. *Half–day Head Start*. Students who attended half-day Head Start classes, completed full-day kindergarten in 2008–2009, and completed Grade 1 in 2009–2010.
2. *MCPS partial-day model*. Students who attended the MCPS partial-day model, completed full-day kindergarten in 2008–2009, and completed Grade 1 in 2009–2010.
3. *No MCPS pre-K experience Grade 1 peers.*[3]   Students similar to full-day Head Start students who did not attend any MCPS pre-K models, completed full-day kindergarten in 2008–2009, and completed Grade 1 in 2009–2010.

Outcome Measures

Two outcome measures were used in this study as follows:

- *MCPS Assessment Program in Primary Reading (MCPSAP-PR).* The MCPSAP-PR is a combination of a locally developed assessment and a nationally norm-referenced assessment that provides formative information to help teachers and administrators focus on instruction and monitor students' reading progress from kindergarten through Grade 2. The MCPSAP-PR consists of two components—foundational reading skills and reading proficiency. The spring administration of the MCPSAP-PR serves as a summative assessment. The Grade 1 end-of-year benchmark is for students to read a Level 16 text with 90 percent or higher accuracy and achieve a score of 4 or higher out of 6 points on oral comprehension. The percentages of students meeting or exceeding the spring Grade 1 reading benchmark on the MCPSAP-PR was used as the outcome measure.

- *MCPS Mathematics Unit Assessment Program (MCPSAP-PM).* Grade 1 end-of-unit (EOU) assessments information were used to compare performance among the groups of students. The mathematics assessment was designed to align with the written and taught curriculum. First, the percentages of correct scores on the Grade 1 or Grade 2 mathematics unit assessments were computed. The percentages of students from each group meeting or exceeding the cut-off proficiency score (77%) on the Grade 1 and Grade 2[4] mathematics assessments were compared (Appendix E, Table E1). In addition, analysis of variance on the total mathematics scores was conducted at each instructional level.

Covariates. The Maryland Model for School Readiness (MMSR) was used as a covariate. The MMSR is a common metric to measure students' school readiness at the beginning of kindergarten across school systems in Maryland (MSDE, 2011). This assessment tests the ability of each child to demonstrate skills, knowledge, behaviors, and interests that are indicators of future school success. MSDE defines "school readiness" as the stage of human development that enables a child to engage in and benefit from early learning experiences. The MMSR consists of an observational assessment tool which assesses seven developmental domains: personal and social development, language arts literacy, mathematical thinking, scientific thinking, social

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[3] Will exclude students included in any of the half-day pre-K models.
[4] Some Grade 1 students are instructed at the Math 2 (Grade 2) level. This is considered above-grade-level.

studies, the arts, and physical development. The tool is administered to all incoming kindergarten students during the first eight weeks of the school year. The results are reported in composite score and level of readiness. The MMSR classifies student school readiness profiles into three groups: "developing readiness (<50)," "approaching readiness (50–70)," and "fully ready (>70)." In this study the composite score was used as a covariate for initial ability in the ANCOVA and logistic regression models.

Procedures for Analyses

The analyses utilized in this study were designed to describe the Grade 1 performance for students who attended the full-day Head Start model relative to the established Grade 1 performance benchmarks and to the performance of students in the comparison groups. Three different analytical procedures were applied: 1) descriptive analyses of performance levels, 2) analyses of covariance (ANCOVA) for mathematics unit assessment scores, and 3) logistic regression models for comparing proportions of students attaining the specified Grade 1 reading or mathematics benchmark. A major concern when using any impact assessment is to minimize bias in the estimation of program effects. Selection bias is a threat to the validity of the program effects in nonequivalent experimental design whereby: a) there is no random assignment and b) some factors that influence the outcome are not fully known (e.g., experiences and services to non-Head Start students). To minimize selection bias, propensity score matching and use of multivariate statistics was applied.

Propensity Score Models

Two separate propensity score models were used. The propensity scores generated from the first model were used to draw a sample of students similar to the full-day Head Start model cohort. The propensity scores computed from the second model were used to statistically control for the nonequivalence of the comparison groups in the ANCOVA and logistic regression procedures.

Propensity score matching.
Students in the full-day Head Start model comprised the treatment group. Students without MCPS pre-K experience made a large pool from which to select students similar to the first full-day Head Start model cohort using a propensity score matching the sampling procedure (Luellen, Shadish, & Clark, 2005).

A propensity score, indicating the conditional probability that a student will be "treated" or would have been placed in the full-day Head Start model was computed using logistic regression. The variables used in this initial propensity score were FARMS, race, ESOL, and special education status of the students using kindergarten data. Data on family income for students not in MCPS pre-K offerings was not available. Using the propensity scores, students in the full-day Head Start model cohort were matched with those without MCPS pre-K experience. A sample of 392 students was drawn from among the large number of students without MCPS pre-K experience who had completed kindergarten and Grade 1 in MCPS.

Propensity score for analytical models. To statistically control for the nonequivalence of the full-day Head Start students and the comparison groups and to isolate the program effects of the full-day Head Start model at the end of Grade 1, a propensity score was computed using logistic

regression and was included in the analytical models. The variables used in the calculation of the propensity score included attendance in Grade 1, demographic characteristics in Grade 1 (race/ethnicity, ESOL, and FARMS status). Further, the propensity score was divided into five categories/quintiles and used as a categorical covariate in the ANCOVA and logistic regression models to adjust the outcome for effects of other variables and compensate for initial differences among the students.

Multivariate analyses. For the categorical outcomes (meeting Grade 1 end-of-year benchmark or attaining mathematics proficiency—attaining 77% or higher), a logistic regression model was used to compute the odds ratio for meeting these benchmarks. Then, the odds ratio was used to compute a logit *d* using the formula below (Kline, 2004):

$$\text{logit } d = \frac{\ln(OR)}{pi/\sqrt{3}}.$$

Lastly, effect sizes to assess the observed magnitude of difference in performance between the students in the full-day Head Start model and the comparison groups were computed from odds ratios as well as from the adjusted mean scores from the ANCOVA models (Appendix D). MMSR scores at the start of kindergarten (MSDE, 2010) were used as covariates in both the logistic and ANCOVA analytical models.

The effect sizes were used to determine which differences between the treatment and comparison groups (if any) are meaningful in an educational setting. Cohen (1988) pointed out that small effect sizes of around $d = 0.2$ are representative of fields aligned with education. Subsequently, a number of researchers have pointed to the need to calibrate the interpretation of effect sizes to the expected impact of the program being studied. Specifically, Lipsey and Wilson (1993) concluded that effects of modest values of $d = 0.1$ to $d = 0.2$ in educational settings are not trivial. Borman and D'Agostino (1996) suggested that the average effect size associated with Title I programs is $d = 0.15$. Overall, as documented in the literature, schoolwide reforms have an average effect size of $d = 0.15$ (Bormann, Hews, Overman, & Brown, 2002; Mason, 2005). Therefore, a threshold of $d = 0.15$ as small-modest, $d = 0.3$ as modest-large, and $d = 0.5$ as large was adopted in this study.

Description of Students in the Study Samples

The majority of students (88.1%) who attended MCPS pre-K programs in 2007–2008 completed kindergarten and were enrolled in Grade 1 in MCPS during the 2009–2010 school year (Table 1). About 95% of the students who participated in the full-day Head Start model were still enrolled in MCPS in Grade 1. Similarly, 76% and 90% of students in the half-day Head Start classes and the MCPS partial-day model, respectively, were enrolled in MCPS in Grade 1.

Table 1
Number and Percentage of 2007–2008 Pre-K Students Enrolled in Grade 1 in 2009–2010

Type of pre-K Model	In pre-K 2007–2008	In Grade 1 2009–2010	% Grade 1
Full-day Head Start	260	247	95.0
Half-day Head Start	391	297	76.0
MCPS Partial day	1,887	1,691	89.6
Total	2,538	2,235	88.1

Table 2 contains family background information for students from the three pre-K class models at the start of pre-K. The information for full-day and half-day Head Start students was similar with respect to guardian's age, guardian's education, and family size. Notably, the average total family income and income per person for students in the MCPS pre-K was higher than for Head Start students because the eligibility criteria for MCPS pre-K are different. Family background information for students who did not attend MCPS pre-K programs was not available for comparison.

Table 2
Family Background Information for 2007–2008 Pre-K Students Enrolled in Grade 1 in
2009–2010 by Pre-K Model (N = 2,235)

Characteristic	Full-day Head Start (N = 247)		Half-day Head Start (N = 297)		MCPS partial day (N = 1,691)	
	Mean	Median	Mean	Median	Mean	Median
Total family income	15,985	15,680	14,469	13,464	28,990	28,600
Income per person	4,161	4,108	3,714	3,485	7,511	7,500
Female guardian's age	32	31	31	30	32	32
Male guardian's age	37	38	36	36	36	36
Female guardian's education (yrs.)	12	12	12	12	12	12
Male guardian's education (yrs.)	11	12	12	12	12	12
Family size	4	4	4	4	4	4

Among students from the original full-day Head Start classes, 34.7% of the students in Grade 1 were African American, 51.1% were Hispanic, 12.2% received special education services, and 61.1% received ESOL services in Grade 1 (Table 3). These proportions of African American, Hispanic, and ESOL students were similar to original pre-K cohorts (Zhao, et al., 2009; Maina & Modarresi, 2010). Noticeably, the proportion of students from these subgroups was lower in the sample of students without MCPS pre-K experiences. These preexisting differences were controlled for through advanced statistical procedures.

Table 3
Characteristics of all 2009–2010 MCPS Grade Students by Pre-K Experience

Demographic Characteristics		Full day (N = 247)		Half day (N = 297)		MCPS partial day (N = 1,691)		No MCPS pre-K experience (N = 8,039)	
		n	%	n	%	n	%	n	%
Gender	Male	131	53.0	137	46.1	834	49.3	4,209	52.4
	Female	116	47.0	160	53.9	857	50.7	3,830	47.6
Ethnicity	American Indian	1	0.4	0	0.0	3	0.2	36	0.5
	African American	83	34.7	142	49.7	499	30.6	1,374	17.7
	Asian	21	8.8	24	8.4	196	12.0	1,306	16.9
	Hispanic	122	51.1	95	33.2	855	52.5	1,278	16.5
	White	12	5.0	25	8.7	77	4.7	3,750	48.4
Special Services	FARMS	208	84.2	252	84.9	1296	76.6	1,438	17.9
	ESOL	151	61.1	111	37.4	927	54.8	1,448	18.0
	Special Education	30	12.2	30	10.1	124	7.3	744	9.3
Level of Readiness	Fully Ready	169	71.0	182	65.2	183	71.2	5,565	74.1
	Developing	2	0.8	11	3.9	43	2.7	239	3.2
	Approaching	67	28.2	86	30.8	456	28.3	1,709	22.8
Math Level in Grade 1	Math 1	217	95.6	242	89.3	1381	88.3	5,656	79.3
	Math 2	10	4.4	29	10.7	183	11.7	1,480	20.7
Data available	Math score	227	91.9	271	91.3	1564	92.5	7,136	88.8
	Reading Score	247	100.0	297	100.0	1691	100.0	8,039	100.0

Characteristics of Students in the Analytical Samples

Students with complete assessment information in reading or mathematics were included in the analytical sample of the full-day Head Start model and the half-day class models. Then, a sample of 269 students who attended the MCPS partial-day model and 392 similar peers without MCPS pre-K experience were selected. The purpose was to maintain a more balanced design in logistic and ANCOVA analyses since only about 227 Head Start full-day students had complete data for mathematics, whereas 247 of them had complete data in reading. Among the 269 MCPS partial-day students in the study sample, all had complete data in reading and 251 had complete data in mathematics. All of the 392 students without prior MCPS pre-K had complete data in reading, whereas 327 had complete data in mathematics (Table 4).

Table 4
Characteristics of 2009–2010 Grade 1 Students by Study Sample and Pre-K Experience

Demographic Characteristic		Full-day (N = 247)		Half-day (N = 297)		MCPS partial day (N = 297)		No MCPS pre-K (N = 392)	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Gender	Male	128	53.8	130	46.6	134	49.8	231	58.9
	Female	110	46.2	149	53.4	135	50.2	161	41.1
Race/Ethnicity	African American	81	35.4	128	47.4	66	25.5	166	45.9
	Asian	19	8.3	23	8.5	34	13.1	23	6.4
	Hispanic	119	52.0	95	35.2	144	55.6	139	38.4
	White	10	4.4	24	8.9	15	5.8	34	9.4
Special Services	FARMS	201	84.5	237	85.0	209	77.7	275	70.2
	ESOL	148	62.2	110	39.4	165	61.3	88	22.5
	Special Education	28	11.8	29	10.4	19	7.1	61	15.6
Level of Readiness	Fully Ready	169	71.0	182	65.2	183	71.2	199	53.6
Math Level	Math 1	217	95.6	242	89.3	223	88.8	299	92.0
	Math 2	10	4.4	29	10.7	28	11.2	26	8.0
Assessment data available	Math score	227	91.9	271	91.3	251	93.3	325	82.9
	Reading Score	247	100.0	297	100.0	269	100.0	392	100.0

The matched sample was similar to the full-day Head Start cohort with regard to the propensity scores for probability of being in Head Start. While the propensity scores were comparable, there are some differences in the demographic characteristics of the students from the two groups. The percentage of students receiving FARMS (85% vs. 70%), ESOL (62% vs. 23%), African American (35% vs. 46%), and Hispanic (52% vs. 38%) as well as students who were fully ready (71% vs. 54%) varied slightly between the two groups. Other notable differences in the demographic makeup of the two groups of students were the proportion of students enrolled in Math 2 (4% vs. 8%) or instructed on above-grade-level mathematics.

Results

The results are displayed in the order of evaluation questions.

Evaluation Question 1. *How did students in the full-day Head Start model perform on the Grade 1 reading assessments compared with a) grade-level peers who attended the half-day Head Start and MCPS partial-day models and b) similar peers without MCPS pre-K experiences?*

The Grade 1 student performance data on the 2010 MCPSAP-PR were analyzed in two ways. First, achievement was considered relative to the Grade 1 grade-level MCPSAP-PR benchmark. More specifically, these analyses investigated what percentage of students from the full-day Head Start model and comparison groups attained the spring benchmark. Second, while controlling for preexisting differences, the impact of the full-day Head Start model on student performance at the end of Grade 1 was estimated using logistic regression.

Performance on Grade 1 Reading Benchmark

Performance on Grade 1 end-of-year MCPSAP-PR *benchmark.* The expectation was that: a) after participating in the full-day Head Start model, the majority of students most impacted by poverty would attain the Grade 1 end-of-year benchmark and b) the performance of full-day Head Start students would be comparable with or higher to the performance of other grade-level peers and higher than that of similar peers without MCPS pre-K experience.

The findings from this study revealed that the majority of students who participated in the 2007–2008 full-day Head class model (78%) met the 2010 Grade 1 MCPSAP-PR benchmark (Figure 1). In addition, the passing rate for the full-day Head Start class was slightly lower than rates for the half-day Head Start and MCPS partial-day models. The observed slight differences in rates of attaining the Grade 1 reading benchmark between the full-day Head Start model and similar peers were not statistically significant based on comparison of the proportions ($p > 0.05$). Noticeably, the passing rates of students in the full-day Head Start model and comparison groups were lower than the rates of all MCPS Grade 1 students in 2010[5] (Appendix C, Table C1; MCPS, 2011a).

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[5] All MCPS includes all Grade 1 students including students included in the three analytical samples.
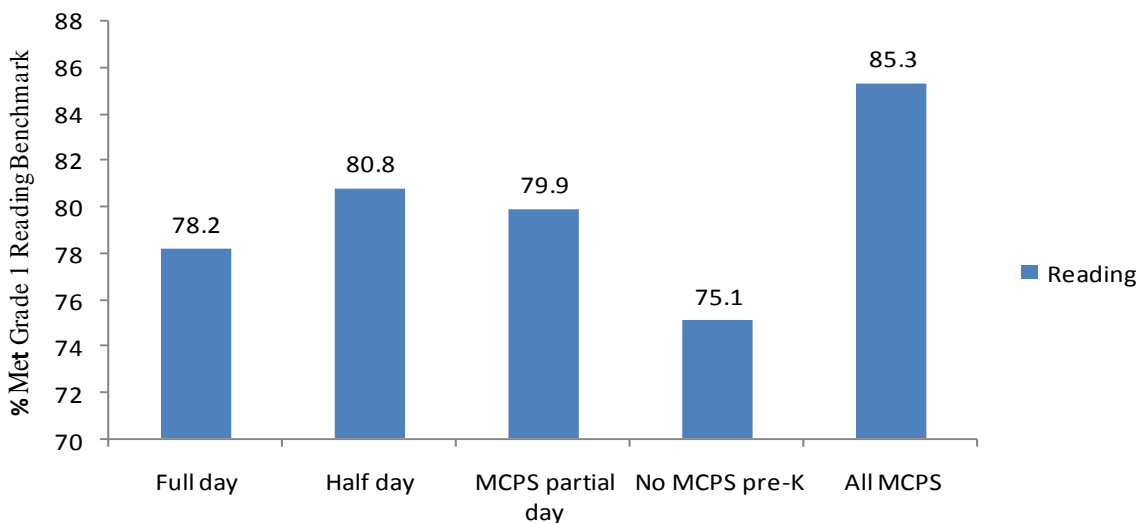
Figure 1. Percentage of full-day Head Start model and comparison groups who met the 2010 Grade 1 end-of-year reading benchmark.

Further, logistic regression procedures were used to examine the impact of attending the full-day Head Start model on rates of meeting the Grade 1 reading benchmark while controlling for demographic characteristics such as FARMS, ESOL, special education status, and race/ethnicity, with attendance and level of readiness in kindergarten as covariates. Students with incomplete data on any of these variables were excluded from the analyses. Findings indicated that for students without MCPS pre-K experiences, the probability (odds) of attaining the Grade 1 benchmark were lower than for students who attended the full-day Head Start model, indicating an added benefit for attending full-day Head Start (Appendix C, Tables C2 and C3). At the same time, the likelihood of attaining the reading benchmark was at the same level with students in the half-day Head Start and MCPS partial-day models (Table 5). Effect sizes for association between participation in the full-day class model and attaining the Grade 1 reading benchmark are summarized in Table 5. Corresponding to the pattern in Figure 1, the effect sizes for attaining the Grade 1 reading benchmark were negligible, comparable among the groups and varied slightly by comparison group: half-day Head Start ($d = -0.12$), MCPS partial day ($d = -0.09$), and similar students ($d = 0.05$). The negligible effect sizes also indicated that the differences in attaining the reading benchmark between the full-day Head Start students and comparison groups were not large enough to be practically meaningful in an educational setting.

Table 5

Measures of Effect Size for Association Between Meeting the Grade 1 Reading Benchmark and Participation in the Full-day Head Start Model

Achievement Benchmark	Comparison group	Odds ratio	Effect size (Logit *d*)
	Half-day Head Start	0.810	-0.12
Grade 1 benchmark	MCPS partial day	0.856	-0.09
	No MCPS pre-K	1.085	0.05

Evaluation Question 2. *Did the effects of the full-day Head Start model on reading performance vary by student subgroups?*

Performance on Grade 1 End-of-Year Benchmark by Student Subgroups

At the student subgroup level, the results varied by comparison group (Appendix C, Tables C2 and C3).

Full-day Head Start vs. Half-day Head Start Model. Among subgroups, the positive impact was the largest for White students ($d = 0.25$) (Figure 2). This suggests that the White students who attended the full-day Head Start model outperformed their counterparts in the half-day Head Start class model. The effect sizes for White students were large enough and meaningful in educational settings. The near zero or negative effect sizes for the remaining student subgroups indicated that the performance of full-day Head Start students was comparable to or lagged behind that of counterparts in the half-day Head Start class model (male, ESOL, Hispanic, and special education students).
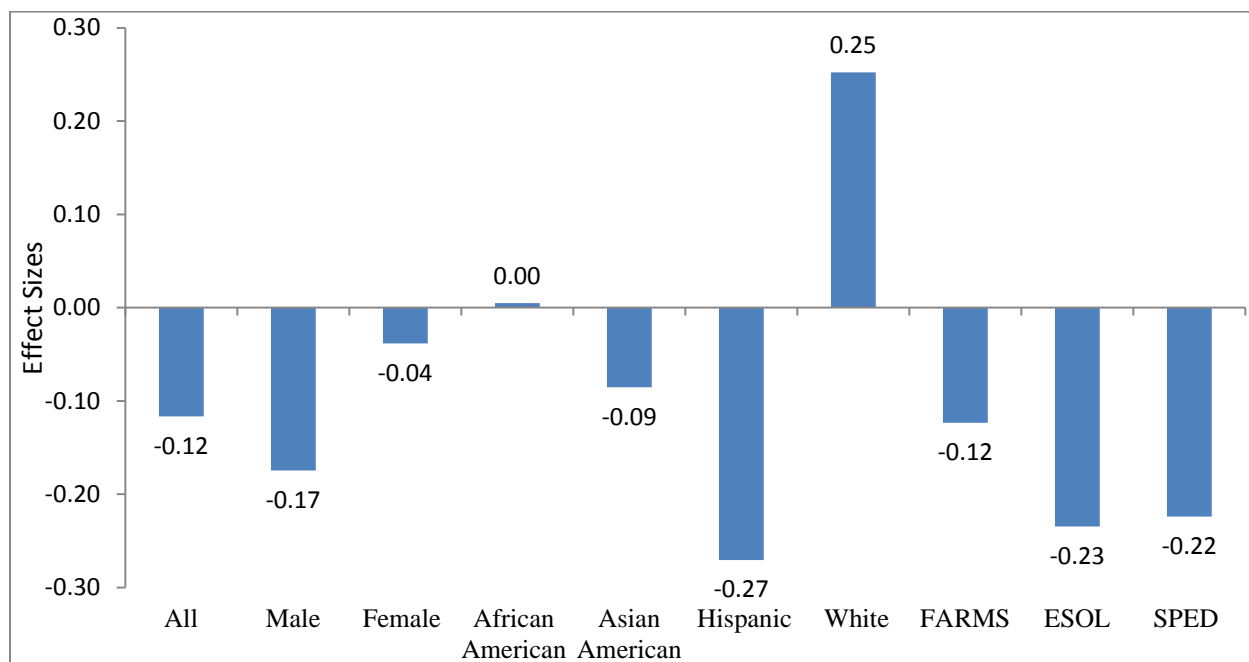
Figure 2. Effect sizes of full-day Head Start vs. half-day Head Start based on attaining the Grade 1 reading benchmark.

Full-day Head Start Model vs. MCPS Partial-day Model. At the subgroup level, most of the students who attended the full-day Head Start model performed at the same level as their MCPS partial-day counterparts with the exception of White students and special education students. The positive moderate effect sizes for special education students ($d = 0.43$) were large enough to be meaningful in educational settings (Figure 3). This finding suggested that special education students who attended the full-day class model outperformed their peers in the MCPS partial-day model. The negligible effect sizes for most of the remaining student subgroups indicated that students who attended full-day Head Start performed at the same levels as their counterparts in the half-day MCPS class model. Conversely, performance of White students ($d = -0.57$) who

attended full-day Head Start lagged behind that of their MCPS partial-day counterparts at a level that is meaningful in educational settings.
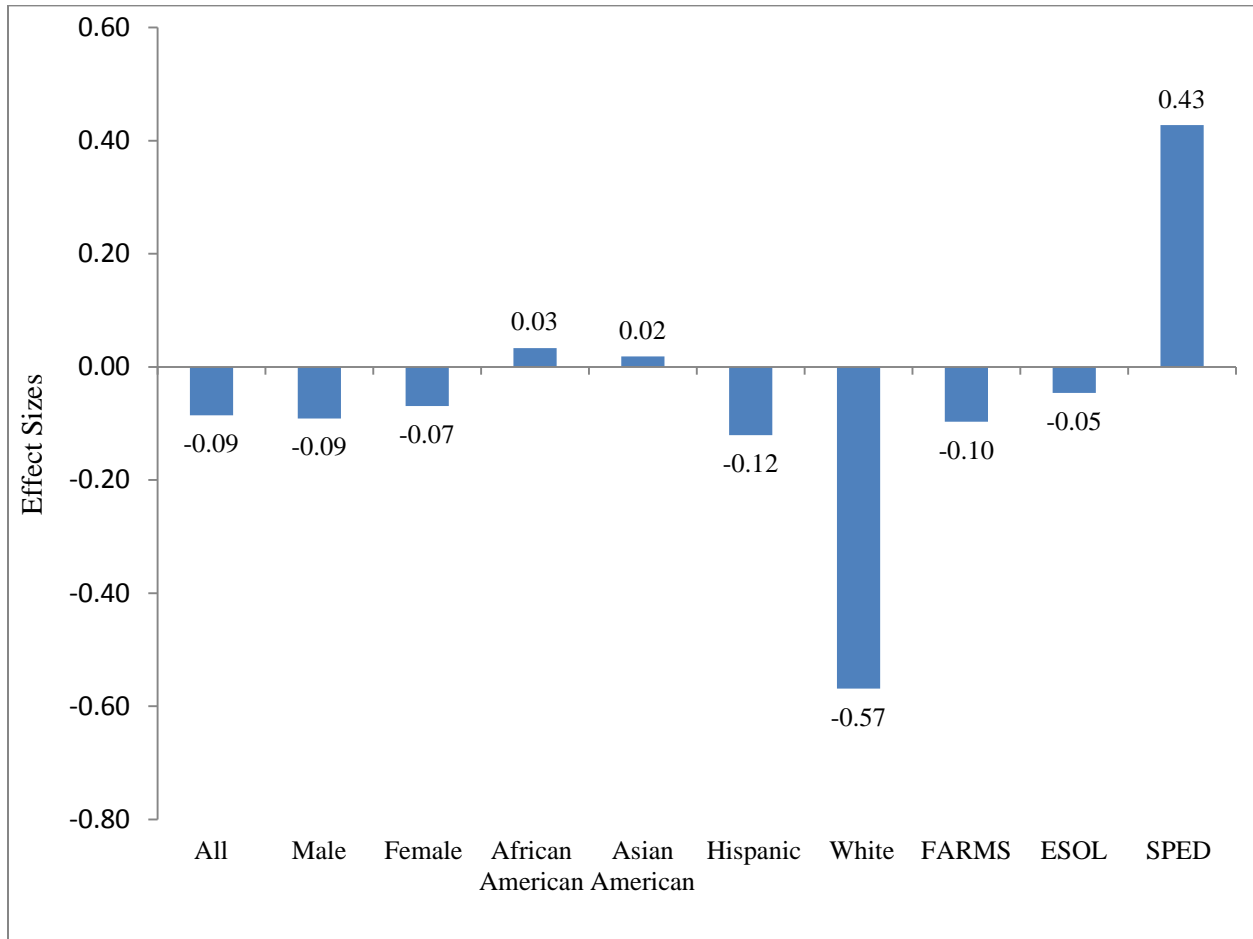
Figure 3. Effect sizes of the full-day Head Start model vs. the MCPS partial-day model based on attaining the Grade 1 reading benchmark.

*Full-day Head Start Model vs. Students Without MCPS pre-*K. Overall, many of the subgroups of students who attended the full-day Head Start outperformed their counterparts without MCPS pre-K experience (Appendix C, Tables C2 and C3). Further, the effect sizes provided evidence that most subgroups of students who attended the full-day Head Start model outperformed their counterparts without MCPS pre-K experience (Figure 4). The positive impact of full-day Head Start on Grade 1 reading achievement was evident for White ($d = 0.32$), ESOL ($d = 0.18$), special education ($d = 0.15$), African American ($d = 0.12$), and FARMS ($d = 0.11$) students. Asian, male, female, and Hispanic students who attended full-day Head Start performed at the same level as their counterparts without MCPS pre-K experience.
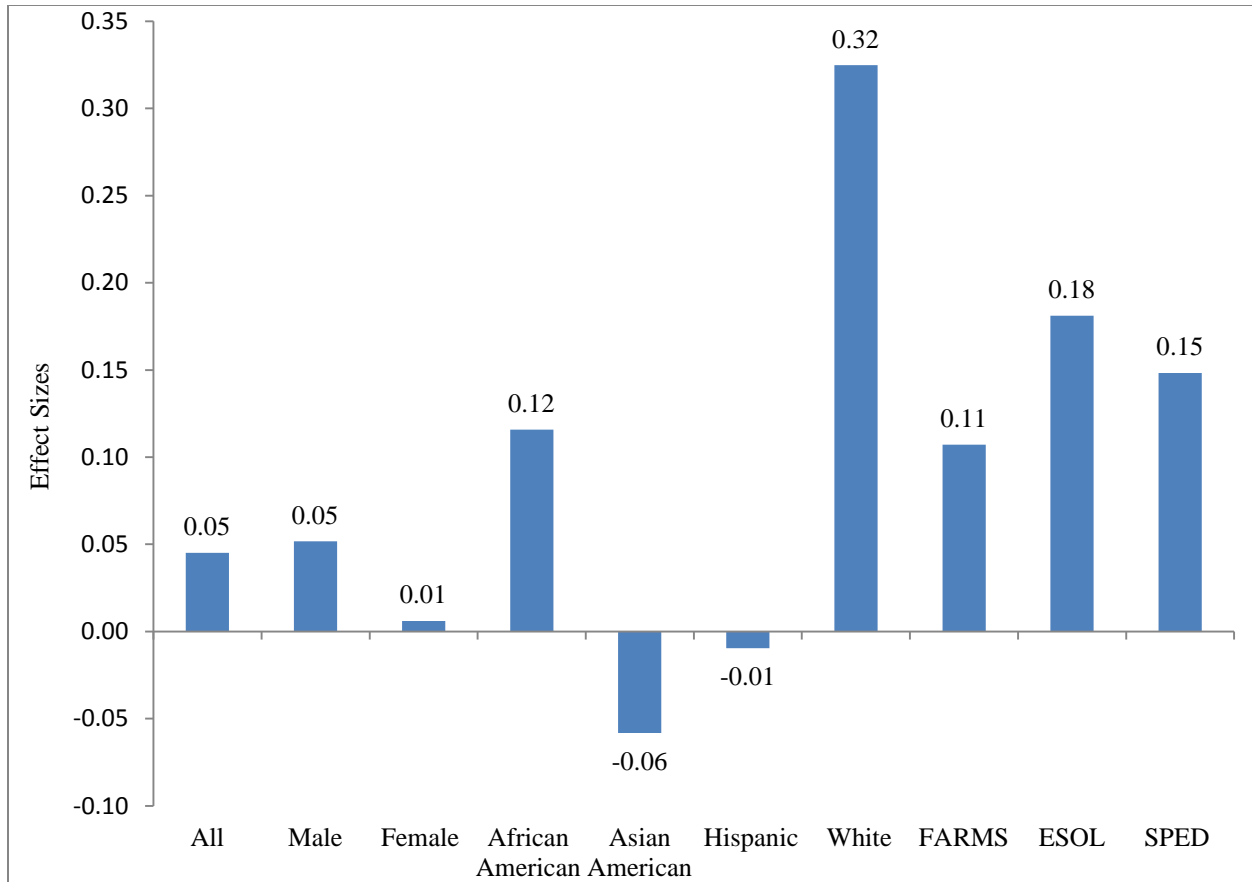
Figure 4. Effect sizes of the full-day Head Start model vs. no MCPS pre-K experience based on attaining the Grade 1 reading benchmark.

Evaluation Question 3. *How did students in the full-day Head Start model perform on the Grade 1 mathematics assessments compared with: a) grade-level peers who attended the half-day Head Start and MCPS partial-day models and b) similar peers without MCPS pre-K experiences?*

Performance on Grade 1 Mathematics Assessments

Descriptive analyses and logistic regression were conducted to compare differences in the proportions of students who attained proficiency (students who scored greater than 77% on the mathematics unit assessments for the Math 1 or Math 2 courses in Grade 1).[6] Further, ANCOVA models were applied to examine the total scores for on-grade-level and above-grade-level assessments while controlling for demographic characteristics with attendance in Grade 1 and initial ability (MMSR composite score) as covariates (Appendix D).

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[6] For this analysis, the total number of the students who were proficient at any mathematics instructional level (Math 1 or Math 2) were summed up. The total proficient is a combination of all students who were proficient in mathematics in Grade 1 irrespective of course level.

All students in the Head Start full-day model and the comparison samples with complete mathematics assessment scores were included in the logistic or ANCOVA models. To compare students' performances in the full-day Head Start class model with their peers in the MCPS partial-day model, 269 students who attended the MCPS partial-day classes and 392 similar peers without MCPS pre-K experience were selected. The purpose was to maintain a more balanced design in logistic and ANCOVA analyses since only about 227 Head Start full-day students had complete data for mathematics, whereas 247 had complete data in reading. All of the 269 MCPS partial-day students in the study sample had complete data in reading, and 251 of them had complete data in mathematics. All of the 392 students in the sample without MCPS pre-K had complete data in reading, whereas 327 had complete data in mathematics.

Performance on Grade 1 Mathematics Proficiency Levels

Mathematics Proficiency Rates in Grade 1. Overall, the findings revealed that about three quarters (74%) of the full-day Head Start students attained proficiency in mathematics by the spring of Grade 1 (Figure 5). Their proficiency rates were slightly higher than those for students without MCPS pre-K experience (72.7%) and comparable to those for students in the half-day Head Start (77.1%) and MCPS partial-day (75.5%) models. These differences were not statistically significant ($p > 0.05$). The proficiency rates for students in the study were lower than the average for all MCPS Grade 1 (79.1%) students.
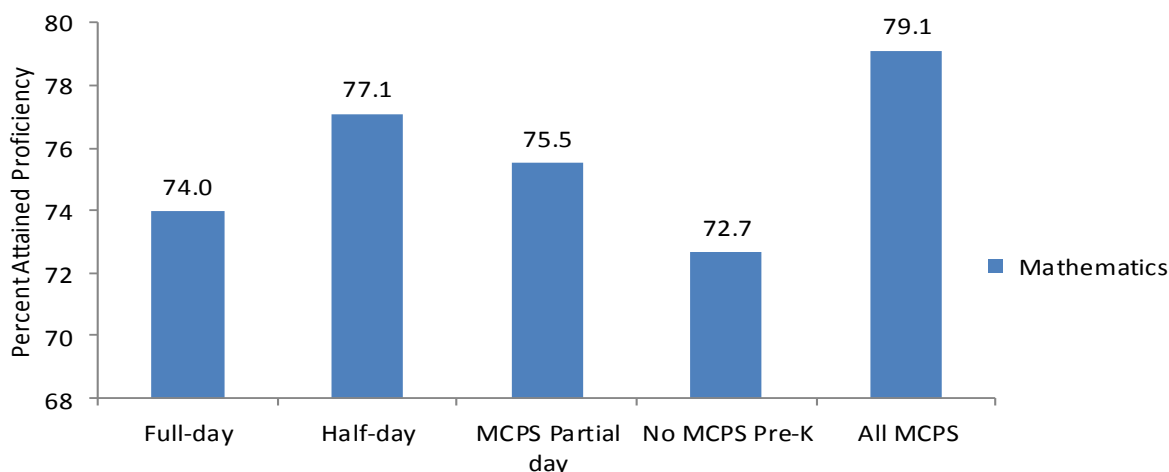
Figure 5. Performance of 2007–2008 full-day Head Start students and comparison groups in mathematics in Grade 1.

Effect sizes for association between participation in the full-day class model and attaining proficiency in mathematics in Grade 1 are summarized in Table 6. Corresponding to the pattern illustrated on Figure 5, the effect sizes varied slightly by comparison group: half-day Head Start ($d = -0.02$), MCPS partial-day pre-K ($d = -0.02$), and similar students without MCPS pre-K experience ($d = 0.17$). The effect sizes illustrate that the difference in proportions of full-day Head Start students proficient in Grade 1 mathematics relative to peers without MCPS pre-K experience were large enough to be practically meaningful in an educational setting.

Table 6
Measures of Effect Sizes for Association Between Attaining Proficiency in
Mathematics and Participation in Full-day Head Start Model

Achievement Benchmark	Comparison group	Odds ratio	Effect size (Logit *d*)
	Half-day Head Start	0.953	-0.02
Attaining proficiency	MCPS partial day	0.929	-0.02
	No MCPS pre-K	1.368	0.17

Mathematics Unit Assessment Scores. Tables 7 and 8 show the means and standard deviations as well as the mean differences in adjusted total scores on the Grade 1 end-of-unit assessments. The adjusted mean score (121.58 out of 141 for students in Math 1, and 113.7 out of 137 for Math 2) for the full-day Head Start class was higher than for the comparison groups (Table 7; Appendix E, Table E4), but the differences in the adjusted mean scores were not statistically significant. Overall, average on-grade and above-grade EOU assessment scores for the full-day Head Start students were similar to those of the students in the comparison groups.

Table 7
Adjusted Mean and Standard Deviation for Mathematics 1 and 2 On-Grade and
Above-Grade Unit Assessments Scores in 2009–2010 by Pre-K Experience

Outcome	Full-day Head Start			Half-day Head Start			MCPS partial-day pre-K			No MCPS pre-K		
	N	*Mean*	*SD*	*N*	*Mean*	*SD*	*N*	*Mean*	*SD*	*N*	*Mean*	*SD*
Mathematics 1												
On grade	217	121.58	18.6	242	122.4	17.7	223	122.89	16.8	299	120.5	19.6
Above grade	216	63.16	35.1	240	57.0	28.1	222	60.70	28.0	289	59.5	30.0
Mathematics 2												
On grade	10	113.70	13.9	29	111.55	19.0	28	101.86	27.7	26	115.8	11.6
Above grade	9	79.30	27.16	28	73.75	37.3	27	71.7	43.6	26	86.6	34.6

As shown in Table 8, the effect size measuring the magnitude of effect for participation in the full-day Head Start model relative to performance in the comparison groups was negligible for on-grade-level total scores. These findings indicated that the average mathematics EOU scores for the full-day Head Start students and students in comparison groups were similar. The finding also revealed that on average, students who attended the full-day Head Start model performed better on the Math 1 above-grade-level items compared with their half-day Head Start Grade 1 peers. The effect size is large enough to have practical significance.

Table 8
Mean Difference in Adjusted Mean Total Scores and Effect Size of Mathematics 1
On-Grade and Above-Grade Assessments in 2009–2010 by Head Start Pre-K Program

Outcome	Mean difference	Standard error	Effect size
On Grade Level			
Full-day Head Start vs. half-day Head Start	0.13	1.632	0.01
Full-day Head Start vs. MCPS partial day	0.65	1.631	0.03
Full-day Head Start vs. No MCPS pre-K	1.23	1.716	0.06
Above Grade Level			
Full-day Head Start vs. half-day Head Start	4.35	2.884	0.15
Full-day Head Start vs. MCPS partial day	0.98	2.891	0.03
Full-day Head Start vs. No MCPS pre-K	1.38	2.996	0.04

Evaluation Question 4. *Did the effects of the full-day Head Start model on mathematics performance in Grade 1 vary by student subgroups?*

Full-day Head Start Model vs. Half-day Head Start Model. At the subgroup level, the pattern of effects of association between participation in the full-day Head Start model and rates of proficiency in Grade 1 mathematics varied depending on the comparison group (Appendix E, Tables E2–E4). The performance of students in the full-day Head Start model was either at the same level or slightly lower than their counterparts in the half-day Head Start model. The African American subgroup is the only full-day Head Start subgroup whose performance was comparable to and did not lag behind that of the half-day Head Start peers (Figure 6). By Grade 1, the mathematics performance of Hispanic (d = -0.27), White (d = -0.31), and special education students (d = -0.62) who attended the full-day Head Start model lagged behind that of their counterparts in the half-day Head Start model.
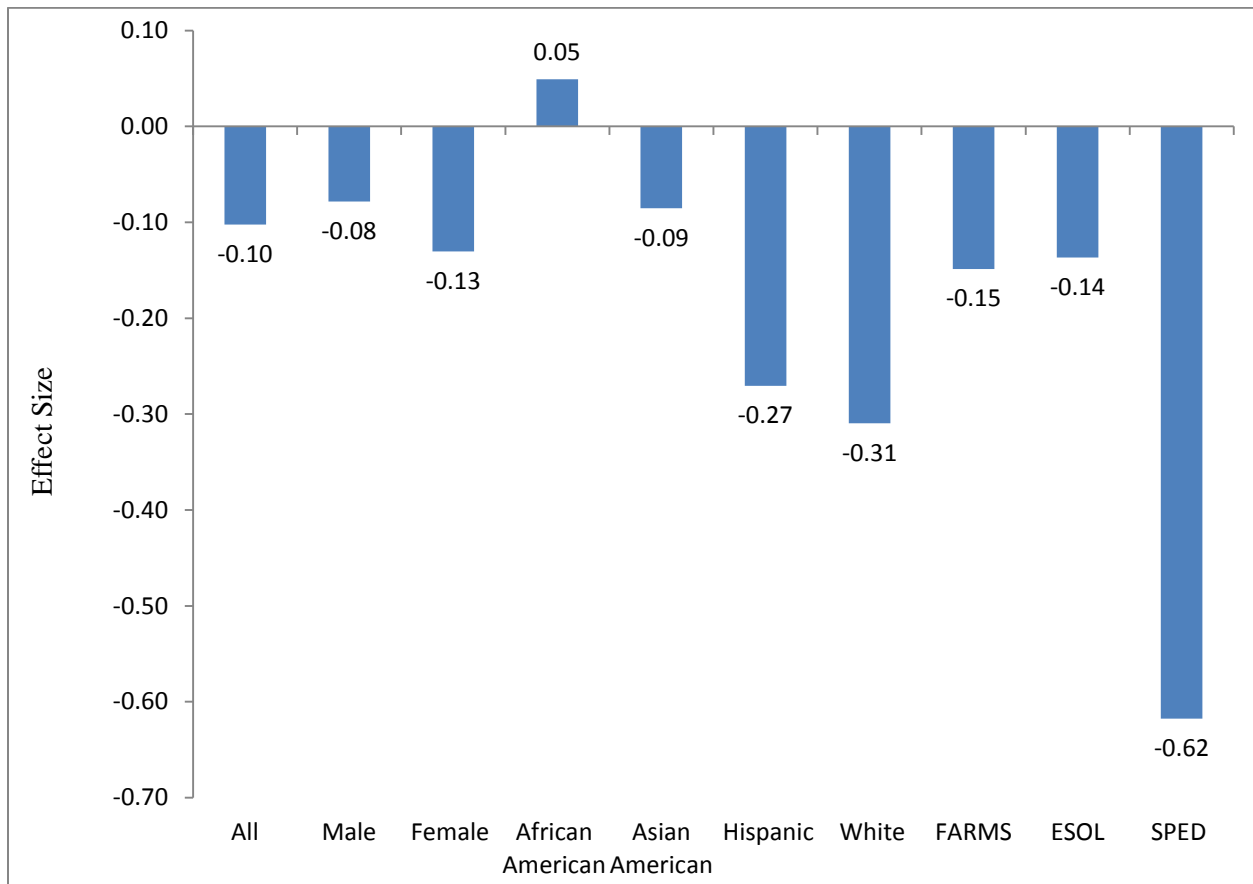
Figure 6. Effect sizes of the full-day Head Start model vs. the half-day Head Start model based on attaining Grade 1 mathematics proficiency.

The findings indicated that the differences in performance for these subgroups were large enough and meaningful in educational settings in favor of the half-day Head Start model.

Full-day Head Start Model vs. MCPS Partial-day Model. When compared to students in the MCPS partial-day model, Asian American (d = 0.24), White (d = 0.22), and African American

($d = 0.21$) students in the full-day Head Start model outperformed their counterparts on the rates of attaining mathematics proficiency (Figure 7). The performance of the remaining subgroups (Hispanic, ESOL, and special education) was either comparable or lagged behind that of their counterparts in the MCPS partial-day model.
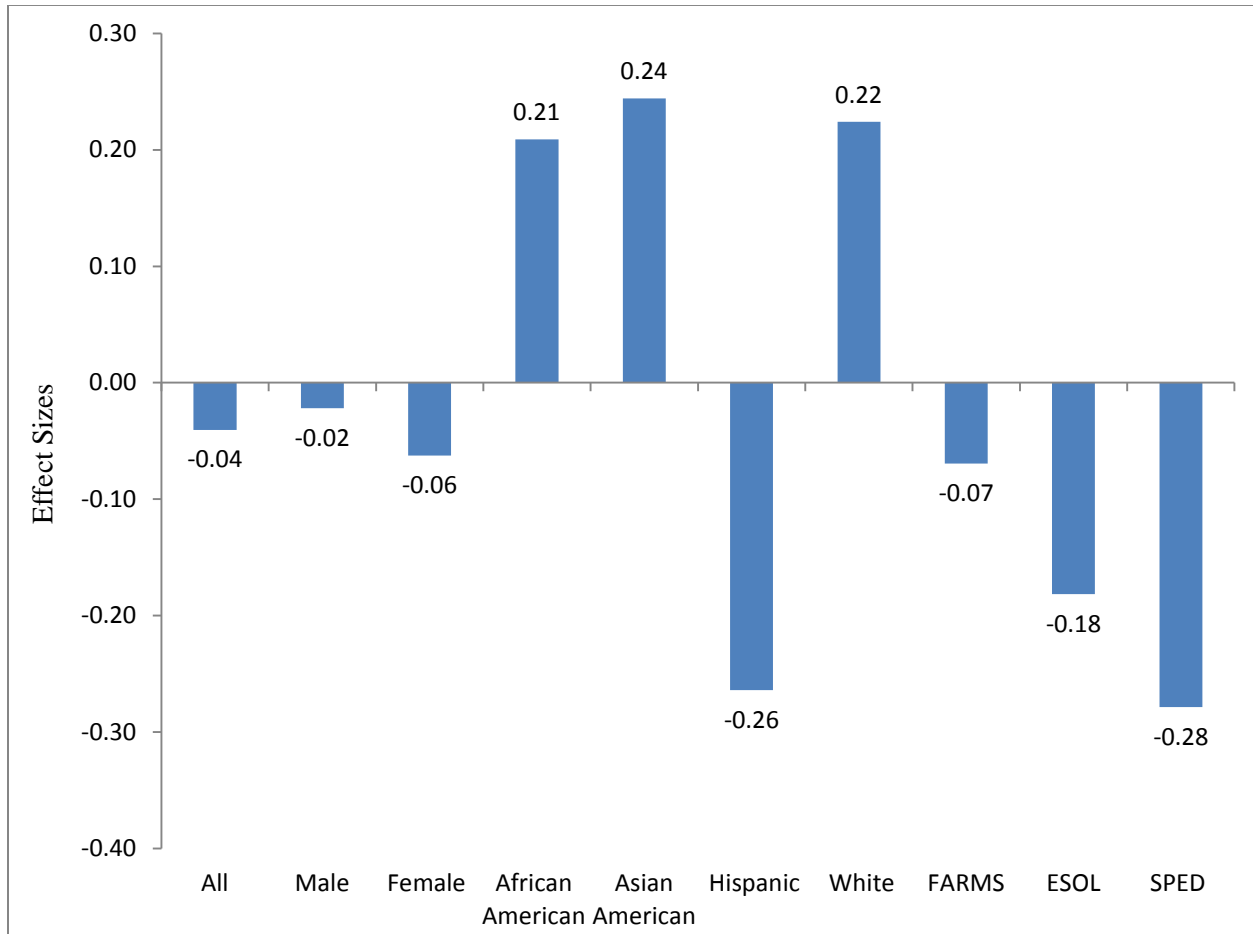
Figure 7. Effect sizes the full-day Head Start model vs. the MCPS partial-day model based on attaining Grade 1 mathematics proficiency.

Full-day Head Start Model vs. No MCPS pre-K Experience. Many subgroups of students who attended the full-day Head Start model outperformed their peers without MCPS pre-K experience on rates of attaining mathematics proficiency in Grade 1. Specifically, when compared to students without MCPS pre-K experiences, all ($d = 0.17$), male ($d = 0.31$), African American ($d = 0.25$), and ESOL ($d = 0.29$) students in the full-day Head Start model outperformed their counterparts on the level of attaining mathematics proficiency (Figure 8). These effects sizes are practically meaningful in an educational setting indicating that full-day Head Start classes had the desired impact on these subgroups. For the remaining subgroups, the effect sizes were negligible indicating that students from the two groups attained proficiency at the same rate.
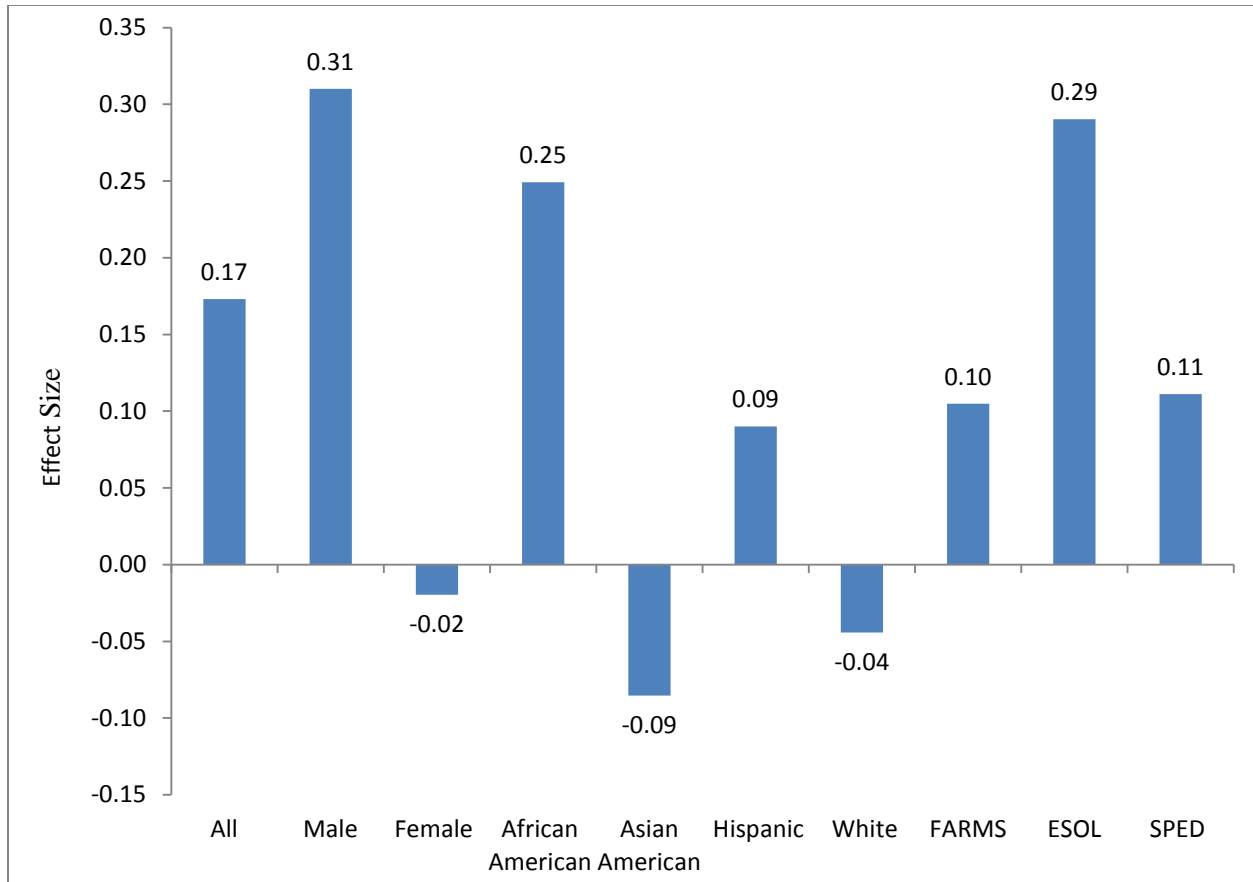
Figure 8. Effect sizes of the full-day Head Start model vs. No MCPS pre-K experience based on attaining Grade 1 mathematics proficiency.

In addition, the effect sizes from the ANCOVA of the total end-of-year mathematics scores for Mathematics 1 are shown in Table 9 and Appendix E, Table E3. The effect sizes indicated the following:

- Mathematics scores of full-day Head Start Hispanic students and students who received special education services lagged behind those of their counterparts who attended the half-day Head Start model.
- When compared to students in the MCPS partial-day model, the scores were comparable for most subgroups, but scores for African American and Asian students were significantly higher and the impact was practically meaningful in favor of full-day students.
- Similarly, when compared to students without MCPS pre-K, meaningful effects on total mathematics scores were observed for African American and ESOL students who attended the full-day Head Start model. Conversely, the mathematics scores for Asian students in the full-day Head Start model lagged behind those of their counterparts with no MCPS pre-K experience.

Table 9
Magnitude of Effects for Mathematics 1 On-Grade-level Assessment Scores

Student Characteristics	Head Start half-day pre-K	MCPS partial-day pre-K	No MCPS pre-K
All Students[a]	0.01	0.03	0.06
Male	-0.04	0.05	0.02
Female	0.03	0.02	0.08
African American	0.12	0.22	0.19
Asian	-0.06	0.15	-0.37
Hispanic	-0.62	0.00	-0.06
White	-0.02	-0.06	0.01
FARMS	0.01	0.04	0.10
ESOL	0.00	-0.02	0.14
Special Education	-0.38	0.09	0.08

[a] Due to the low number of students in Math 2, ANCOVA analyses were not conducted on their scores.

Summary

Performance in Grade 1 Reading

- When compared with students who attended the half-day Head Start model, students who attended the full-day Head Start model performed at the same level as their peers on rates of attaining the Grade 1 reading benchmark. At the subgroup level, positive and meaningful effects were observed only for White students who attended the full-day Head Start model.
- When compared with students who attended the MCPS partial-day model, students who attended the full-day Head Start model performed at the same level as their peers on rates of attaining the Grade 1 reading benchmark. At the subgroup level, positive and meaningful effects were noted for students who received special education services who attended the full-day Head Start model.
- When compared with students without MCPS pre-K experiences, students in the full-day Head Start model outperformed their peers on the rates of attaining the Grade 1 reading benchmark but not at educationally meaningful levels. At the subgroup level, positive and meaningful effects were noted for most subgroups: White, FARMS, ESOL, and students receiving special education services in favor of students who attended the full-day Head Start model.

Performance in Grade 1 Mathematics

- When compared with students who attended the half-day Head Start model, students who attended the full-day Head Start model performed at the same level as their peers on rates of attaining proficiency in mathematics in Grade 1. At the subgroup level, positive but not educationally meaningful effects were found only for African American students who attended the full-day Head Start model.
- When compared with students who attended the MCPS partial-day model, students who attended the full-day Head Start model performed at the same level as their peers on rates of attaining proficiency in mathematics in Grade 1. At the subgroup level, positive and

meaningful effects were noted for African American, Asian, and White subgroups for students who attended the full-day Head Start model. Conversely, the performance of Hispanic and special education students who attended the full-day Head Start model lagged significantly behind that of peers who attended the MCPS partial-day pre-K model.

- When compared to students similar to Head Start eligible students who did not attend MCPS pre-K offerings, the students who attended the full-day Head Start model outperformed their peers on rates of attaining the mathematics proficiency in Grade 1. At the subgroup level, positive and meaningful effects were noted for male, African American, and ESOL students who attended the full-day Head Start model. For the remaining subgroups the performance of students who attended full-day Head Start was at the same level as their peers who did not attend MCPS pre-K.

Discussion

The discussion focuses on: a) similarities of findings from this study to those by other researchers, b) transition from pre-K to early grades, and c) the question of the nature of assessments in early years.

The overall goal of the full-day Head Start model is to provide learning experiences to help children impacted by poverty develop and maintain foundational skills necessary to be successful in school. The expansion from half-day to full-day Head Start classes for MCPS Title I schools was intended to provide an opportunity to develop essential skills for the most economically disadvantaged young learners to be successful (MCPS, 2007). The additional instructional time in full-day Head Start classes was expected to: 1) allow students to experience a more integrated school day with in-depth study of the MCPS pre-K curriculum, 2) promote school readiness, and 3) contribute to the narrowing of achievement gaps related to school readiness at the start of kindergarten (Gormley, Gayer, & Phillips, 2005; MCPS, 2010b).

Positive impact of full-day Head Start was evident by the end of pre-K (Zhao & al, 2009; Maina & Modarresi, 2010). By the end of kindergarten, the impact was most evident in reading (Zhao & Modarresi, 2010). By the end of Grade 1, this study showed that the most positive and meaningful effects for students attending the full-day Head Start model were most evident when their performance was compared with students similar to Head Start students who did not attend any of the MCPS pre-K offerings. These positive impacts by the end of Grade 1 also are more evident in mathematics than in reading. They are also more evident at the subgroup level than at the program level overall. These findings suggest that full-day Head Start is having the intended impact on the target population by increasing academic achievement among students impacted by poverty. The success of these students after pre-K is undeniably an interaction of a variety of factors with the instructional experiences these students have after pre-K. Therefore, the mixed results on the impact of the full-day Head Start model observed by Grade 1 need not be viewed as diminishing the impact of Head Start as students impacted by poverty progress through grade levels. The effect of full-day Head Start should be analyzed within a broader context. Notably, the trend in performance of full-day Head Start students as they move from pre-K to Grade 1 in reading mirrors the trends illustrated by MCPS K–2 MCPSAP-PR trend data

(MCPS, 2011).[7]   The MCPSAP-PR trend data show that in general, the percentage of all students, and students impacted by poverty or receiving ESOL services in particular, who attain the reading benchmark decreases considerably as students move from kindergarten to Grade 2. That the impact of full-day Head Start by Grade 1 is discernable at the subgroup level, suggests that the model is contributing to decreasing the achievement gaps among the student subgroups. Further, the comparable performance of students who attended the full-day Head and half-day Head Start in reading could be the case that the students who attended the half-day Head Start model "catch-up" with full-day Head Start peers , and not that the impact of the full-day Head Start model "faded-out" per se.

Similarities of Findings to Studies on Impact of Head Start

Program Level Impacts.   The findings from this study correspond in many aspects to other studies on the impact of pre-K programs. Recent studies show that at the end of one program year, access to full- or half-day Head Start models contributes positively and in meaningful ways to children's school readiness (Puma, et al., 2010; Maina & Modarresi, 2011; Zhao, et al., 2009; Zhao & Modarresi, 2010).   The same studies also indicated that when student achievement was measured again at the end of kindergarten, however, the results were mixed depending on the study. In one national study, Head Start children and the control group children were at the same level on many of the measures studied (Puma, et al., 2010). For one study conducted when students were in kindergarten, the effect was found only in reading and for select subgroups in mathematics (Zhao & Modarresi, 2010).

The findings in this study also concur with those from Valentine and Tracy (2009). Their study examined relationships between students' attendance at full-day, half-day, or no preschool and first grade reading achievement for 214 urban, low socioeconomic public first grade students of mixed ethnicities. The results for relationships between students' attendance at full-day, half-day, or no preschool and first grade reading achievement indicated that: a) by the middle of first grade, students who completed one year of full-day preschool significantly outperformed students who did not attend preschool, and b) students who completed one year of full-day preschool also outperformed students who completed half-day preschool, although not to a significant degree. Additionally, students who completed half-day preschool outperformed students who did not attend preschool, although not to a significant degree (Valenti & Tracey, 2009).

Using rich data from the Early Childhood Longitudinal Study, three researchers also estimated the effects of prekindergarten on children's school readiness (Ruhm, Magnuson, & Waldfogel, 2007). They found that prekindergarten was associated with higher reading and mathematics skills at school entry. However, by the spring of first grade, estimated effects on academic skills had largely dissipated. In addition, the extent to which these programs could establish equal educational opportunities for children from different social backgrounds was evaluated. Program start, intensity, and duration were considered. Like the findings in the current study, the findings indicated that the vast majority of recent early education and care programs had considerable positive short-term effects and somewhat smaller long-term effects on academic achievement (Kaspar, 2010).

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[7] Comparable information for mathematics is not available.

Differential Impact at the Subgroup Levels. Depending on outcomes, this study provided evidence of positive impact in reading or mathematics for select subgroups of students who attended the full-day Head Start. By spring of Grade 1, this study showed no discernable effect in reading performance at the group level. At the same time, by spring of Grade 1, meaningful effect in mathematics performance relative to peers without MCPS pre-K was observed at the group level as well as at the subgroup level for most subgroups. In particular, in almost all cases, favorable and educationally meaningful impacts were observed for African American students and students receiving ESOL services. Also, similar to the findings in this study, larger and longer lasting associations with academic gains were found in another study for selected subgroups of disadvantaged children (Kaspar, 2010).

Fade-out or Pre-K-3 Misalignment? Widespread misunderstanding of the goal and full scope of Head Start and the subsequent failure to consider the full-range of cognitive and academic outcomes of full-day Head Start often results in flawed conclusions that the impact of Head Start fades with time. Researchers and educators have long puzzled over why children impacted by poverty who acquired significant academic benefits from preschool tend to lose that academic edge by third grade—a phenomenon known as "fade-out" (Barnett & Hustedt, 2005). Gradually, researchers are filling some pieces of the puzzle, by showing that one factor related to perceived fade-out is whether the child's elementary school serves a population that is mostly poor (Brooks-Gun, 2005; Magnuson, Ruhm & Waldfogel, 2007; Barnett & Hustedt, 2005; Guernsey, 2009). Overall, researchers concur that it is critical to consider the quality of elementary school into which students enter because subsequent classroom environment mattered. High-quality environments provided a boost to those without preschool, while low-quality ones hampered the progress of children even if they had preschool experience. Also, having strong, well-aligned programs beginning at pre-K and extending through third grade is a necessary means to fighting "fade out" and enabling children to maintain and expand upon gains made in pre-K (Kauerz, 2006).

Where there is a combination of quality pre-K preschool experience with attendance at low-poverty schools or a school with less than 25% of students impacted by poverty, not only do the benefits last, their impact appears even bigger than at kindergarten (Magnuson et al., 2007; Guernsey 2009; Children, Youth and Families Education and Research Network 2009). By third grade, for example, children impacted by poverty in these relatively affluent schools had reading skills that were far above their counterparts who went to high-poverty schools. On the flip side, and in keeping with the fade-out phenomenon, the effects of preschool diminished greatly for children impacted by poverty who attended preschool but who went to high-poverty schools (>=50%). The impact was significant and evident for both the reading and mathematics scores of the students in poverty. Independent of family socioeconomic status, the quality of school a student attends makes a difference; as such pre-K in and of itself, cannot solve the issues of the achievement gap.

Attention to Transitions From pre-K to School. Young children's transition into school has been constructed as a time-limited period around initial school entry, a set of teacher or school practices, a process of establishing continuity of experience, and one which is a dynamic relationship-based process (Petriwskyj, 2010). The nature of students' educational experiences

after pre-K is critical for full-day Head Start students to build on the skills and competencies attained in pre-K. In general, there is limited literature and study on the transition from pre-K to early grades. Although preparedness and school readiness continue to be addressed through the full-day Head Start model, there is a need to better understand the process of transition for the Head Start children when they leave pre-K. A concerted focus on transition after pre-K with more emphasis on continuity, relationships among multiple stakeholders, and system coherence across grade levels may be needed. This would fortify and build upon children's educational experiences after pre-K and from year to year. Such a structure would continually provide children impacted by poverty with a consistent set of experiences from their first days in preschool through their completion of third grade. Therefore, attention to the reconceptualization of readiness and transition as they relate to children impacted by poverty and diverse subgroups' pathways through early childhood and early school settings may be needed. How these transitions are enacted will become even more critical with the implementation of *MCPS Curriculum 2.0/* Integrated Elementary Curriculum (EIC) (MCPS, 2011b).

The Question of Nature of Assessments in Early Years. It is worth noting that each of the previous studies on the impact of the full-day model on academic performance conducted in MCPS has cited the limitations of the assessment and outcome data available for use in assessing the impact of programs on academic performance, in the lower grades in general, and in mathematics in particular (Zhao, et al., 2009; Maina & Modarresi, 2010; Zhao & Modarresi, 2010). The outcome measures in place were said to be either formative in nature, not administered in standardized situations, not vertically equated, or prone to 'ceiling' effects. As such, the data from these measures are often not amenable to analyses that verify long-term impacts of programs or interventions. There is need to pay attention to decision making about assessments in the early years with regard to methods, purposes, scope, and the use of the information that results from the assessments.

Recommendations

1. Examine areas needing improvement as early as kindergarten for students impacted by poverty by establishing processes to review and use Maryland Model for School Readiness (MMSR) data at the school and program level. Understanding patterns of strengths and areas needing improvement among students impacted by poverty, beyond what is measured through reading and mathematics assessments, is critical to a) improving the pre-K instructional program, b) preparing students for continued achievement in subsequent grade levels, and subsequently closing the achievement gaps between them and their grade-level peers. In time, understanding of the areas needing improvement by the instructional team will be critical to preparing students to readily access MCPS Curriculum 2.0/Integrated Elementary Curriculum (EIC) (MCPS, 2011b). The MCPS Curriculum 2.0 is expected to be more rigorous and blends reading, language arts, and mathematics instruction with lessons in science, social studies, music, art, and physical education in a way that spurs creativity and critical thinking skills.

2. Develop an action plan to review and synthesize the findings from the series of four studies on the impact of the Head Start full-day prekindergarten (pre-K) program in Montgomery County Public Schools with a goal to: a) identify areas needing improvement in the pre-K and kindergarten instructional programs and b) establish strategies for instituting changes to ensure continuous improvement.

3. Refocus future studies to include the examination of students' instructional experiences as they transition from pre-K to successive grade levels. Most of the current research is on impact of Head Start or prekindergarten programs and does not provide data on the nature and the quality of the kindergarten or first grade instructional programs or the schools attended by students after their Head Start year. This creates the need to understand how kindergarten and early elementary programs are structured to enable teachers and schools to actually build on the gains from Head Start programs.

4. Confirm the patterns of the findings in this report with at least one more cohort of students who attended the full-day Head Start model.

5. Evaluate the long-term impact of the full-day pre-K program in succeeding grades. This is crucial because the Grade 1 reading and mathematics unit assessments (MCPSAP-PR and MCPSAP-PM) are not administered in standardized settings. These assessments are designed to capture specified dimensions of students' academic achievement in reading and mathematics. By Grade 2, various standards assessments that capture a variety of areas are administered to all Grade 2 students globally (e.g., TerraNova 2nd Edition and Inview). These assessments administered in Grade 2 would provide more consistent, reliable, and additional information on the lasting effects of the full-day Head Start model on a comprehensive set of educational outcomes.

Acknowledgements

The author would like to thank Dr. Huafang Zhao, Ms. Julie Wade, Dr. Shahpar Modarresi, and Ms. Janine G. Bacquie for their valuable comments.

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Appendix A

Table A1
Location of MCPS Head Start Full-Day Classes in 2010–2011 Federal Head Start

	Head Start Site	Classes	Projected Capacity
1	Montgomery College at Rockville (DHHS/CAA)	1	20
2	Silver Spring Presbyterian Children's Center (DHHS/CAA)	1	10
3	Arcola Elementary School	1	20
4	Broad Acres Elementary School	1	20
5	Brown Station Elementary School	1	20
6	Clopper Mill Elementary School	1	20
7	East Silver Spring Elementary School	1	20
8	Harmony Hills Elementary School	1	20
9	Highland Elementary School	1	20
10	Georgian Forest Elementary School	1	20
11	Montgomery Knolls Elementary School	1	20
12	New Hampshire Estates Elementary School	3	60
13	Rolling Terrace Elementary School (Judy Center)	1	20
14	South Lake Elementary School	1	20
15	Summit Hall Elementary School (Judy Center)	1	20
16	Twinbrook Elementary School	1	20
17	Viers Mill Elementary School	1	20
18	Washington Grove Elementary School	1	20
19	Watkins Mill Elementary School	1	20
20	Weller Road Elementary School	1	20
21	Wheaton Woods Elementary School	1	20

Note. 19 Elementary schools and 21 classes.

Appendix B
Sample Pre-kindergarten Schedules

Table B1
Sample Daily Schedule (Full-day)
Full-day Head Start Class Model Schedule (6¼ hour day)

Time	Instruction
5 minutes	Arrival Sign in or check in (attendance), Venn diagram or question of the week
5 minutes	Class Meeting Morning message or question of the week, reading daily schedule, calendar activities, and job chart
3 minutes	Movement/Music
20 minutes	Whole Group Literacy Lesson 5 minutes: oral language/vocabulary focus 15 minutes: Read-Aloud/Shared Reading, *Building Language for Literacy* (BLL) lesson and/or Reading, Writing, Language Arts Guide lesson
2 minutes	Movement Transition
10 minutes	Shared Writing (e.g., taking dictation about a shared experience or children's plans for center time.)
30 minutes	Child- Selected Centers (Free Choice) - Interaction with peers and adults in learning activities Centers include: Dramatic Play—BLL and other dramatic play settings… Literacy—books/print materials, comfortable reading space, writing/drawing materials, blank books, mailboxes, computer, listening station, alphabet games, and puzzles, magnetic letters, puppets and puppet stage, etc. Blocks—enhanced with props, theme-related books (e.g. construction), and writing materials (for making signs) Art—paint, glue, clay, and/or playdough; a variety of drawing, writing, and printing tools; collage materials; and paper Math—magnetic numerals, writing/drawing materials, puzzles, math literature books, real-world photographs, pattern blocks, attribute blocks, connecting links, connecting cubes, pegs and pegboards, shapes to trace around, etc. Manipulatives—puzzles, counting sets, attribute blocks, geometric solids, etc. Science—sand and water table, objects to sort and classify, pan balance scale, magnifying glasses and other materials from science kits
3 min	Movement Transition
35 minutes	Differentiated Small Group Literacy Lesson Rotation/ Indicator-Focused Literacy Centers Each student participates in a teacher-directed, small group literacy lesson daily. Differentiated lessons focus on foundational skills: Oral Language, Concepts about Print, Phonemic Awareness, or Letter Knowledge and lasts for 5-7 minutes. As one group meets with the teacher, the remaining students work in indicator-driven literacy centers, such as book center, listening station, letter puzzles, writing center, computer, puppets, flannel board etc. Paraeducator facilitates student learning in literacy centers.

Continued

Table B1
Full-Day Head Start Class Model Schedule, continued

Time	Instruction
5 minutes	Clean-up Time
30 minutes	Outside Time Physical motor, science, and social activities (includes transition time)
20 minutes	Whole Group Math Lesson Teacher-directed whole group mathematics lesson (daily)
35 minutes	Table setting and hand washing Family-Style Lunch (conversation and sharing among children and adults) Brushing teeth-Children look at books on rug after eating
30 minutes	Special: Art, Music, P.E. (includes transition time)
40 minutes	Rest Break: Students rest or participate in quiet time activity: look at books/ play with manipulatives (includes transition time)
35 minutes	Differentiated Small Group Math Lesson Rotation/ Indicator-Focused Math Centers: The teacher and paraeducator each meet with math small groups of students for 15-minute, differentiated lessons focusing on math indicators. Remaining students work in structured indicator-driven math centers. Students rotate so that everyone participates in adult-directed small group and math centers daily.
2 minutes	Movement Transition
20 minutes	Integrated Whole Group Lesson: Teacher-directed whole group lessons focusing on social skills, science, social studies, health, etc. Include lessons from *Talking About Touching*, *Second Step*, *Color Me Healthy* and science curriculum
30 minutes	E.L.M., Pre-K Level: Time for in-depth investigation of BLL and other curriculum topics. Teachers support and extend children's learning by providing experiences to develop and reinforce literacy, mathematics, and problem-solving skills. Time to promote oral language, vocabulary, science, social studies, and social-emotional skills through teacher-student and student-student interactions in social settings. (includes transition time)
15 minutes	Prepare to Dismiss: Review Day, Pack Belongings, Dismissal

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Table B2
Sample Daily Schedule (Part-day)
Half-day Head Start Class Model (3¼ hour day)

Time	Instruction/Activity
8:50 – 8:55 (5 minutes)	Arrival Greetings. Conversation. Sign-in or check-in system (e.g., move name card/photo). May include question of the day or table activities.
8:55 – 9:00 (5 minutes)	Class Meeting Welcome. Daily schedule. Highlights of day or week. May include selection of student jobs, daily message, and/or question of the day.
9:00 – 9:30 (30 minutes)	Literacy Block – Large Group Literacy Lesson 5 minutes: oral language/vocabulary, phonological/phonemic awareness, letter identification 15 minutes: Read Aloud or shared reading (focusing on skill/concept development such as concepts about print, oral language, vocabulary, phonemic awareness, letter identification, fluency, and comprehension) - Literacy Block – Small Group Literacy Lessons 10 minutes: differentiated activities focusing on prekindergarten-level indicators from the MCPS *English Language Arts Curriculum Framework*
9:30 – 10:05 (35 minutes)	Center Time Centers include dramatic play, literacy, blocks, art, math/manipulatives, and science
10:05 – 10:15 (10 minutes)	Clean-up Time
10:15 – 10:35 (20 minutes)	Outdoor Time Includes physical development, natural science, and socialization activities
10:35 – 10:55 (20 minutes)	Mathematics Instruction May include calendar activities and mathematics-related read aloud
10:55 – 11:20 (25 minutes)	Small Group Math Instruction or Special Subject (Art, Music, or PE) Note: Art, Music, and PE may occur at other times during the day.
11:20 – 11:25 (5 minutes)	Table setting and hand washing
11:25 – 11:50 (25 minutes)	Family style lunch Conversation during lunch.
11:50 – 12:00 (10 minutes)	Prepare for dismissal
12:05	Dismissal

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Table B3
Sample Daily Schedule (Part-day)
MCPS Partial Day Pre-kindergarten AM (2½ hour day)

Time	Instruction/Activity
8:50–8:55 (5 minutes)	Arrival Greetings. Conversation. Sign-in or check-in system (e.g., move name card/photo). May include question of the day or table activities.
8:55–9:00 (5 minutes)	Class Meeting Welcome. Daily schedule. Highlights of day or week. May include selection of student jobs, daily message, and/or question of the day.
9:00–9:30 (30 minutes)	Literacy Block – Large Group Literacy Lesson 5 minutes: oral language/vocabulary, phonological/phonemic awareness, letter identification 15 minutes: Read Aloud or shared reading (focusing on skill/concept development such as concepts about print, oral language, vocabulary, phonemic awareness, letter identification, fluency, and comprehension) - Literacy Block – Small Group Literacy Lessons 10 minutes: differentiated activities focusing on prekindergarten-level indicators from the MCPS *English Language Arts Curriculum Framework*
9:30–9:55 (25 minutes) Includes clean-up time	Center Time Centers include dramatic play, literacy, blocks, art, math/manipulatives, and science
9:55–10:10 (15 minutes)	Outdoor Time Includes physical development, natural science, and socialization activities
10:10–10:30 (20 minutes)	Small Group Math Instruction or Special Subject (Art, Music, or PE) Note: Art, Music, and PE may occur at other times during the day.
10:50–11:15 (25 minutes)	Lunch Handwashing before and after lunch. Conversation during lunch.
11:15–11:20 (5 minutes)	Prepare for dismissal
11:20	Dismissal

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Table B4
Sample Daily Schedule (Part-day)
MCPS Partial Day Pre-kindergarten PM (2 ½ hour day)

Time	Instruction/Activity
12:35–12:40 (5 minutes)	Arrival Greetings. Conversation. Sign-in or check-in system (e.g., move name card/photo). May include question of the day or table activities.
12:40–1:05 (25 minutes)	Lunch Handwashing before and after lunch. Conversation during lunch.
1:05–1:10 (5 minutes)	Class Meeting Welcome. Daily schedule. Highlights of day or week. May include selection of student jobs, daily message, and/or question of the day.
1:10–1:40 (30 minutes)	Literacy Block – Large Group Literacy Lesson 5 minutes: oral language/vocabulary, phonological/phonemic awareness, letter identification 15 minutes: Read Aloud or shared reading (focusing on skill/concept development such as concepts about print, oral language, vocabulary, phonemic awareness, letter identification, fluency, and comprehension) - Literacy Block – Small Group Literacy Lessons 10 minutes: differentiated activities focusing on prekindergarten-level indicators from the MCPS *English Language Arts Curriculum Framework*
1:40–2:05 (25 minutes) Includes clean-up time	Center Time Centers include dramatic play, literacy, blocks, art, math/manipulatives, and science
2:05–2:20 (15 minutes)	Outdoor Time Includes physical development, natural science, and socialization activities
2:20–2:40 (20 minutes)	Small Group Math Instruction or Special Subject (Art, Music, or PE) Note: Art, Music, and PE may occur at other times during the day.
3:00–3:05 (5 minutes)	Prepare for dismissal
3:05	Dismissal

Division of Early Childhood Programs and Services Pre-kindergarten Fact Sheet

Appendix C

Table C1
Number of Test Takers and Percentage Who Met or Exceeded Grade 1 End-of-Year
Reading Benchmark from 2006 to 2010 by Demographic Group

Demographic Group	N Test Takers Baseline Year and Most Recent 3 Years				% Met or Exceeded Benchmark at Text Level 16 or Higher			
	2006	2008	2009	2010	2006	2008	2009	2010
All	9050	9176	9828	10472	75.6	83.1	83.2	85.4
Male	4621	4660	4969	5443	72.6	80.5	79.9	83.6
Female	4429	4512	4859	5029	78.6	85.9	86.5	87.3
Race/Ethnicity								
African American	2031	1978	2062	2270	68.6	78.8	78.5	81.1
Male	1036	1009	1029	1173	64.3	74.7	74.1	78.1
Female	995	969	1033	1097	73.2	83.1	83.0	84.4
Asian	1401	1547	1700	1768	83.0	91.0	89.7	93.6
Male	709	758	848	924	81.0	90.1	87.4	92.2
Female	692	789	852	844	85.1	91.9	92.0	95.1
Hispanic	1799	1961	2272	2406	59.4	70.0	71.0	73.4
Male	902	979	1177	1250	55.5	65.2	67.6	72.2
Female	897	982	1095	1156	63.2	74.8	74.7	74.8
White	3777	3652	3769	3991	84.4	89.1	90.1	91.3
Male	1959	1896	1905	2079	82.1	87.4	87.3	89.9
Female	1818	1756	1864	1912	87.0	90.9	93.0	92.9
Special Services								
FARMS	2637	2641	3066	3440	57.5	70.1	70.8	74.9
Special Education	794	763	903	845	44.0	54.7	46.1	47.1
ESOL	1602	2067	2464	2815	52.4	69.2	70.3	75.3

Source. MCPS (2011a). Student performance on the 2010 Assessment Program in Primary Reading (Kindergarten to Grade 2) Rockville, MD: Montgomery County Public Schools.

Note. Results are reported for students who were required to take the test. American Indian students and students in special/alternative schools are included with all students but are not reported separately. FARMS = Free and Reduced-price Meals System; ESOL = English for Speakers of Other Languages.

Table C2
Percent of 2007–2008 Head Start Students Who Were Reading at Grade-Level Benchmark by Subgroup

Demographic Characteristics		Full-day (N = 247)		Half-day (N = 269)		MCPS Pre-K (N =251)		No MCPS Pre-K (N = 392)	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Gender	Male	98	74.8	110	80.3	104	77.6	168	72.7
	Female	93	80.2	130	81.3	111	82.2	129	80.1
Ethnicity	African American	65	78.3	111	78.2	51	77.3	124	74.7
	Asian	18	85.7	24	100.0	29	85.3	20	87.0
	Hispanic	10	83.3	19	76.0	112	77.8	103	74.1
	White	90	73.8	78	82.1	14	93.3	25	73.5
Special services	FARMS	157	75.5	200	79.4	164	78.5	197	71.6
	ESOL	113	74.8	91	82.0	126	76.4	60	68.2
	Special Education	15	50.0	18	60.0	6	31.6	26	42.6

Table C3
Odds Ratio for Association Between Attending Full-day Class Model and Attaining
Grade 1 Reading benchmark in 2010 by Student Subgroups

	Half-day Head Start	MCPS Pre-K	Similar Student
All	0.810	0.856	1.085
Male	0.729	0.848	1.098
Female	0.933	0.882	1.011
African American	1.009	1.062	1.233
Asian	0.857	1.034	0.900
Hispanic	0.613	0.804	0.983
White	1.579	0.357	1.800
FARMS	0.800	0.839	1.214
ESOL	0.654	0.920	1.388
Special Education	0.667	2.167	1.308
Fully Ready	0.682	0.677	0.949
Developing Readiness	0.910	1.667	1.021

Appendix D

ANCOVA Model Description

Model 1 (Full-day Head Start Model vs. Half-day Head Start Model in Mathematics)

The dependent variables or outcome measure for these models were the on-grade total score and above-grade total scores in 2009–2010. The independent variable was treatment representing students' pre-K experiences (half-day Head Start model). The control variables included race and ethnicity, special education status, ESOL services, days present in Grade 1, and gender and a propensity score. The covariate was readiness for school composite score. The dependent variables were total score on mathematics unit assessments for on-grade-level and above-grade-level mathematics course. The correlation coefficient ($r = 0.238$) of total mathematics score and readiness for school composite scores was significant at the 0.01 level (2-tailed). The sample for the analysis included 498 (227 vs. 271) who had complete mathematics scores in the 2009–2010 school year.

Model 2 (Full-day Head Start Model vs. MCPS Partial-day Model in Mathematics)

The dependent variables or outcome measure for these models were the on-grade total score and above-grade total scores in 2009–2010. The independent variable was treatment representing students' pre-K experiences (half-day MCPS pre-K model). The control variables included race and ethnicity, special education status, ESOL services, days present in Grade 1, and gender and a propensity score. The covariate was the readiness for school composite score. The dependent variables were total score on mathematics unit assessments for on-grade-level and above-grade-level mathematics course. The correlation coefficient ($r = 0.265$) of total mathematics score and readiness for school composite scores was significant at the 0.01 level (2-tailed). The sample for the analysis included 478 (227 vs. 251) who had complete mathematics scores in the 2009–2010 school year.

Model 3 (Full-day Head Start Model vs. No MCPS pre-K Experience in Mathematics)

The dependent variables or outcome measure for these models were the on-grade total score and above-grade total scores in 2009–2010. The independent variable was treatment representing students' pre-K experiences (no MCPS pre-K experience). The control variables included race and ethnicity, special education status, ESOL services, days present in Grade 1, and gender and a propensity score. The covariate was readiness for school composite score. The dependent variables were total score on mathematics unit assessments for on-grade-level and above-grade-level mathematics course. The correlation coefficient ($r = 0.289$) of total mathematics score and readiness for school composite scores was significant at the 0.01 level (2-tailed). The sample for the analysis included 552 (227 vs. 325) who had complete mathematics scores in the 2009–2010 school year.

Appendix E

Cut-off Scores for End-of-Unit Assessments Math 1 through Math 6

Table E1
Cut-off Scores for End-of-Unit Assessments Math 1 Through Math 6

Mathematics Unit Assessments/ Course Level and Acceleration	Cut Score[a]/Total Points Possible	%
Kindergarten	Total points: 58[b]	
Acceleration (Math 1)	Total points: 131	
Math 1	Proficient: 108/141	77
Acceleration (Math 2)	Proficient: 106/137	
Math 2	Proficient: 105/136	77
Acceleration (Math 3)	Proficient: 131/174	
Math 3	Proficient: 145/193	75
Acceleration (Math 4)	Proficient: 129/177	
Math 4	Proficient: 133/182	73
Acceleration (Math 5)	Proficient: 125/166	
Math 5	Proficient: 131/174	75
Acceleration Math 6 (Math A)	Proficient: 137/192	
Math 6 (Math A)	Proficient: 138/194	71
Acceleration Math 7 (Math B)	Proficient: 104/144	
Math 7 (Math B)	Proficient: 133/185	72
Acceleration Algebra Prep (Math C)	Proficient: 86/107	
Algebra prep (Math C)	Proficient: 93/147	64
Additional points in Algebra Prep that do not count toward total	10	

[a] Adapted/Decision made by Executive Leadership Team Meeting, June 28, 2007.
[b] No proficiency cut scores for kindergarten
Note. Math 7 and algebra were not included in the proficiency computation for this evaluation. There were too few students in these

Table E2
Percent of 2007–2008 Head Start Students who were Mathematics Proficient by Subgroup

Demographic Characteristics		Full Day		Half Day		MCPS Pre-K		Similar	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Gender	Male	98	78.4	106	80.9	102	76.1	148	64.1
	Female	84	74.3	123	79.4	100	74.1	117	72.7
Ethnicity	African American	65	78.3	109	76.8	47	71.2	116	69.9
	Asian	18	85.7	21	87.5	27	79.4	23	100.0
	Hispanic	90	73.8	78	82.1	118	81.9	98	70.5
	White	9	75.0	21	84.0	10	66.7	26	76.5
Special services	FARMS	160	77.3	205	81.3	166	79.4	203	73.8
	Special Education	17	56.7	24	80.0	13	68.4	32	52.5
	ESOL	121	80.1	93	83.8	140	84.8	62	70.5
Level of Readiness	Fully Ready					149	81.4	152	76.4

Table E3
Odds Ratio for Association between Attending Full-day Class Model and Attaining Proficiency in Math 1
2009–2010 School Year

	Half-day Head Start	MCPS Partial Day	Similar Student	Random Sample
All	0.831	0.929	1.368	0.177
Male	0.868	0.961	1.753	0.327
Female	0.790	0.893	0.965	0.068
African American	1.093	1.460	1.570	0.281
Asian	0.857	1.556	0.857	0.173
Hispanic	0.613	0.620	1.177	0.324
White	0.571	1.500	0.923	0.163
FARMS	0.764	0.882	1.209	0.578
ESOL	0.781	0.720	1.691	0.381
Special Education	0.327	0.604	1.223	0.351
Fully Ready	0.729	0.842	1.158	0.144
Developing Readiness	0.802	1.667	0.911	0.178

Note. American Indian students were included but not reported separately. No odds ratio was calculated for a group if the sample size was fewer than 30 students. Results may not add up to 100 due to rounding.

Table E4
Adjusted Mean Score, Standard Deviation, and Effect Size of Mathematics On-Grade and Above-
Grade Assessments in 2009-2010 by Pre-K Experience and Student Subgroup

Outcome measure	Full-day Head Start			Comparison Models			Mean difference	Effect size	Effect size based on control group
	mean	n	SD	mean	n	SD			
				Half-day Head Start					
Gender									
Male	121.0	121	19.8	121.7	125	16.77	-0.67	-0.04	-0.04
Female	121.5	106	16.9	121.0	146	19.3	0.55	0.03	0.03
Race/ethnicity									
Asian	126.21	19	13.235	126.96	24	13.08	-0.75	-0.06	-0.06
African American	121.29	77	20.473	119.04	125	18.61	2.25	0.12	0.12
White	116.9	10	25.865	124.61	23	12.42	-7.71	-0.44	-0.62
Hispanic	120.9	115	17.022	121.3	89	19.954	-0.4	-0.02	-0.02
Special services									
FARMS	120.82	198	19.052	120.61	234	17.434	0.21	0.01	0.01
ESOL	121.84	151	17.089	121.85	120	17.788	-0.01	0.00	0.00
Special Education	110.64	28	21.474	118.0	29	19.527	-7.36	-0.36	-0.38
				MCPS Partial Day					
Male	121.0	121	19.8	120.0	126	19.2	0.96	0.05	0.05
Female	121.5	106	16.9	121.1	125	19.7	0.47	0.03	0.02
Asian	126.21	19	13.235	123.28	32	19.973	2.93	0.16	0.15
African American	121.29	77	20.473	116.43	61	22.574	4.86	0.23	0.22
White	116.9	10	25.865	116.92	12	21.973	-0.02	0.00	0.00
Hispanic	120.9	115	17.022	121.95	141	17.731	-1.05	-0.06	-0.06
FARMS	120.82	198	19.052	120.11	201	19.861	0.71	0.04	0.04
ESOL	121.84	151	17.089	122.13	171	17.995	-0.29	-0.02	-0.02
Special Education	110.64	28	21.474	108.42	19	26.007	2.22	0.09	0.09
				No MCPS Pre-K					
Male	121.0	121	19.8	119.4	188	19.8	1.61	0.08	0.08
Female	121.5	106	16.9	121.1	137	18.4	0.44	0.02	0.02
Asian	126.21	19	13.235	129.61	23	9.114	-3.4	-0.30	-0.37
African American	121.29	77	20.473	117.88	148	18.331	3.41	0.18	0.19
White	116.9	10	25.865	118.59	29	27.71	-1.69	-0.06	-0.06
Hispanic	120.9	115	17.022	120.76	114	18.875	0.14	0.01	0.01
FARMS	120.82	198	19.052	118.72	247	20.519	2.1	0.11	0.10
ESOL	121.84	151	17.089	119.21	77	19.451	2.63	0.15	0.14
Special Education	110.64	28	21.474	108.35	48	29.334	2.29	0.09	0.08

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