Memorandum

TO: Chairperson Kirwan and Commission members

FROM: Mark Fermanich, Bob Palaich and Justin Silverstein, Augenblick, Palaich and Associates

DATE: January 6, 2017

SUBJECT: Responses to Questions Posed at December 8, 2016 Meeting Regarding Variation in Recommended Base Costs and At Risk Weights by School Level; Transportation Funding; and School Size, Configurations and Student Achievement

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This memo is delivered in response to a number of the questions posed by the Commission following the study team's presentation on December 8, 2016 including:

1. What is the variation in the recommended base cost by school level?
2. What is the variation in at risk weights by school level?
3. What are states the Commission could examine that have strong transportation formulas?
4. Were there any recommendations for school size based on grade configurations?

Additionally, the Commission asked for a full list of the 111 successful schools, which is provided at the end of this memo in table format.

What is the Variation in Base Cost and At Risk Weights by School Level

This section addresses the first two questions regarding the variance in the recommended base cost and at risk weights by school level (elementary, middle and high school).

Base Cost[1]

In the *Final Report of the Study of Adequacy of Funding for Education in Maryland,* the study team recommended a base cost, prior to adjusting for federal funds, of $10,970. This figure was derived

[1] [1] This summary is based on the analysis reported in the final adequacy report and is cited as follows: Augenblick, Palaich & Associates. (2016). *Final Report of the Study of Adequacy of Funding for Education in Maryland*. Denver, CO: APA Consulting.

using the blended adequacy model that reconciled the results of the evidence-based (EB) and professional judgment (PJ) approaches. The base cost figure is intended to represent the resources a student with no special needs in a district with no special circumstances needs to meet state standards and includes the following key resources:

- Small class sizes (15:1 grades K-3, 25:1 grades 4-12);
- Staffing to support (but not limited to) the following areas: art, music, PE, world languages, technology, CTE, and advanced courses;
- Significant time for teacher planning, collaboration, and imbedded professional development;
- Additional instructional staff including instructional coaches and librarian/media specialists;
- High level of student support, such as counselors, nurses, behavior specialists, or social workers, for all students;
- Administrative staff to allow for instructional leadership, data-based decision making, and evaluation;
- Technology rich learning environments, resourced at a level that would allow for one-to-one student devices;
- Resources for instructional supplies and materials, assessment, textbooks, and student activities; and
- District-level personnel and other resources to support schools.

Please refer to *Final Report of the Study of Adequacy of Funding for Education in Maryland* Chapter II (pages 14-17) and Chapter III (pages 39-57) for a detailed description of the resources identified from the EB and PJ approaches, respectively, as well as Chapter V (pages 73-77) that discusses the key resource areas that were modified to blend the two approaches to create the final recommended base figure.

As noted, a single base figure was recommended. It was derived by combining the resources at the three school levels proportionally based on the number of students in each grade and then adding that per pupil amount to the per pupil district costs. Table 1 presents the calculated base cost for each school level based on adding each school level's per pupil resources to the per pupil district level costs separately.

Table 1

Base Cost by School Level

	Elementary	Middle	High School	Combined
Base	$11,822	$10,401	$10,128	$10,970

Source: APA

As shown, there was variation in the base amount by school level, with the identified cost at the elementary level more than $1,000 per student higher than at the middle and high school levels, where the costs were similar. The higher base at the elementary level is due to the smaller class sizes identified for kindergarten through third grade (15:1) compared to the 25:1 class size

identified for grades four and above as noted above. Pupil supports and administration were similar across the three levels.

At Risk Weights

Prior to adjustments for federal funds, the study team recommended a .40 weight for at risk students. This weight was based on a review of the results from the EB and PJ approaches with the recommended figure coming most directly from the PJ work. As such, the weights by school level shown in Table 2 are based on the resources identified through the PJ approach in relation to the blended base cost; at risk weights are presented for three concentration levels (25, 50, and 75 percent) as well as the average weight at each school level.

Table 2
At Risk Weights by School Level

	Elementary	Middle	High School	Combined
At Risk Weights				
25% Concentration	0.47	0.22	0.20	0.34
50% Concentration	0.57	0.40	0.28	0.45
75% Concentration	0.37	0.38	0.27	0.35
Average	***0.47***	***0.34***	***0.25***	***0.39***

Source: APA

As was seen for the base cost, weights for at risk varied by school level, with the highest weights generated at the elementary school level and the lowest weights at the high school level. This is based upon the more intensive interventions identified in elementary schools (such as before/after school and summer school programs for 100 percent of elementary at risk students and more interventionist support during the day) that are intended to reduce the amount of intervention that would be needed in later grades.

For more specific detail on the resources that led to the at risk weights by school level above, in the *Final Report of the Study of Adequacy of Funding for Education in Maryland* please refer to: Table 3.8a (pages 43-44) for specific at risk personnel by school level; Table 3.9 (page 47) for school-level non-personnel costs; and Table 3.10a-c (pages 49-50) for additional programs.

Student Transportation Funding in Maryland and Other States

This section examines the various approaches states use to fund transportation and identifies three state transportation formulas the Commission may want further examine. It begins with a brief summary of Maryland's current transportation formula and then provides information on other states.

Transportation in Maryland Today[2]

Maryland's Transportation Subsidy Formula is comprised of a Transportation Base Grant for non-disabled riders and an additional amount for disabled riders (currently set at $1,000 per disabled rider). Each district's Transportation Base Grant consists of its Transportation Base Grant for the prior year adjusted both by the transportation component of the Consumer Price Index for the Baltimore-Washington metropolitan area and by a factor for enrollment increases of $277.55 (for fiscal year 2014-15) for each additional student over the prior fiscal year's enrollment. Districts are guaranteed a minimum annual increase of 1.0 percent in their Base Grant. The formula does not, however, decrease funding in response to enrollment decreases. Until 1982, a committee of the State Board of Education established the per district funding amount. The current formula was adopted by the Legislature in 1982. In 2002, the formula was further adjusted to increase the base student transportation grant for the 15 districts that experienced enrollment increases between 1980 and 1995 – a time during which the formula did not adjust funding in response to enrollment increases.

Transportation expenditures amounted to 5.3 percent of total public school spending in 2012-13. Overall transportation costs are determined by the number of students transported, driver compensation, maintenance costs, vehicle fuel costs, and other operating costs. The population density of a district influences costs because areas with lower population densities tend to require buses to drive more miles than areas with higher population densities. Even with longer miles driven, the need to maintain reasonable ride times may not allow the seating capacity to be fully used. In urbanized areas, traffic congestion may also require longer drive times at higher labor rates. More strategic travel routes and better utilization of available seats can influence bus route efficiency.

Statewide, the total number of non-disabled students being transported declined slightly between 2005-06 and 2014-15. However, significant changes in the number of non-disabled students transported have occurred for specific districts. Some of these changes have resulted from district policy and practice changes that have made more students eligible for transportation services. Shifts in district total enrollment have also driven some of the transportation figures. Statewide, there was a 2.7 percent decrease in the number of regular students transported. However, two districts experienced much larger changes in the number of non-disabled students transported. Calvert County experienced a 25.7 percent decrease (a reduction of 4,430 students), while Talbot County saw a 58.8 percent increase (a gain of 1,599 students). Other districts that saw large decreases in numbers, but not percentages, included Baltimore City (1,372), Carroll County (2,380), Frederick County (5,046), Harford County (3,292), and Prince George's County (7,115).

Transportation of disabled students is often very expensive. Disabled students tend to be placed in highly specialized programs in distant locations. These students may require wheelchair-accessible vehicles or other specialized vehicles. The passenger capacity of such vehicles is typically low. Over the

[2] This summary is based on the analysis reported in the final report on increasing and declining enrollment in Maryland Public Schools prepared for the Maryland Adequacy Study contract and is cited as follows. Hartman, W. & Schoch, R. (2015). *Final Report of the Study of Increasing and Declining Enrollment in Maryland Public School*s. Denver, CO: APA Consulting.

last 10 years, most districts have experienced both a decrease in special education enrollment and an increase in numbers of disabled students transported. For example, in Talbot County, special education enrollment decreased by more than 10 percent, while the number of disabled students transported increased by 100 percent.

Transportation costs for the total number of combined non-disabled and disabled students transported increased by 41 percent between 2005-06 and 2012-13. The average cost per pupil transported in 2005-06 was $751 compared to $1,058 in 2012-13 (transportation costs were not available broken out by each category). Prince George's County had the highest per pupil transportation costs in both five-year periods ($1,589). Cecil County had the lowest cost in both five-year periods ($564).

In the past decade, a number of Maryland districts have expanded transportation services. The number of students eligible for transportation has increased along with the levels of transportation services offered. According to interviews with transportation managers, service level expansion could include more frequent bus stops, more stops located at homes, and more air conditioned vehicles. All of these factors affect transportation costs.

The study team's Increasing and Declining Enrollment study presented an analysis of the Transportation Base Grant in relation to a number of factors that affect transportation costs. These factors included route miles traveled, vehicles utilized, and population densities. Based on an analysis of all of the factors that impact transportation costs and revenues, no single factor appeared to strongly influence the Transportation Base Grant amounts provided to districts. Because a large number of factors affect transportation cost, many states use a more complex transportation formula in an attempt to account for a variety of cost factors when calculating transportation funding. Under Maryland's current transportation funding formula, the highest-funded county received approximately double the amount of the lowest-funded county. Table 3, below, summarizes the wide variations across districts in the amounts provided by the transportation funding formula factors examined for this analysis.

Table 3
Summary of Transportation Base Grant Amounts by Factor

Transportation Funding Formula Measure	State Average	Low	High
Per Non-Disabled Student Transported in 2013-	$396	$325	$785
Per Route Vehicle in 2013-14	$32,034	$25,635	$54,462
Per Route Mile in 2013-14	$2.88	$1.96	$49.07
Transportation Grant as a Percentage of Total Transportation Expenditures 2005-06	43%	34%	67%
Transportation Grant as a Percentage of Total Transportation Expenditures 2012-13	42%	33%	70%

Source: MSDE

Transportation Funding in Other States

Several states have recently studied and revised their transportation funding formulas to address historical inequities and promote cost effective transportation services. Studies done in the states of Washington and Montana[3] have identified as many as six approaches to transportation funding across the country:

1. Provide funding to support all K-12 educational programs, but no funds explicitly for pupil transportation.
2. Allocate block grant funding for transportation separate from the basic education funding. These funds can be distributed based on total enrollment or students transported.
3. Allocate state funds based on approved costs, identifying each specific type of expenditure that will be reimbursed. States may reimburse all or a percentage of approved costs.
4. Provide per unit funding for specified and measurable units. The units used vary from the total miles driven, the number of students transported, the number of trips per day, and other measurable units related to costs.
5. Allocate funds based on expected costs. A set of factors defining demographic and geographic differences as well as transportation activities is analyzed with a multivariate statistical methodology that computes the expected costs for each district. The state then funds a district's expected, rather than actual, costs. These formulas are intended to promote certain transportation service levels and efficiencies.
6. Provide funding levels based on efficiency and best practice. This approach provides adjustments for factors beyond the control of local school districts.

Typically, transportation funding formulas aim to provide transportation funding that: (1) is closely related to factors influencing transportation costs; (2) is understandable; (3) rewards efficiency or penalizes inefficiency; (4) promotes student safety; and (5) accommodates special circumstances. The most sophisticated formulas incorporate statistical analyses of the factors influencing transportation costs into their financial models. In this way, these formulas determine the appropriate state and local shares of transportation funding. Using formulas effectively requires accurate data, usually transportation operations information from the prior school year.

The study team feels that Florida, North Carolina and Pennsylvania have transportation systems that have strong data systems, that offer help to districts in route planning, and that have formulas that address the principles listed above. It would be recommended that the Commission further examine these states formulas as they look into transportation funding.

[3] Management Partnership Services, Inc., *Development of Student Transportation Funding Methodology Options for Washington State,* State of Washington Office of Financial Management, November, 2008. The Montana review was conducted by the Montana Legislative Council in the early 1990s.

School Size, Configuration and Student Achievement

The commission asked for information on impact of school size by grade configuration. The study team provided three school size reports during the course of the study. This section provides an overview of the results of the school size work, which provide insights into the school size question.

Summary[4]

This section provides an overview of the effects of school size and configuration on student achievement. The findings summarized here were originally presented in the final report of the study team's school size study. While there is a significant body of research on the effects of school size, the literature is not conclusive. However, two consistent themes may be drawn from the literature. First, smaller school sizes do not directly impact student achievement but instead enable other conditions that do, such as a positive school climate, supportive relationships between staff and students, and greater student engagement in academics and extracurricular activities. Successful smaller schools also benefited when accompanied by strong school leadership and a high-quality instructional program. Second, smaller schools particularly benefit students who are at risk of underperforming or failing in school, such as students in poverty, English language learners, and students receiving special education services.

Given the potentially beneficial impacts of smaller learning communities on student learning, especially for at risk students, a number of organizations invested in smaller learning communities and smaller schools as strategies in the 2000s to boost student achievement. These organizations, including the U.S. Department of Education, the Bill and Melinda Gates Foundation, and the Carnegie Corporation, were guided by the hypothesis that smaller schools lead to better academic outcomes. Several comprehensive reform models for creating smaller schools or smaller learning environments emerged from these efforts. These include:

- School within a school/school within a building;
- Smaller learning communities;
- Career academies;
- Autonomous small schools;
- Alternative schools; and
- Magnet schools or theme-based schools.

Each of these models is described later in this section.

An examination of the relationship between school size, the concentration of poverty in schools (i.e. the percent of students eligible for the federal free- and reduced-price meals, or FRPM, program), and the percent of student proficient or above on State assessments found that in middle schools and high schools, student performance on State assessments increased with school

[4] This summary is based on literature and analysis reported in the final school size report prepared for the Maryland Adequacy Study contract and is cited as follows. Humann, C., Palaich, R., Fermanich, M., and Griffin, S. (June 2015). *Final School Size Study: Impact of Smaller Schools*. Denver, CO: APA Consulting.

enrollment until enrollment reached 1,200 to 1,600 students. Performance began to decline in secondary schools with enrollment exceeding 1,600 students. The smallest secondary schools tended to be low performing. However, there were relatively few of these schools and in most cases these schools housed special programs for serving at risk students.

There was little relationship between school size and student performance at the elementary school level in schools with lower poverty concentrations (less than 60 percent FRPM). Student performance in higher poverty elementary schools was greatest in schools with enrollment between 450 and 650 students – a finding that is consistent with the school size literature. Schools that were both smaller and larger than this range produced somewhat lower performance.

The remainder of this memo provides more detail on 1) the research literature on school size and student achievement; 2) models of smaller schools or learning communities; 3) the impacts of school size on student achievement in Maryland; and 4) the impact of school size on school climate.

The Literature

Researchers have examined the correlation between school size and student achievement for many years. However, a confluence of events – investment in small schools by the Bill and Melinda Gates Foundation, a special project of the National Governor's Association (NGA), and investment from the U.S. Department of Education – brought renewed attention to the issue in the early 2000s, especially for high schools. These investments in smaller school models were accompanied by strategy and outcome evaluations, contributing to the current understanding of the impacts of small schools.

A meta-analysis of studies of small schools (Rochford, 2005) found that school size functions primarily as an enabler of improved student outcomes. The meta-analysis found that the schools that were able to improve student outcomes were also the schools that had decreased their enrollment numbers as part of a suite of related reform efforts. Early implementers and proponents of small schools speculated that, with fewer students, school staff would be able to form deeper and more supportive relationships with learners. Indeed, this hypothesis was proven to be true – but only in the schools that also changed their approaches to community engagement, instruction, and school structure.

First and foremost, these small schools benefited from leadership that both set a tone that encouraged personalization and distributed responsibility for reform efforts among multiple staff as well as the community at large. Successful small schools focused on improving the quality of instruction, often implementing new curricula or approaches to teaching. Teachers and leaders participated in professional development to learn new methods of content delivery and relationship-building skills. Teachers and leaders also participated in follow-up meetings to discuss implementation of these new skills. Furthermore, smaller schools were more successful when district leaders, boards of education, and community members were supportive of the work. In short, a school's staff, leaders, and surrounding community needed to work collaboratively to make the small school learning environment successful (Howley, 2002).

It is also critical to note that research shows smaller schools and smaller learning environments have an even more pronounced effect on children from low-income families (Friedkin & Necochea, 1988;

Greenwald, Hedges, & Laine, 1996). Indeed, in addition to improved grades and standardized test scores, low-income elementary-aged students attending small schools have better attendance, fewer behavior problems, and increased participation in extracurricular programs compared to low-income students in larger schools.

It is also true, however, that research around outcomes in smaller schools is not uniformly favorable. Several recent studies have found a performance advantage for larger schools (Steiner, 2011; Tanner & West, 2011). In the case of high schools, proponents of larger schools have argued that larger enrollments are needed to support more diverse course offerings (Conant, 1959; Hoagland, 1995). Other research, however, suggests that this advantage of larger schools may be overstated. Unks (1989) found that smaller schools provide a broader array of learning experiences than the published course offerings may suggest, while Monk (1987) found that the relationship between school size and curricular diversity begins to decrease with school enrollments above roughly 400 students.

Academic Achievement of Students in Need of Additional Learning Support

With the conflicting conclusions about the effects of school size on academic achievement, there is a growing sub-area of research focused on the benefits of smaller schools. Specifically, this research examines the degree to which smaller schools help students who need additional learning support. When examining this area of research, it can be challenging to isolate the effects of school size on academic achievement, since small school reforms often take place as part of a package, in combination with multiple other changes in policies, practices, or resources over time (Schwartz, Stiefel, & Wiswall, 2011).

There is a growing body of research identifying interventions and services that bolster the achievement of students receiving special education services, LEP students, and students living in poverty. Relationship-enhancing interventions are especially important for student populations that are, according to research, more prone to teacher-student relationship problems. Such students include boys, students living in poverty, students with disabilities, students from minority backgrounds, and students with problematic behaviors (Rathvon, 2008). As noted above, other interventions shown to be beneficial for students from low-income families are often part of the fabric of successful small school environments. Such interventions include strong parental engagement, personalized instruction, and collaborative, flexible approaches to meeting student needs. Thus, the academic achievement of students who need additional learning supports increases when certain academic tools and interventions are made part of the reform package. Such tools and interventions could include personalized learning, specialized curriculum, a distributed model of school leadership, and parent and community engagement. These tools and interventions are also often found in small school settings.

Small school achievement outcomes appear to be more pronounced for students who have traditionally shown lower levels of achievement (Darling-Hammond, Ross, & Milliken, 2006). This is evidenced in Unterman's (2014) report on New York City's Small Schools of Choice (SSC). The SSC student population, accepted on a lottery basis, is 94 percent minority. Eighty-four percent of SSC students are eligible for FRPM and 75 percent of them enter high school performing below grade level in reading or math.

Nevertheless, these SSCs are sending more students to college than other city schools: forty-nine percent of SSC students attend college, compared to an average of 40 percent at other city high schools.

Models of Smaller Schools

In the early 2000s, a number of funders invested in smaller learning communities and smaller schools as strategies to boost student achievement. These funders were guided by the hypothesis that smaller schools lead to better academic outcomes. Efforts were undertaken to determine if smaller, more personalized education settings would lead to improved academic achievement. In some cases, small schools did improve achievement, particularly for children in poverty. Overall, however, research shows school size as merely one of a collection of factors in improving student achievement. Parallel reforms and actions taken to help implement and support smaller school size models can also contribute greatly to overall improvements in student achievement.

Several comprehensive reform models have emerged for creating smaller schools or smaller learning environments. A number of factors – students, facilities, operating autonomy, and instructional philosophy – guide LEAs as they select models for smaller and more personalized learning environments. Some models, such as career academies and magnet schools, are learner-focused and seek to create community by bringing together students and staff who share particular interests and goals. Other models, like clusters and pods, are supported by facility design. These schools have been intentionally designed to accommodate a team-driven model of instruction. The terms *school within a school* and *school within a building* imply subtle differences, indicating varying levels of autonomy among multiple school administrators. There are also smaller learning communities guided by alternative educational philosophies. These communities include Montessori schools and foreign language immersion schools, among others.

A variety of terms have been used to describe small school models. In 2001, Cotton defined a number of common and relevant small school models. The broad categories of these models are described below.

School within a School/School within a Building

This model brings several small schools under one roof. More specifically, in a *school within a school* model, there is a building administrator or principal responsible for the entire physical plant and all schools, students, and teachers on a campus. In the *school within a building* model*,* principals are more autonomous and report directly to an LEA. Baltimore City, with support from the Bill and Melinda Gates Foundation, has created several schools that have adopted a *school within a school* model. The LEA calls these co-located schools. There are no standard definitions for these terms, rather individual districts define how they use each term.

Additional terms used to describe *school within a school* configurations include *minischool, multiplex, multischool,* and *scatterplex.* In Maryland*,* some LEAs have large schools clustered in a multischool or multiplex complex, such as the Old Mill Educational Complex in Anne Arundel County. The former Frederick Douglass High School in Baltimore City was transformed into a multiplex/multischool complex of small high schools.

Smaller Learning Communities

A smaller learning community is a term used to define an individual learning unit within a larger school. Teachers and their students are scheduled together and typically hold classes in shared, common areas of the school (Cotton, 2001).

Career Academies

Career academies provide a specialized, focused curriculum to support career exploration and preparation during high school, sometimes leading to job certification or receipt of credentials. The result is a *school within a school* environment that unites a group of peers with common long-term goals and interests. Other terms used to describe these smaller learning communities include *career clusters* and *career pathways* (Conley, D. & Rooney, K., January, 2007, & Guha, R. et al., 2014).

Autonomous Small Schools

Autonomous small schools, also referred to as *freestanding schools,* have independent governance and budget control. These schools have the ability to select both teachers and students. An autonomous small school sets its own schedule and defines its own learning program. It may share a building with another school, or may simply be a *historically small school,* located in a small building that limits enrollment. Maryland LEAs have experimented with autonomous small schools, namely in Baltimore City, where a contract was awarded to Edison Schools to manage a number of small schools in need of reform. The Edison Schools received per pupil funding from Baltimore City Schools, but had complete autonomy over staffing, curricula, and budget decisions that are normally approved at the LEA level. Charter schools are mostly autonomous small schools.

Alternative Schools

Alternative schools often provide nontraditional curriculum and educational methods, such as credit recovery or night school. Students have more flexibility in their programs of study and/or class schedules than they would in a traditional school. In the Maryland context, alternative schools often serve the needs of students who are not behaviorally successful in a traditional school setting and who may require a different environment from traditional classroom and school settings. These schools may be physically located within another school's building or in a separate building.

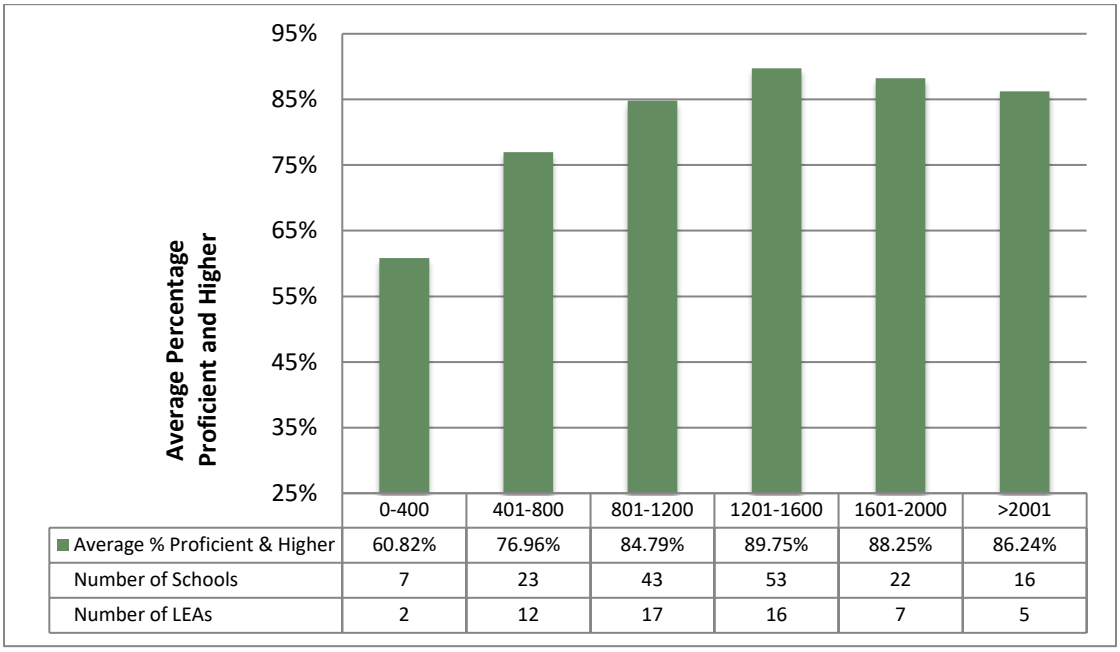
Magnet Schools or Theme-based Schools

Magnet and theme-based schools design curriculum and school activities around a particular area of study or theme. For these schools, community is built around a shared interest and experience regarding a particular subject. All classes are taught using the school's subject focus. For example, a visual arts magnet school might teach social studies concepts in the context of art history and geographic variations in artistic styles. Popular themes and subjects for theme-based schools include STEM, performing or visual arts, international studies, and world languages. Several Maryland LEAs have magnet schools, including foreign language immersion schools.

Impacts of School Size on Student Achievement in Maryland

The charts below show the average percentage of students in Maryland schools scoring proficient or advanced on state assessments, by ranges of school sizes, for each school level.[5] The horizontal axis of each chart shows the ranges of school sizes and the vertical axis shows the average composite performance score of students in each school size range. The composite score represents the percentage of all students in all subjects in a school achieving proficient or advanced on the state assessments.[6] In the case of elementary schools and middle schools, the data for schools with FRPM percentages less than or greater than 60 percent are shown separately.

Chart 1
Average Percentage of Students Attending Traditional High Schools Who Score Proficient and Higher on State Assessments, by School Size



	0-400	401-800	801-1200	1201-1600	1601-2000	>2001
Average % Proficient & Higher	60.82%	76.96%	84.79%	89.75%	88.25%	86.24%
Number of Schools	7	23	43	53	22	16
Number of LEAs	2	12	17	16	7	5

While the charts presented show the distribution of schools by size and student performance level, they do little to explain why the distribution of school performance across school size looks as it does. The multivariate analysis, reported in Appendix E, suggests that schools serving higher-need student populations will tend to experience lower levels of student achievement on state assessments.

As Chart 1, above, shows, high school achievement scores increase with school size up to a certain point, then begin to level off in schools enrolling more than 1,600 students. Based on data from 2013, student achievement is highest in schools that enroll 1,201 to 1,600 students. These schools represent 31

[5] No experimental studies we conducted for any part of this analysis, therefore all results are correlational and do not support causal claims.

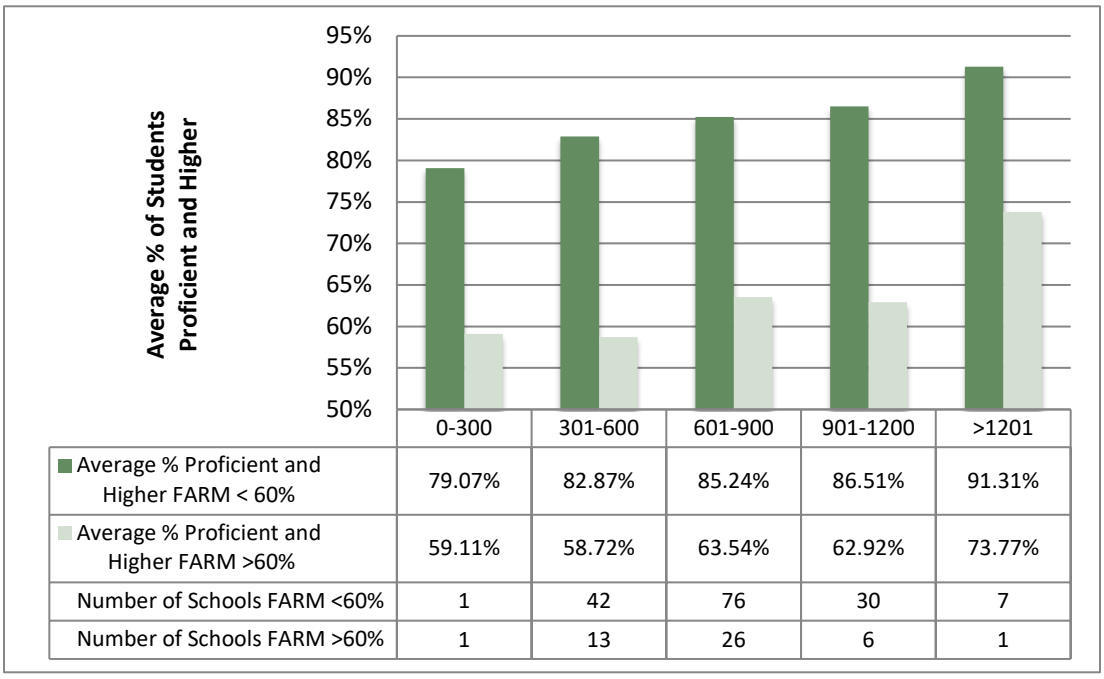
[6] The state assessment used for elementary and middle schools is the 2012 Maryland School Assessment. For high schools the assessment is the 2013 Maryland High School Assessment. The subjects assessed consist of reading, mathematics, and science (in grades five and eight only) in elementary and middle schools, and English, algebra and biology in high schools.

percent of the traditional high schools across the state. Because FRPM-eligible students in high schools tend to be undercounted, the FRPM counts in many high schools were quite low. Thus, the sample size of schools with greater than 60 percent FRPM students was too small to include in the analysis reported above.

For the multivariate high school analysis, the school characteristics explained 75 percent of the variation in the composite test scores. Special education percentage, FRMP percentages, square footage per student, total enrollment, and staff salary expenditures per student were all significant predictors of student achievement and were all associated with lower test scores.

Chart 2

Average Percentage of Students Attending Traditional Middle Schools Who Score Proficient and Higher on State Assessments, by School Size

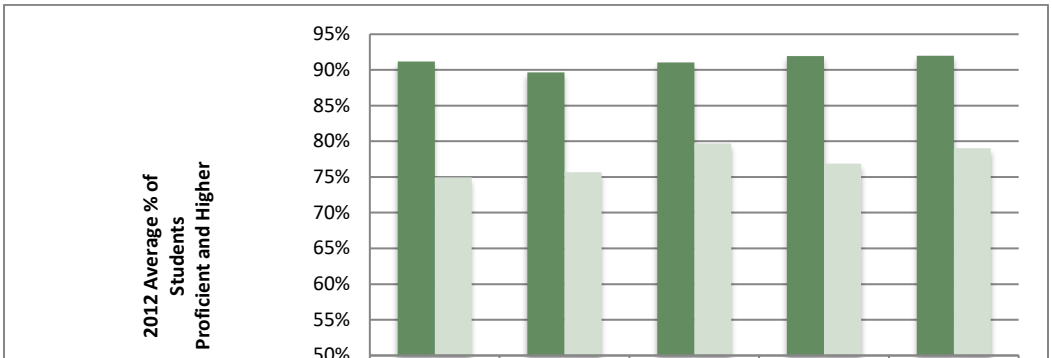


	0-300	301-600	601-900	901-1200	>1201
Average % Proficient and Higher FARM < 60%	79.07%	82.87%	85.24%	86.51%	91.31%
Average % Proficient and Higher FARM >60%	59.11%	58.72%	63.54%	62.92%	73.77%
Number of Schools FARM <60%	1	42	76	30	7
Number of Schools FARM >60%	1	13	26	6	1

Chart 2, above, shows that in the school size categories ranging from 301 to 1,200 students, average middle school performance on the composite state assessment scores increased gradually with larger school sizes. (The number of schools in the zero to 300 student and greater than 1,200 student school size categories are too small to draw any valid conclusions.) This is true both for schools with less than 60 percent FRPM students and for those with greater than 60 percent FRPM. However, average performance peaked in the 601 to 900 student school size category and declined in schools with enrollments between 901 and 1,200 students.

Chart 3

Percentage of Students Attending Traditional Elementary Schools Who Score Proficient and Higher on State Assessments, by School Size



	0-250	251-450	451-650	651-850	>851
Average % Proficient and Higher FARM < 60%	91.16%	89.65%	91.05%	91.93%	92.00%
Average % Proficient and Higher FARM >60%	74.95%	75.68%	79.70%	76.90%	79.03%
Number of Schools FARM =<60%	27	148	188	77	12
Number of Schools FARM >60%	22	118	110	43	7
Number of LEAs	16	23	22	16	8

The Maryland elementary school data in Chart 3, above, show that school size has little impact on achievement, regardless of the level of poverty in a school. This result is in contrast to the apparent performance advantage found in larger middle and somewhat larger high schools. However, average school achievement peaked in schools with greater than 60 percent FRPM students that also had enrollments between 451 and 650 students.

It is important to note that the data presented above represent merely a snapshot in time and not trend data. It is also important to note that the descriptive data presented in the charts shown above show the distribution of schools by the relationship between school size and average school performance on state assessments. However, the charts cannot show the interactions between size, spending, and performance.

It is telling that, at first glance, school size does not appear to be a main driver of student achievement in the traditional schools in Maryland. Also, as noted above in the analysis of school size and cost, the smallest schools, particularly at the middle and high school levels, consist largely of schools designed to provide focused or special programs, which tends to be associated with both higher per student costs and lower levels of performance.

Impacts of School Size on School Climate

Extracurricular Activities Participation

The research related to extracurricular participation (EP) in high school focuses on the correlation between EP and socioeconomic status, academic achievement, self-esteem, and school size. The school size research compares participation at smaller high schools (defined as having enrollments under 800) to participation at larger high schools (defined as having enrollments greater than 1,600). Enrollment size is often associated with other community characteristics that contribute to EP. For example, smaller schools are often located in rural areas, where the high school is the hub of community attention and activity. Research suggests that students in rural areas feel a greater sense of opportunity, even responsibility, to participate in activities like sports or plays. This results in students participating in multiple activities over the course of the school year. Students who attend large, urban high schools often have EP readily available outside of school through other venues, such as parks and recreation programs or competitive youth sports that allow student athletes to specialize in specific sports or other activities, resulting in participation in a narrower range of activities within the high school setting.

Overall, research on the impact of school size on EP has competing findings. Larger schools tend to offer more varied opportunities that include expanded student government and volunteerism choices, enhancing the likelihood that students will be able to find an activity of personal interest (Lay, 2007). Yet Coladarci and Cobb (1996) found that EP was higher among students attending smaller high schools than those attending larger high schools. There is agreement in the research that larger high schools offer a greater variety of activities, which provides greater opportunities for more students to participate. While smaller schools have a narrower range of opportunities, it also is more likely that the students feel encouraged or compelled to participate in multiple, varied activities throughout the school year.

Unfortunately, data on school-level participation in extracurricular activities in Maryland are not readily available. Because both the Maryland Public Schools Secondary School Athletic Association and the Maryland Association of Student Councils track and report student participation by LEA, data are only available on trends in LEA-level participation. For example, according to the annual High School Athletics Participation Survey conducted by the National Federation of State High School Associations, participation in high school athletics in Maryland has steadily increased as a percentage of the student population over the past decade. In the 2013-14 school year, total participation in extracurricular activities was 116,104 students, or 15.4 percent of total high school enrollment. This represents increased participation since the 2004-05 school year, which totaled 100,305 students, or 12.8 percent of total high school enrollment.

Without school-level participation data, however, an analysis of the relationship between school size and participation is not possible.

Teacher and Student Satisfaction and School Climate

Surveys of school staff show that smaller schools tend to cultivate better attitudes towards work among school administrators and teachers, leading to greater staff collaboration and more successful school

improvement efforts (Cotton, 1996; Klonsky, 2006). The likely causes of this effect include the more favorable school climates and deeper personal relationships found in smaller schools (Cotton, 1996). Still, it is difficult to attribute improved teacher satisfaction solely to school size. Often, smaller schools employ other strategies that may also improve educator satisfaction. For example, small schools may use a distributed leadership model and may enjoy greater support from the district office. Both of these factors have been found to have positive impacts on teacher satisfaction and motivation (Rochford, 2005). As noted in the review of literature, teacher satisfaction and connection to students rises when school enrollment decreases.

The feelings and attitudes that are elicited by a school's environment are referred to as school climate (Loukas, 2007). Advocates for smaller learning communities and schools posit that school climates would be more favorable in smaller schools. Research is showing that perceptions of school climate also influence student behavioral and emotional problems. Additionally, researchers have identified several characteristics of smaller schools that may explain their positive effects on student performance. Key among these characteristics is the presence of a supportive school climate. Some smaller schools are found to be more successful at developing personal and informal relationships among school staff, students, and parents than larger schools serving similar student populations. Such relationships lead to improved student engagement and student social behavior, broader participation in extracurricular activities, heightened teacher satisfaction and collaboration, and increased parent involvement (Lee and Loeb, 2000). These positive effects are even more pronounced for low-income and minority students, who tend to have higher attendance rates and lower dropout rates in smaller schools (Carruthers, 1993). A study in North Carolina specifically identified the positive impact of smaller schools on school climate, leading to recommendations for much smaller school sizes to prioritize school climate, and larger school sizes to prioritize operating efficiency (North Carolina Department of Public Instruction, 1998). A 2001 meta-analysis of research on school size notes increased attendance and fewer behavior problems among students attending elementary schools with enrollments under 500 (Rochford, 2005).

Smaller schools tend to have fewer incidences of negative student social behavior than large schools, resulting in greater student engagement and satisfaction, higher attendance rates, and lower dropout rates. Again, the research suggests that ethnic minority and low-income students, in particular, benefit from the supportive school climate that is often present at smaller schools (Cotton, 1996).

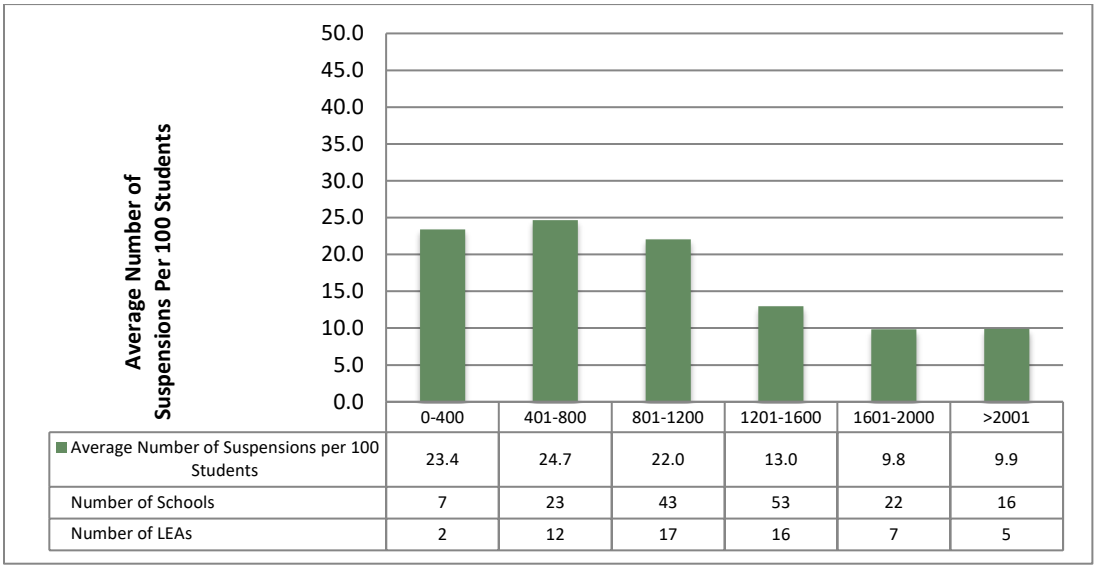
Schools suspensions are a key indicator of school climate. Therefore, to explore the relationship between school size and school climate in Maryland, the study team analyzed school level suspension data provided by MSDE. The study team plotted the combined in-school and out-of-school suspensions by school. In the case of elementary schools and middle schools, the data for schools with FRPM percentages less than and greater than 60 percent are shown separately in the charts below. The horizontal axis of each chart shows the ranges of school sizes with the vertical axis showing the number of suspensions per 100 students for traditional high, middle, and elementary schools.[7]

[7] No experimental studies we conducted for any part of this analysis, therefore all results are correlational and do not support causal claims.

For the three school levels, school size does not appear to be a significant predictor of suspension numbers. Chart 4 shows the number of suspensions per 100 students in Maryland high schools. These data show that suspension rates actually begin to decline as school sizes rise above 1,000 students.

Chart 4

Average Number of Suspensions Per 100 Students Attending Traditional High Schools

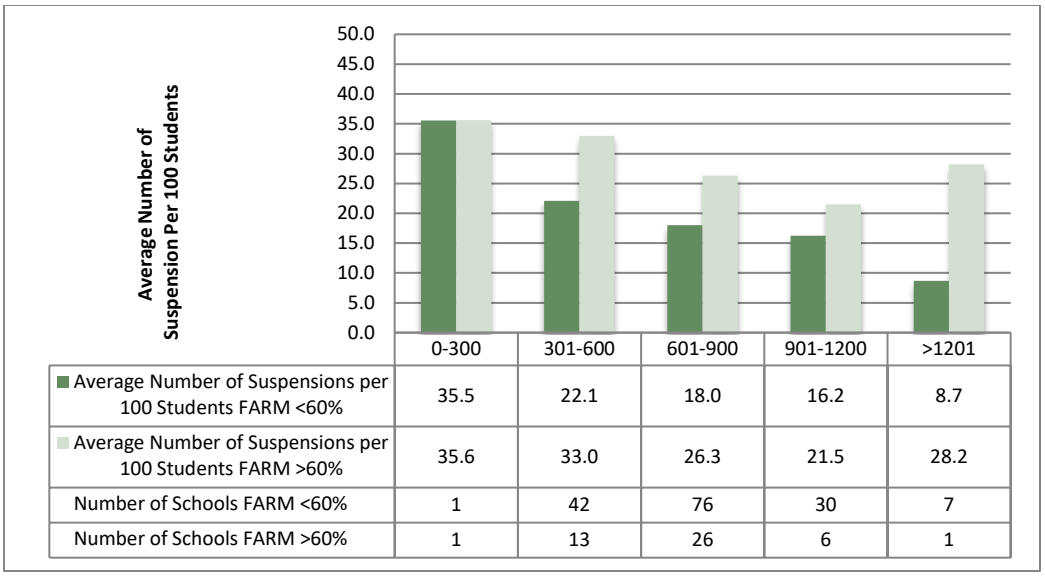


	0-400	401-800	801-1200	1201-1600	1601-2000	>2001
Average Number of Suspensions per 100 Students	23.4	24.7	22.0	13.0	9.8	9.9
Number of Schools	7	23	43	53	22	16
Number of LEAs	2	12	17	16	7	5

Chart 5 shows that the trend toward lower suspension rates in larger schools is less definitive in middle schools, especially in schools with higher concentrations of FRPM students. In middle schools with under 60 percent FRPM students, suspensions per 100 students decrease as school enrollments increase. Large schools (over 1,201 students) with less than 60 percent FRPM students, have only about a quarter of the number of suspensions found in the smallest schools. In those schools with greater than 60 percent FRPM students, the suspension rate declines more gradually than at the lower poverty schools and actually begin to increase as schools become very large (school with more than 1,200 students).

Chart 5

Average Number of Suspension Per 100 Students Attending Traditional Middle Schools

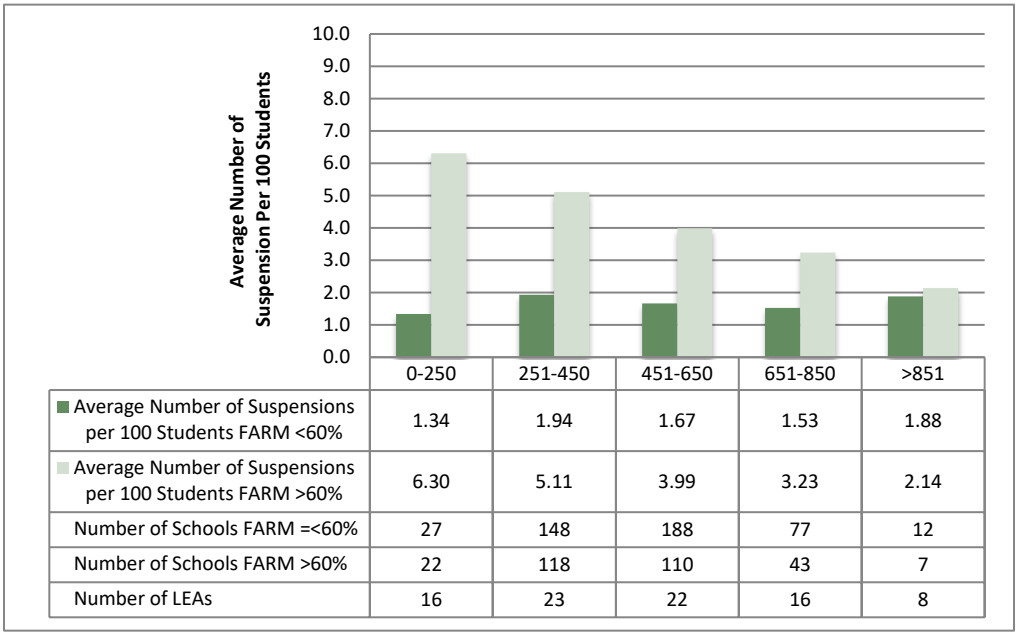


	0-300	301-600	601-900	901-1200	>1201
Average Number of Suspensions per 100 Students FARM <60%	35.5	22.1	18.0	16.2	8.7
Average Number of Suspensions per 100 Students FARM >60%	35.6	33.0	26.3	21.5	28.2
Number of Schools FARM <60%	1	42	76	30	7
Number of Schools FARM >60%	1	13	26	6	1

Chart 6, below, shows the suspension rates for elementary schools. The two sets of bars represent schools with concentrations of FRPM students below 60 percent (the darker-colored bars) and schools with concentrations above 60 percent (the lighter-colored bars). The suspension rates for schools with lower concentrations of FRPM students are fairly consistent across the school size categories but show a slight increase in the largest schools – those with enrollments greater than 850 students. Surprisingly, suspension rates decline in schools with higher concentrations of FRPM students as enrollment increases.

Chart 6

Average Number of Suspensions Per 100 Students Attending Traditional Elementary Schools



	0-250	251-450	451-650	651-850	>851
Average Number of Suspensions per 100 Students FARM <60%	1.34	1.94	1.67	1.53	1.88
Average Number of Suspensions per 100 Students FARM >60%	6.30	5.11	3.99	3.23	2.14
Number of Schools FARM =<60%	27	148	188	77	12
Number of Schools FARM >60%	22	118	110	43	7
Number of LEAs	16	23	22	16	8

List of Successful Schools

Table 4 presents the characteristics of the 111 initial successful schools, which are then listed in Table 5, beginning on the following page.

Table 4
Characteristics of Initial 111 Schools Selected for Successful Schools Adequacy Study

Performance Category	Elementary Schools	Middle Schools	High Schools	Total Schools
Schools by Level	65	29	17	111
Percent by Level	59%	26%	15%	100%
High-Performing	57	25	17	99
High-Growth	8	4	0	12
Average Enrollment	540	804	1,571	636
Average FRPM	18%	15%	9%	14%
Average LEP	8%	2%	1%	4%
Average Special Education	9%	8%	7%	8%

Table 6
Initial Selection of 111 Schools for Successful Schools Adequacy Study

Local School System		School #	School	Selection Category	Selection Criteria	Level
01	Allegany	0702	Bel Air Elementary	High Performance	>=95% P/A	E
02	Anne Arundel	2052	Arnold Elementary	High Performance	>=95% P/A	E
02		3013	Arundel High	High Performance	>=95% P/A	H
02		2072	Benfield Elementary	High Performance	>=95% P/A	E
02		2092	Cape St. Claire Elementary	High Performance	>=95% P/A	E
02		3082	Crofton Woods Elementary	High Performance	>=95% P/A	E
02		4122	Davidsonville Elementary	High Performance	>=95% P/A	E
02		2102	Folger Mckinsey Elementary	High Performance	>=95% P/A	E
02		2152	Jones Elementary	High Performance	>=95% P/A	E
02		2243	Magothy River Middle	High Performance	>=90% P/A	M
02		2413	Severn River Middle	High Performance	>=90% P/A	M
02		2202	Severna Park Elementary	High Performance	>=95% P/A	E
02		2013	Severna Park High	High Performance	>=95% P/A	H
02		2043	Severna Park Middle	High Performance	>=90% P/A	M
02		2432	Shipley's Choice Elementary	High Performance	>=95% P/A	E
02		2372	Windsor Farm Elementary	High Performance	>=95% P/A	E
03	Baltimore County	1001	Carroll Manor Elementary	High Performance	>=95% P/A	E
03		0916	Cromwell Valley Elementary Technology	High Performance	>=95% P/A	E
03		1404	Fullerton Elementary	High Performance	>=95% P/A	E
03		0772	Hereford High	High Performance	>=95% P/A	H
03		0855	Hereford Middle	High Performance	>=90% P/A	M
03		1002	Jacksonville Elementary	High Performance	>=95% P/A	E
03		1104	Kingsville Elementary	High Performance	>=95% P/A	E
03		0803	Lutherville Laboratory	High Performance	>=95% P/A	E
03		0811	Pinewood Elementary	High Performance	>=95% P/A	E
03		0809	Riderwood Elementary	High Performance	>=95% P/A	E
03		0852	Ridgely Middle	High Performance	>=90% P/A	M
03		0907	Rodgers Forge Elementary	High Performance	>=95% P/A	E

Local School System		School #	School	Selection Category	Selection Criteria	Level
03		0701	Seventh District Elementary	High Performance	>=95% P/A	E
03		0905	Stoneleigh Elementary	High Performance	>=95% P/A	E
03		0310	Summit Park Elementary	High Performance	>=95% P/A	E
03		0805	Timonium Elementary	High Performance	>=95% P/A	E
04	Calvert	0217	Huntingtown High School	High Performance	>=95% P/A	H
04		0312	Mount Harmony Elementary	High Performance	>=95% P/A	E
04		0314	Northern High	High Performance	>=95% P/A	H
04		0315	Northern Middle	High Performance	>=90% P/A	M
04		0216	Plum Point Middle	High Performance	>=90% P/A	M
05	Caroline	0802	Colonel Richardson Middle School	High Growth	>40% Growth, >80% P/A 2012	M
06	Carroll	0507	Liberty High	High Performance	>=95% P/A	H
06		0406	Mechanicsville Elementary	High Performance	>=95% P/A	E
06		1306	Mount Airy Middle	High Performance	>=90% P/A	M
06		0508	Oklahoma Road Middle	High Performance	>=90% P/A	M
06		0509	Piney Ridge Elementary	High Performance	>=95% P/A	E
06		0504	Sykesville Middle	High Performance	>=90% P/A	M
10	Frederick	0204	Lincoln Elementary	High Growth	>40% Growth, >80% P/A 2012	E
10		0313	Middletown High	High Performance	>=95% P/A	H
10		0311	Middletown Middle	High Performance	>=90% P/A	M
10		1604	Myersville Elementary	High Performance	>=95% P/A	E
10		0713	Urbana High	High Performance	>=95% P/A	H
10		0716	Urbana Middle	High Performance	>=90% P/A	M
10		0714	Windsor Knolls Middle	High Performance	>=90% P/A	M
12	Harford	0386	Fallston Middle School	High Performance	>=90% P/A	M
13	Howard	0509	Atholton High	High Performance	>=95% P/A	H
13		0406	Bushy Park Elementary	High Performance	>=95% P/A	E
13		0214	Centennial High	High Performance	>=95% P/A	H
13		0210	Centennial Lane Elementary	High Performance	>=95% P/A	E
13		0505	Clarksville Elementary	High Performance	>=95% P/A	E
13		0521	Clarksville Middle	High Performance	>=90% P/A	M
13		0307	Folly Quarter Middle	High Performance	>=90% P/A	M

Local School System		School #	School	Selection Category	Selection Criteria	Level
13		0404	Glenelg High	High Performance	>=95% P/A	H
13		0405	Glenwood Middle	High Performance	>=90% P/A	M
13		0606	Hammond Elementary	High Performance	>=95% P/A	E
13		0203	Howard High	High Performance	>=95% P/A	H
13		0526	Lime Kiln Middle	High Performance	>=90% P/A	M
13		0208	Northfield Elementary	High Performance	>=95% P/A	E
13		0523	Pointers Run Elementary	High Performance	>=95% P/A	E
13		0605	Thunder Hill Elementary	High Performance	>=95% P/A	E
13		0306	Triadelphia Ridge Elementary	High Performance	>=95% P/A	E
13		0215	Waverly Elementary	High Performance	>=95% P/A	E
13		0213	Worthington Elementary	High Performance	>=95% P/A	E
15	Montgomery	0420	Bannockburn Elementary	High Performance	>=95% P/A	E
15		0607	Bells Mill Elementary	High Performance	>=95% P/A	E
15		0333	Benjamin Banneker Middle	High Growth	>40% Growth, >80% P/A 2012	M
15		0226	Beverly Farms Elementary	High Performance	>=95% P/A	E
15		0410	Bradley Hills Elementary	High Performance	>=95% P/A	E
15		0606	Cabin John Middle School	High Performance	>=90% P/A	M
15		0604	Carderock Springs Elementary	High Performance	>=95% P/A	E
15		0511	Cashell Elementary	High Performance	>=95% P/A	E
15		0351	Darnestown Elementary	High Performance	>=95% P/A	E
15		0209	Lakewood Elementary	High Performance	>=95% P/A	E
15		0413	North Bethesda Middle	High Performance	>=90% P/A	M
15		0812	Parkland Middle	High Growth	>40% Growth, >80% P/A 2012	M
15		0601	Potomac Elementary	High Performance	>=95% P/A	E
15		0237	Robert Frost Middle School	High Performance	>=90% P/A	M
15		0603	Seven Locks Elementary	High Performance	>=95% P/A	E
15		0405	Somerset Elementary	High Performance	>=95% P/A	E
15		0653	Stone Mill Elementary	High Performance	>=95% P/A	E
15		0234	Thomas S. Wootton High	High Performance	>=95% P/A	H
15		0428	Thomas W. Pyle Middle School	High Performance	>=90% P/A	M
15		0216	Travilah Elementary	High Performance	>=95% P/A	E

Local School System		School #	School	Selection Category	Selection Criteria	Level
15		0427	Walt Whitman High	High Performance	>=95% P/A	H
15		0424	Walter Johnson High	High Performance	>=95% P/A	H
15		0235	Wayside Elementary	High Performance	>=95% P/A	E
15		0408	Westbrook Elementary	High Performance	>=95% P/A	E
15		0412	Westland Middle	High Performance	>=90% P/A	M
15		0602	Winston Churchill High	High Performance	>=95% P/A	H
15		0422	Wyngate Elementary	High Performance	>=95% P/A	E
16	Prince George's	1709	Chillum Elementary	High Growth	>40% Growth, >80% P/A 2012	E
16		1725	Cool Spring Elementary	High Growth	>40% Growth, >80% P/A 2012	E
16		1214	Glassmanor Elementary	High Growth	>40% Growth, >80% P/A 2012	E
16		1408	Glenn Dale Elementary	High Growth	>40% Growth, >80% P/A 2012	E
16		1712	Lewisdale Elementary	High Growth	>40% Growth, >80% P/A 2012	E
16		2007	Woodridge Elementary	High Growth	>40% Growth, >80% P/A 2012	E
18	Saint Mary's	0806	Town Creek Elementary	High Performance	>=95% P/A	E
19	Somerset	1303	Somerset 6/7 Intermediate School	High Growth	>40% Growth, >80% P/A 2012	M
21	Washington	0403	Clear Spring High	High Performance	>=95% P/A	H
21		0704	Smithsburg Middle	High Performance	>=90% P/A	M
23	Worcester	1001	Ocean City Elementary	High Performance	>=95% P/A	E
23		0312	Showell Elementary	High Performance	>=95% P/A	E
23		0308	Stephen Decatur Middle	High Performance	>=90% P/A	M
30	Baltimore City	0023	Wolfe Street Academy	High Growth	>40% Growth, >80% P/A 2012	E