ABSTRACT

Title of Document: PREDICTING PROFICIENCY ON A STATE ASSESSMENT USING PRIOR PERFORMANCE FOR RACIAL AND ECONOMIC SUBGROUPS

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The study considers the feasibility of using prior performance to identify students at risk of failure as a strategy for reducing the achievement gap in the elementary grades in a large metropolitan school district. More specifically, the study examines the relationship between student performance on a 2nd grade Comprehensive Test of Basic Skills (CTBS/5) and student proficiency status for the Maryland School Assessments (MSA) in mathematics and reading in the 3rd, 4th, and 5th grades. The nature of the racial and poverty gaps are that White students and economically advantaged students score consistently higher than Black students and economically disadvantaged students on the MSA, though differences in achievement are largely explained by whether individual students and their peers participate in the school's free-and reduced-price meals service (FARMS). Different analytic and policy-relevant methods for examining the magnitude of the gap and the district's progress towards reducing the gap are considered as part of the study. Analyses with logistic regression show that prior performance in the 2^{nd} grade is positively related to proficiency in reading and mathematics in the middle and later elementary grades, though the strength of the relationship is stronger in reading and declines in later grades. There are indications of an interaction between prior achievement, race, and especially FARMS status, with prior achievement becoming less important and FARMS status becoming more important in predicting proficiency in later grades. The feasibility of using these models to identify students at risk of failing to attain proficiency in later grades is discussed along with a set of recommendations for policymakers and school leaders.

PREDICTING PROFICIENCY ON A STATE ASSESSMENT USING PRIOR PERFORMANCE FOR RACIAL AND ECONOMIC SUBGROUPS

By

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CHAPTER I

INTRODUCTION

This introductory chapter presents the purpose of the study, the background, the significance, and the statement of the problem. The chapter then sets forth a research model that guides the study. Subsequent sections include the research questions, limitations of the study, and the definition of terms.

Purpose of the Study

The central purpose of this study is to consider the feasibility of using prior performance to identify students at risk of failure as a strategy for reducing the achievement gap in early elementary grades. The feasibility of such a strategy depends on the extent to which early assessments accurately predict accomplishing proficiency in later grades for different subgroups of students, particularly those subgroups of students who are historically disadvantaged. To accomplish this purpose, I examine the relationship between 2nd grade assessments of learning in mathematics and reading and students' performance on the Maryland School Assessment (MSA) in the 3rd, 4th, and 5th grades. Using assessment data from a large metropolitan school district, I examine the achievement gap and consider the probability of identifying students at risk of future failures on MSA using 2nd grade assessment data.

The school district that I have selected reflects the demographic transitions taking place in the nation as well as the educational and social challenges associated with these changes. It also appears to be fairly representative of the student population in the state of Maryland. The school district is neither a highly segregated inner-city school district nor a highly segregated suburban school district, though some racially isolated schools do exist within the school district boundaries. Some schools within the school district have been identified as having exemplary levels of school performance, while others have been identified as having failed to make adequate yearly progress (AYP).

In January of 2002 with the passage of No Child Left Behind Act of 2001 (NCLB), states were required to develop content standards in reading and mathematics that are linked to tests in grades 3 through 8 (Public Law 107-110). It is most important that school districts can identify early students who do not have the skills and knowledge needed to be successful on assessments. The findings of this study may have implications for early identification and interventions in schools which may help decrease the student achievement gap for disadvantaged students and thus enhance school capacity to meet the high-stakes requirements of NCLB.

Background

A more diverse school population in the United States requires greater efforts to provide a high-quality public education for all elementary and secondary students (Coleman et al., 1966; Jencks & Phillips, 1998; Lee & Burkam, 2002; National Center for Education Statistics, 2003; O'Day & Smith, 1993; Williams, 1996). In 2003, of the approximately 47 million school age (kindergarten-12) children attending public schools, 58% were White, 19% Hispanic, 16% Black, 4% Asian, and 3% Other (U.S. Census Bureau 2003). With the growth of these populations comes the challenge of promoting achievement gains for populations of students that public education has historically underserved.

Since 1972, minority public school enrollment has increased from 22% to 42%. The fastest growing minority group is Hispanic students. Enrollment has increased from

6% to 19%, as the percentage of White students has decreased from 78% to 58%. Black student enrollment has remained relatively stable at 16% (National Center for Education Statistics, 2005). The distribution of minority students in public schools differs by region. In the West minority public school enrollment (54%) exceeds White enrollment (46%). The South (25%), Northeast (16%), and Midwest (14%) have more Blacks enrolled in public school education than the West (5%), which has more Hispanic students (36%) enrolled in public schools (National Center for Education Statistics, 2005).

The ability of public education to provide a high-quality education to all students is of national concern. Despite years of educational reform efforts, poor and minority[1] children continue to underachieve academically (National Center for Education Statistics, 2004; O'Day & Smith, 1993). Disparity in educational performance persists at all achievement levels between Blacks, Hispanics, American Indian, and White and Asians students and, as well, between students from economically advantaged and disadvantaged homes. This disparity in academic achievement or performance between groups of students is commonly known as the "achievement gap". The achievement gap[2] shows up in standardized test scores, retention rates, dropout rates, higher education entrance and completion, and later in job earnings (Jencks & Phillips, 1998). It has become a focal point of education reform efforts.

The Black-White achievement gap has been documented since at least the 1960s. The National Center for Education Statistics (2004), longitudinal results from the National Assessment of Educational Progress (NAEP), indicated that some progress was made in reducing the Black-White achievement gap between the 1970s and the early and mid-1980s. By the late 1980s, however, progress had stalled. Despite decades of attention, the gap in student performance between historically advantaged and disadvantaged students remains a pressing problem.

In particular, disturbing numbers of Black students in the U.S. continue to achieve academically below White students (Borman, Stringfield, & Rachuba, 2000; Kozol, 1992; National Center for Education Statistics, 2004). There are substantial differences for Blacks and Whites in children's test scores as they begin kindergarten (Lee & Burkam, 2002). Even when Black students start elementary school with the same test scores, substantial proportions of Black students fall behind their White peers by the time they reach the twelfth grade (Phillips, Crouse, & Ralph, 1998). Blacks currently score lower than White students on vocabulary, reading, and mathematics tests, as well as on tests that claim to measure scholastic aptitude and intelligence (Jencks & Phillips, 1998).

Even more discouraging, this gap has disturbing consequences for both post-secondary education and employment (Jencks, 1992; Ogbu, 1994; Phillips & Jencks, 1998). Proportionally fewer Black students take the SATs, suggesting that the achievement gap may pose barriers to Black students in their access to post-secondary education (Kane, 1998). Moreover, because Black students who do take the SATs have lower grade point averages and SAT scores than White students (Vars & Bowen 1998); the achievement gap may also pose barriers to Black students in their access to high-quality post-secondary institutions. For those Black students who do not continue with post-secondary education, the achievement gap impacts wages and earnings. Black adults, particularly men enter the labor market with fewer basic skills than White adult men**.** The gap in basic pre-market skills remains a prominent cause of the inequality in Black-White earnings (Johnson & Neal 1998).

The Black-White achievement gap is confounded by disparities in the economic resources that families and communities can direct toward the education of children. Coleman and his colleagues, in their ground-breaking 1966 *Equality of Educational Opportunity Report*, documented the effects of economic advantage and disadvantage on the achievement of Black and White children. Advantaged homes are better able to "pass on" their advantages to their children through publicly supported and privately supported educational opportunities. Higher income families tend to have and devote more resources to their children's education (Lareau, 2000; Lee & Burkam, 2002). Growing up poor often means, having fewer educational resources in the home, as well as less advantageous educational opportunities at school. In 2003, the National Center for Children in Poverty at Columbia University, reported that these challenges are especially acute for Black and Hispanic children as higher proportions of the poor children are Black (34%) or Hispanic (28%).

Federal Role. On January 8, 2003, President George Bush signed into law the Elementary and Secondary Education Act of 2001 known as "No Child Left Behind" or "NCLB". At the center of NCLB is Title I, which ties federal aid to a series of high-stakes accountability requirements. The Title I Grant Program provides funds to school districts to supplement state and local education funding for low-income families. This program contains requirements aimed at improving the academic achievement of disadvantaged children. Congress has authorized that non-compliance with NCLB provisions can result in lost federal funding (McColl, 2005). Thus, NCLB is a nationwide high-stakes accountability system.

The goal for NCLB is for all children to meet high standards demonstrated by proficiency in reading and mathematics by 2014. The overall focus of NCLB is on raising achievement standards and promoting greater accountability for all student learning. States must demonstrate not only overall achievement gains by making adequate yearly progress (AYP) toward achievement goals, but they must also demonstrate reductions in the gap between Black and White students' test scores, as well as reductions in the gap between the test scores of other historically advantaged and disadvantaged student populations (e.g., students from low-income households, language minority students, and students with disabilities). NCLB requires states to disaggregate student achievement data by various subgroups of students, including racial and economic subgroups, so that performance gains can be tracked.

The reauthorization of the Elementary and Secondary Education Act or NCLB has placed closing the achievement gap on the national agenda. NCLB's intent is to close "the achievement gap between high- and low-performing children, especially the achievements gaps between minority and non-minority students, and between economically disadvantaged children and their more economically advantaged peers" (NCLB, 2001, Sec.1001 [3]). With the reauthorization of NCLB comes increased responsibility for states and local school districts to close the achievement gap.

State Role. In order to receive federal funding under NCLB accountability standards, all states are required to develop and receive federal approval of plans to implement their requests. Maryland's accountability plan was approved by the U.S. Department of

Education in April 2003. As part of its obligation, Maryland developed an accountability system with established measures of performance (basic, proficient, and advanced) against which yearly results can be compared. Maryland's goal, as required by NCLB is that by 2014 all students will be proficient in reading and mathematics.

Maryland sets annual measurable objectives for overall and subgroup performance and requires schools and school districts to show that students are making AYP by accomplishing these objectives. Student achievement is measured at the aggregate level and also for eight subgroups of students: five racial/ethnic groups (African American, American Indian, Asian/Pacific Islander, Hispanic, and White), students with English as a second language, students receiving special education services, and economically disadvantaged students. The state also established confidence intervals for overall performance and subgroup performance to protect schools from possible yearly measurement errors.

Maryland partnered with Harcourt Assessment Inc. for the development of reading assessments in 3rd-8th grades and with CTB/McGraw-Hill for the development of mathematics assessments in 3rd-8th grades. The combined assessments are known as the Maryland School Assessment or MSA. The assessments measure student mastery of the content standards of the Maryland Voluntary State Curriculum. Standards were established through a structured process that involved discussions with a large number of educators and stakeholders.

MSA is a combination of criterion-referenced tests (CRT) and norm-referenced tests (NRT) in reading and mathematics. CRT measure student performance against specified standards and indicate how well a body of content has been mastered. NRT compares students to a national standard based on a representative sample of all of the students who have been assessed across the country.

Like other states, Maryland is seeking new ways to more effectively raise the performance of historically underachieving groups of students. Although some might argue that closing the achievement gap has been an important policy issue in Maryland for some time, the passage of NCLB "ratchets up" the pressure on the state to do so.

Significance of Reducing the Achievement Gap

Over a decade ago, L. Scott Miller (1995) claimed that the achievement gap is prohibitively costly to the whole nation. Miller, a sociologist, argues the following:

> Among the most compelling reasons for seeking to eliminate this gap as soon as possible are the following: 1) the achievement of significantly higher minority education levels is essential to the long-term productivity and competitiveness of the U.S. economy; 2) if minorities are to enjoy the full benefits of civil rights, they need formal-education-dependent-knowledge and skills much closer in quantity and quality to those held by Whites; and 3) the maintenance of a humane and harmonious society depends to a considerable degree on minorities reaching educational parity with Whites" (p. 4).

Although the achievement gap traditionally has been viewed as an economic problem, Miller also identified civil rights and social harmony as relevant policy concerns. Because race and income are so tightly intertwined in this country, much of what Miller asserts about race also has implications for eliminating the educational gap between students who come from economically advantaged and disadvantaged households.

Economic Significance. Many educators, researchers, and policymakers agree that education is strongly tied to the economy's performance through the productivity of its workforce (Ferguson, 2004; Murnane & Levy 1996). A *Nation at Risk* (1983) is best known as the national "wake up call" for the concern that low levels of achievement threaten the economic well being of the U. S. The National Commission on Excellence in Education warned the American people of a "rising tide of mediocrity" in American schools. The Commission argued that American students had alarmingly lower levels of achievement compared to students from other industrialized nations. They called for a nationwide movement to achieve "educational excellence" in American schools so as to guarantee U.S. competitiveness in increasingly global economic markets.

In April 1998, the Commission released a second education manifesto, *A Nation Still at Risk*. The report emphasized the lack of progress and said that "we were failing our youth" in U.S. schools. The report acknowledged the educational performance gaps between historically advantaged and disadvantaged groups of students and identified equal educational opportunity as not only a pressing economic issue but also as the next civil rights issue.

Over twenty years after the first "wake up call" issued by the authors of a *Nation at Risk*, low levels of achievement in American schools are still seen as a condition that threatens the productivity and competitiveness of the U.S. economy (National Center for Education Statistics, 2003). But there is also a growing recognition that ensuring U.S. competitiveness requires not only higher levels of achievement but reducing the achievement gap between historically advantaged and disadvantaged groups of students (National Center for Education Statistics, 2005).

In 2003, 42% of the total public school enrollment came from a minority household (U.S. Census Bureau, 2003). The U.S. Census Bureau predicts that by the year 2060 Whites will be outnumbered by nonwhites in the total population, with the majority of elementary and secondary school students coming from racial/ethnic minority households. The importance of education to a nation's economic well-being coupled with the existence of large numbers of minority youth who are not doing well academically suggest that the U.S. has a compelling interest in accelerating the educational advancement of minority youth (Borman, Stringfield, & Rachuba, 2000; McCollum & Walker, 1992; Miller, 1995; Natriello, McDill, & Pallas 1990).

Civil Rights Significance. Although there has been substantial progress in gaining civil rights for people of color, inequalities still exist. Ogbu (1994) argues that the civil rights movement of the 1960s did not improve the opportunity structure for all segments of the Black community. He believes rather that college-educated and middle-class Blacks benefited through "a sponsored social mobility," while lower-class Blacks, and inner-city Blacks were largely ignored by the Civil Rights Movement. He does not believe that the Civil Rights Movement ushered in an era of "color-blind labor-market forces". Banks (2000) agrees that the Civil Rights Movement is unfinished and argues that education systems continue to privilege certain groups of citizens rather than promote the educational capacity of all of its citizens.

Although civil rights are embodied in the Bill of Rights, before the Civil Rights Movement and the resulting Civil Rights Act of 1964, few Blacks could realistically expect to have the same societal and educational opportunities as Whites. However, forty years later, and despite substantial state and federal civil rights legislation, Blacks are still far from being equal beneficiaries of publicly funded social and educational services. Blacks continue to lag behind Whites in educational attainment, a factor that limits their social mobility and economic prosperity. In 2003, of the 16.6 million students enrolled in graduate and undergraduate schools, 68% were White, 13 % Black, and 10% Hispanic (U.S. Census Bureau, Current Population Survey, October, 2003).

Miller (1995) describes a strong link between educational performance and the capacity of minority groups to climb all rungs of the nation's intergenerational advancement ladder. Historically, groups with little formal education have had difficulty acquiring substantial amounts of human capital – that is, knowledge and skills that translate into desirable jobs and employment opportunities. The problem has been most difficult for Blacks. "As long as this is the case," Miller argues, "the dream of civil rights leaders for an America in which minorities can participate on an equal basis with the White majority in all realms of society will be difficult to realize fully" (p.11). In other words, the full realization of the Civil Rights Movement requires a more equitable distribution of educational opportunities and benefits.

Better educated adults report themselves to be in better health, regardless of income; young adults with higher levels of education earn more than their peers with less education; and adults with college degrees are much more likely to read newspapers, magazines, and books than adults without a high school diploma. In addition, students are more likely to enroll in postsecondary education if their parents have a college education (National Center for Education Statistics, 2001). Well-educated parents are often able to provide more advantages for their children such as reading extensively to their children, hiring tutors, and assessing college preparatory classes (Lareau, 2000). By reducing disparities in educational achievement and attainment, Miller argues, federal, state, and local policies can further civil rights in the country and substantially improve the well-being of minority families.

Social Harmony Significance. Miller predicts that the longer the achievement gap persists, the more disheartened and frustrated nonwhites are likely to become with not only schools but also other U.S. institutions. In American society today, better education is needed for higher paying jobs. Higher paying jobs provide more money and access for goods and services. When minority groups are denied access to those goods and services that a dominant group possesses, it increases social tension and the potential for racial conflict.

One indication of the potential for racial conflict is the earnings gap. Historically, Blacks and Hispanics have been paid less than Whites for their work. For example, in 2003, White workers (ages 25-29) had a median income of $35,400 while Black workers' median income was $28,600, and Hispanic workers' median income was $26,500 (National Center for Education Statistics, 2005). Without greater and more sustained progress in achieving economic equality between Blacks and Whites, Miller fears that economic injustice could fuel future racial conflicts and social disharmony.

Ferguson (2004) expresses concerns similar to those expressed by Miller – namely, that achievement disparities among today's students foreshadow socioeconomic disparities among tomorrow's families. He believes that large socioeconomic disparities among families are morally objectionable and politically dangerous for the future of society. In *An Unfinished Journey: The Legacy of Brown and the Narrowing of the Achievement Gap*, Ferguson concludes "It seems clear that the nation's future depends fundamentally on the degree to which schools and communities can raise skill levels among children of all racial, ethnic, and socio-economic backgrounds" (p. 669).

Statement of the Problem

No Child Left Behind requires that all children reach proficiency in reading and mathematics by 2014. Regardless of race or socioeconomic status, students are held to the same academic expectations and their academic progress is measured against state-specified standards, and reported by subgroups to demonstrate adequate yearly progress.

The most pressing issue in education today is the demand for higher test scores and at the same time a narrowing of the academic achievement gap between historically disadvantaged children and advantaged children. If Maryland children who may not reach proficiency in reading and mathematics on the MSA can be identified early in their schooling, these children can be targeted for additional services and resources.

NCLB has limited funding and has placed even greater pressure on already tight school budgets. Many school districts are faced with large budget deficits. Unequal access to local education revenues is still a problem in most states (Odden, 2003). Using assessment data to identify individual students to determine specific needs might allow school districts to target resources more effectively and efficiently to meet those needs.

Historically, schools have experienced little success in closing the achievement gap. With school district and school accountability beginning as early as the 3rd grade, identifying students early who do not have the skills and knowledge needed to be successful on assessments can help to narrow the "achievement gap".

By studying the relationship of students' prior performance on a commonly available 2nd grade assessment, and later performance on the state's MSA in 3rd, 4th, and

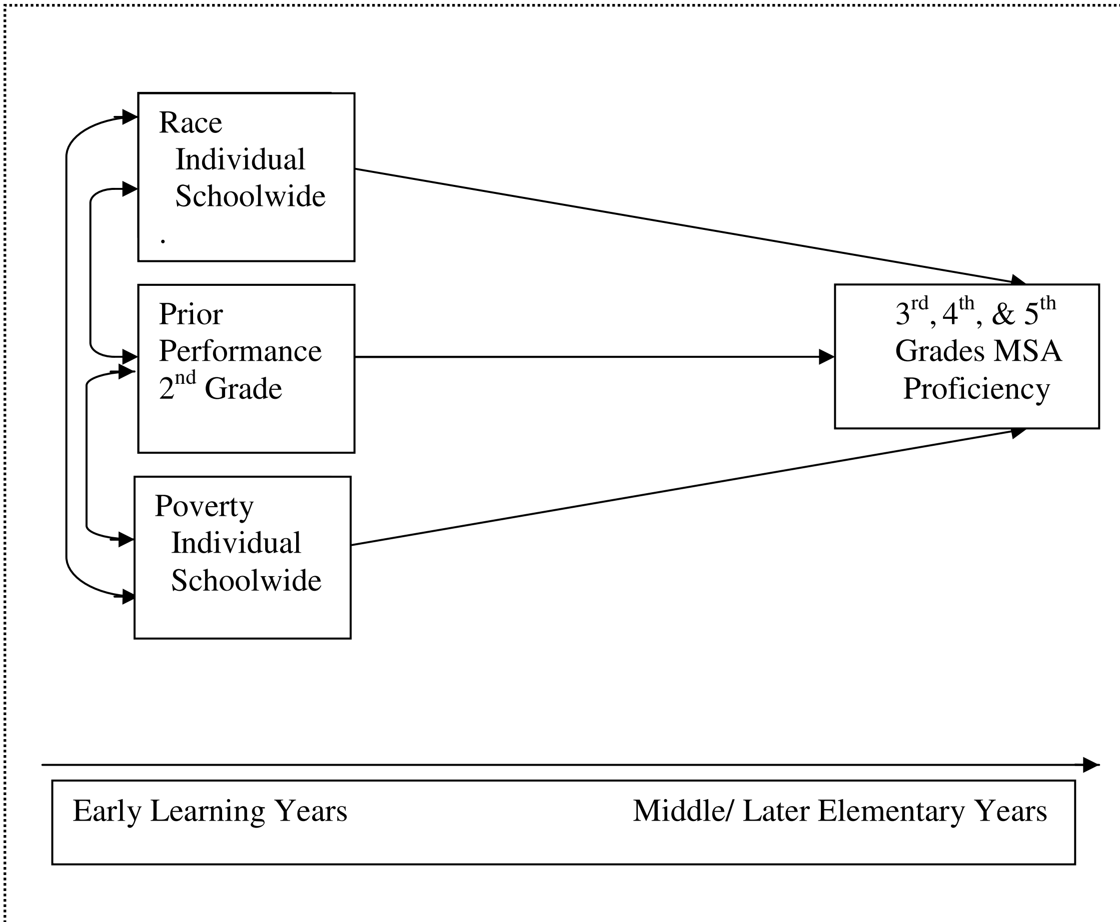
5^{th} grades, it may be possible to identify early Black, White, poor, and non-poor students with a high probability of failure on the MSA. Students can be then more effectively and efficiently targeted for intervention. Thus, early identification and intervention may enhance state and local capacity to meet the ambitious achievement goals as set by NCLB.

Research Model

Figure 1.1 displays graphically the research model that addresses the research problem. The model uses demographic variables for race and poverty and a variable for student's prior achievement. In this study, race is defined as Black or White students, as these two groups comprise over 90% of the population in the selected school district. Under federal guidelines (U.S. Department of Education, 2002), poverty or low-income status is usually determined by whether a student is eligible for free or reduced-price meals (FARMS). Prior achievement is defined as 2^{nd} grade performance in reading and mathematics.

Although Figure 1.1 displays three categories of independent variables, race (individual and schoolwide), prior achievement, and poverty (individual and schoolwide), it is expected that these factors interact or are related to each other, as represented by the solid arrows connecting the boxes on the left hand side of the figure. The dependent or outcome variables are students' proficiency on 3^{rd}, 4^{th}, and 5^{th} MSA. The continuous arrow at the bottom indicates the underlying relationship between early learning years' achievement and subsequent middle/later-elementary years' achievement.

Figure1.1 Prior performance prediction model for MSA proficiency in 3rd, 4th, and 5th grades



Research Questions

This research model intends to answer the following research questions.

- What is the achievement gap between Black and White students in the 2nd grade? What is the achievement gap between economically advantaged and disadvantaged students in the 2nd grade? How do these achievement gaps change over time as students progress through the 3rd, 4th, and 5th grades?

- Can student performance on the CTBS/5 in the 2nd grade predict student proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics? Are there differences between White and Black students or economically advantaged and disadvantaged students in how well student performance on the CTBS/5 in the 2nd grade predicts their proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics?

Limitations of the Study

The primary limitations to the study are that the data set involves a single school district, in a single state, and performance data for only one cohort of students across four years. These limitations restrict the potential generalizability of results, even within the research site. Also, changes within the school district, particularly regarding new programs and practices implemented in response to MSA and NCLB, may influence both the scope of the achievement gap, as well as the estimates of the probability of attaining proficiency in later grades, particularly for specific subgroups of students. Nonetheless, these data provide an opportunity to examine the scope of the achievement gap as well as the feasibility of using prior achievement as a basis for predicting the gap in future grades and as a basis for identifying specific subgroups of students for earlier interventions. Moreover, the size and the population of the school district make it a potentially informative case in which to conduct the study.

Free or Reduced Price Meals (FARMS) are the only socioeconomic (SES) data collected and maintained in the school district. Although FARMS is an acceptable proxy for poverty, there are many other documented SES factors affecting student achievement such as income, parental education, family educational expectations, access to quality child care, and home reading. On the other hand, it is precisely this measure, FARMS that most school districts use when disaggregating data to examine the achievement gap between economically advantaged and disadvantaged students.

Although a major strength of the study is that the data used in these analyses represent the types of data used by school districts to meet the requirements of NCLB and monitor student achievement, these data are not available for 1st grade students. If 1^{st} grade assessments can predict proficiency in higher grades, it would allow for an even earlier identification and intervention than is considered in this study.

Definition of Terms

The definitions set forth below are used in this study:

- Achievement Gap - disparity in academic achievement or performance between groups of students.
- Adequate Yearly Progress (AYP) - as part of the federal requirements of NCLB, schools, school districts, and states must make gains each year – 3^{rd}-8^{th} grades, in the proportion of students achieving proficiency in reading and mathematics.
- Comprehensive Tests of Basic Skills (CTBS/5) - a standardized achievement test that compares the child’s performance with the performance of other children across the country in the same grades.
- Criterion-referenced Test (CRT) - a test whose scores are interpreted by comparison to specifically defined performance standards rather than by comparison to some comparable group of people.

- Free or Reduced Price Meals (FARMS) - a NCLB subgroup used as poverty indicator for students whose applications meet family size and income guidelines of the U.S. Department of Agriculture.
- Maryland School Assessment (MSA) - Maryland's state assessment that was introduced in the spring of 2003 to meet the federal requirements of NCLB. Students are assessed in reading and mathematics in 3rd-8th grades.
- Maryland Standards - measures of performance against which yearly results are compared.

  Advanced - a highly challenging and exemplary level of achievement indicating outstanding accomplishment in meeting the needs of students.

  Proficient - a realistic and rigorous level of achievement indicating proficiency in meeting the needs of students.

  Basic - a level of achievement indicating that more work is needed to attain proficiency in meeting the needs of students.

- No Child Left Behind (NCLB) - the Elementary and Secondary Education Act of 2001 signed into law on January 8, 2003. The goal for NCLB is for all children to meet high standards demonstrated by proficiency in English language arts and mathematics by 2014.
- Norm-referenced Test (NRT) - a test designed to show where a given student lies in comparison to a group of peers, usually a national norm.
- School Readiness - upon school entry, skills and resources that children possess from early childhood experiences that prepare them for school success.

- Title I Grant Program - federal government grants provided to school districts to supplement state and local education funding for low-income families. This program provides extra academic support and learning opportunities for disadvantaged students.

Endnotes

[1]Minority has been traditionally defined as non-white in educational reports and research. In more recent reports and research, Asian students are usually not included as they are not seen as an at risk student population. Today, minority generally refers to Blacks and Hispanics as they comprise the two largest groups of minorities. In reviewing the literature, it is often unclear whether minority refers to non-whites or some other racial/ethnic designation. When possible I have tried to clarify these distinctions in the text.

[2] The achievement gap in the literature is referred to as the minority achievement gap, Black-White achievement gap, Black-White test-score gap, and performance gap. It is used interchangeably and/or inconsistently across studies. The focus of this study is on Black and White students, and poor and non-poor students.

CHAPTER II

REVIEW OF THE LITERATURE

The intent of this chapter is to provide insight into the achievement gap by providing data as to the size of the gap (both nationally and in Maryland), theories regarding the causes of the gap, in particular differences in school readiness, and a brief discussion of intervention and early identification strategies that have been used to identify at risk students during the early learning years. For the purpose of this study, I organize the research into three major categories: national v. Maryland achievement gap, theories of racial and economic achievement gaps, early intervention and early identification. These categories are neither exclusive nor exhaustive, but they do capture the breadth of the research on the achievement gap and provide a broader policy context for the study.

National v. Maryland Achievement Gap

Evidence of a persistent national achievement gap is apparent in *The Nation's Report Card 2003*. The report presents longitudinal results of national assessments in reading and mathematics conducted by the National Assessment of Educational Progress (NAEP)[1].

National Achievement Gap. *The Nation's Report Card*, state that the overall trend in reading from 1992 to 2003 was relatively "flat".[2] Although there was a small improvement in average 8th grade scores (a 3 point gain), there was no significant change in 4th grade average reading scale scores (a 1 point gain) over this time period. The trend for Black students in 4th grade and 8th grade average reading scale scores was generally more positive, gains of 6 and 7 points respectively; as was the trend for students eligible for FARMS between 1998 and 2003 (the time period for which NAEP has collected information about the FARMS status of students), in 4th grade and 8th grade, gains of 5 and 6 points respectively. The achievement gap, though diminished slightly by the achievement gains of Blacks, was still substantial in 2003. Black 4th grade students and Black 8th grade students scored 31 points and 28 points below the scores of their White counterparts, while FARMS 4th grade and 8th grade students scored 28 points and 24 points below Non-FARMS students (see Table 2.1). There was no statistically significant change in the reading achievement gap for Black and White students and FARMS students and their more advantaged peers during the time period covered by *The Nation's Report Card*. [3]

Table 2.1

NAEP Average Reading Scale Scores in 2003

	Grade 4	Grade 8
All Students	218	263
Black Students	198	244
White Students	229	272
Racial Gap	**31**	**28**
FARMS	201	247
Non-FARMS	229	271
Poverty Gap	**28**	**24**

The Nation's Report Card, states that there were greater overall gains in mathematics than in reading with 4th grade students recording gains of 22 points and 8th grade students recording gains of 15 points from 1990 to 2003.[4] The trend in Black 4th grade and 8th grade average mathematics scale scores was similar with gains of 28 and 15 points respectively. However, there was no improvement in the gap between Black and White students between 1990 and 2003. Black 4th grade students still scored 27 points below their White counterparts, and Black 8th grade students score 36 points below their White counterparts (see Table 2.2). For students in 4th and 8th grades who were eligible for FARMS, *the Nation's Report Card* states gains of 15 and 9 points respectively between 1998 and 2003. The 4th grade gap and 8th grade gap stayed roughly the same during this time period. Overall, 4th grade Non-FARMS students scored 22 points higher than FARMS students, while 8th grade Non-FARMS students scored 28 points higher than their less advantaged peers (see Table 2.2).

Table 2.2

NAEP Average Mathematics Scale Scores in 2003

	Grade 4	Grade 8
All Students	235	278
Black Students	216	252
White Students	243	288
Racial Gap	**27**	**36**
FARMS	222	259
Non-FARMS	244	287
Poverty Gap	**22**	**28**

Maryland Achievement Gap. Although NAEP was originally meant to provide information primarily about national trends, more recent assessments provide portraits of achievement for individual states. In 2003, Maryland's average 4th grade and 8th grade reading scale scores were very similar to the average reading scale scores for the nation's public schools, the difference in average scale scores was 1 point. Maryland's Black and low-income students, however, also scored substantially below their White and more advantaged peers.

In 2003, Maryland's gap in reading achievement was very similar to the national gap in reading achievement. Black 4th grade students had an average scale score that was 31 points below the average scale score for White students, while Black 8th grade students had an average scale score 26 points below their White counterparts (see Table 2.3). The average reading scale score for 4th grade FARMS students was 31 points below the average scale score for Non-FARMS students, and the average scale score for 8th grade FARMS students was 26 points below the average for their more advantaged peers. In no instance, does the reported gap for Maryland students differ from the gap for the nation's students by more than 3 points.

Table 2.3

Maryland NAEP Average Reading Scale Scores in 2003

	Grade 4	Grade 8
All Students	219	262
Black Students	200	245
White Students	231	271
Racial Gap	**31**	**26**
FARMS	199	242
Non-FARMS	230	268
Poverty Gap	**31**	**26**

The picture of overall achievement and the achievement gap in mathematics is similar to the picture in reading. In 2003, Maryland's average 4th grade and 8th grade mathematics scale scores were essentially the same as the average scale scores for the nation's public schools, differences in scores being 2 points or less. Black students in the 4th grade had an average mathematics scale score 28 points below their White counterparts while Black students in the 8th grade had an average scale score 33 points below their White peers (see Table 2.4). The average scale score for 4th grade FARMS students was 28 points below the average scale score for Non-FARMS students, whereas the average scale score for 8th grade FARMS students was 30 points below their more advantaged peers. Although there is a smaller gap at the 8th grade for Maryland's FARMS and non-FARMS students (a difference of 6 points), all of the remaining gaps are within 3 points of the achievement gap for students nationwide.

Table 2.4

Maryland NAEP Average Mathematics Scale Scores in 2003

	Grade 4	Grade 8
All Students	233	278
Black Students	216	256
White Students	244	289
Racial Gap	**28**	**33**
FARMS	216	255
Non-FARMS	244	285
Poverty Gap	**28**	**30**

Maryland's NAEP reading and mathematics results generally mirror those of the nation. With the possible exception of the gap in mathematics between Maryland's 8^{th} grade FARMS and non-FARMS students, differences in achievement are comparable to those reported by NAEP for the nation.

Theories about Racial and Economic Achievement Gaps

Theories that have sought to explain economic and racial achievement gaps arose out of diverse perspectives and political interests. Although there is no consensus regarding why achievement gaps between specific populations of students occur, theories have centered on supposed biological differences, differences in family resources, differences in cultural expectations, and differences in the educational opportunities afforded children.

Biological Theories. Biological determinism holds that shared behavioral norms, as well as, the social and economic differences between groups (primarily races, classes, and sexes) arise from inherited and inborn distinctions. Supporters of this theory believe that race and intelligence have genetic components that lead to different outcomes for individuals and groups. These biological differences are thought to exist within and between races and can be categorized hierarchically in terms of ability and learning (Herrnstein & Murray, 1994; Jensen, 1969). Thus, achievement differences reflect differences in ability, and the achievement gap, whether it is between Black and White students or low-income and more advantaged students, is the "inevitable" outcome of genetic diversity.

Jensen, an educational psychologist, began extensive testing of minority school children in the 1960s. In 1969, he published a highly controversial article in the *Harvard Educational Review*, in which he concluded that there were noticeable differences between races in the ability to conceptualize and engage in higher-order forms of thinking. Later, in 1972, he examined studies of 122 identical twins reared together and apart and concluded again that intelligence was primarily inherited rather than influenced by socio-psychological or environmental factors. He found intelligence, as measured by the intelligence quotient or "IQ" tests, to be the chief mitigating factor of children's academic success. He argues that race and IQ are closely related because of the presumed links between race, intelligence, and genetics.

Although Jensen's assertions are strongly contested by educators and others (Daniels, Devlin, & Roeder, 1997; Jencks & Phillips, 1998; Singer & Riff, 1997; Wahlsten, 1997), Herrnstein and Murray (1994) revived his theory of genetic inequality in their book, *The Bell Curve*. Using regression methods, they analyzed data from the National Longitudinal Survey of Youth (NLSY). Hernstein and Murray argue that IQ is the best indicator of student achievement, followed by race and then socio-economic status (SES). Their study supports Jensen's basic argument regarding genetic diversity, the predominant role of heredity over environment, and a presumed link between race and intelligence. Their work clearly offers biological determinism as an explanation for achievement differences.

Biological explanations of the achievement gap are strongly contested (Hedges & Nowell, 1998; Jencks, 1998; Nesbit, 1998; Phillips et al, 1998). Jencks (1998) studied testing and the possibility of racial bias in testing. Jencks claims that standardized testing harms Blacks as a group, because of labeling bias (when tests claim to measure one thing but actually measure something else) and selection bias (when a test is used to predict performance). Jencks does not claim that standardized tests are flawed but instead that they fail to measure other predictors of performance on which Blacks are far less disadvantaged. However, Jencks does say that biological theories are flawed, in part because they rely on standardized testing as indicators of ability.

Nesbit (1998) reviewed five studies typical of those that have been used to assert the heritability of intelligence and explain differences between Blacks and Whites in cognitive outcomes. Three of the studies focused on the genetic heritage of race. Methods assessed skin color and facial features, examined blood groups, and asked about the activities of parents and grandparents. The other two studies were those of mixed-race children. Methods assessed hereditary outcomes for mixed-race and single-race children. Nesbit concludes that these studies provide no evidence for the genetic superiority of either race, but provide strong evidence for substantial environmental contributions to the IQ gap between Whites and Blacks.

Despite endless speculation regarding the role of heredity versus environment in students' academic outcomes, there is no convincing evidence that intelligence is innately linked to race. Instead, most educators and education researchers identify a range of factors that could conceivably influence student achievement, at least some of which might be influenced by social policies and educational interventions.

Family Resources Theories. The *Equality of Educational Opportunity* or "The Coleman Report" (1966) startled the country with the revelation that the home, not the school was the strongest predictor of school outcomes. Since then, student achievement has been thought to be strongly related to family resources or resource-related characteristics, such as family income, parents' education, parents' occupation, and family size (Coleman, 1966; Jencks & Phillips, 1998; Miller, 1995). Theories that focus on family resources explain the achievement gap as the consequence of differences between families in the resources that they can allocate to their children's education. Although not all of these differences can be affected by social policies, some welfare policies seek to create minimal thresholds for differences in family resources as a way of indirectly affecting the achievement gap (e.g., federally funded free and reduced price lunch programs).

During the 1960s Coleman and colleagues conducted a large-scale survey of roughly 570,000 students, 60,000 teachers, and 4,000 schools. Authorized by the 1964 Civil Rights Act, the study was to document the scope and potential consequences of segregated schooling across the nation, but particularly in the South. The principle findings of the Coleman Report include: 1) variations in standardized test scores among students from different racial groups was strongly associated with variations in home background, particularly as measured by socioeconomic status-related characteristics

(SES) such as education and occupations of parents; 2) the average academic achievement levels for White students was significantly higher than for Black students on standardized achievement tests, and the disparity increased from first to twelfth grade; 3) school characteristics were only modestly related to differences in standardized test scores, but the effects of school differences was somewhat stronger for Black students than White students; 4) variations in the qualifications of teachers were somewhat correlated with group differences in test scores; 5) variations in school and curricula had little association with differences in standardized test scores of students from different racial groups; 6) the school factor most correlated with variations in test scores was the composition of the student body; and 7) the study found substantial racial segregation of teachers and students throughout the country (Miller, 1995).

Although some scholars criticized the Coleman Report on methodological grounds (Mosteller & Moynihan, 1972; Yudof, Kirp, & Levin, 1992), re-analysis of the data by other researchers did not substantially alter the conclusions (Jencks et al., 1972). Jencks and colleagues (1979) sought to extend Coleman's findings about the importance of family resources by examining its role in not only educational outcomes but occupational outcomes. They found family background to be not only the major determinant of school achievement but also a major determinant of occupational attainment, even after controlling for achievement. Jencks concludes that inequalities in family resources are a major determinant of life chances in the U.S., creating not only educational gaps but social inequalities that help to explain the persistence of the achievement gaps between Blacks and Whites and economically disadvantaged and advantaged populations.

Although the pivotal role of family resources in determining life chances, either educational or occupation, is generally accepted, there is less consensus about the processes by which this occurs (see, e.g., Lareau, 2000; Phillips et al, 1998). Lareau (2000) provides one example. She conducted an in-depth ethnographic study that examined the mobilization of family resources and its differential effects on children's educational experiences. She details the daily workings of social class in affecting parents' educational expectations for their children, as well as their ability to pass on to their children social advantages through educational supports and interventions. Although working-class parents and middle-class parents share the desire to help their children, middle-class parents draw from a broader range of resources to help their children succeed in school (e.g., income for tutors, information about the best teachers and schools, and access to supplemental educational opportunities). According to Lareau, such "home advantages" are especially important when students experience academic or social difficulties in school.

Although the importance of family background in determining academic outcomes in generally accepted, the effects of family background alone are not sufficient to explain the achievement gap. In 1998, Phillips and colleagues analyzed survey data from the Children of the National Longitudinal Survey of Youth (CNLSY) and the National Longitudinal Survey of Youth (NLSY) to study the effects of family background on children. They conclude that traditional measures of SES can account for no more than one third of the test score gap between Black and White students. While other non-traditional SES characteristics also play a potential role in explaining the achievement gap – such as birth weight, mothers' perceived self-efficacy, and parenting practices – these factors do not fully explain the achievement gap or its persistence over time.

Cultural Theories. Cultural theorists claim that the achievement gap occurs because schools reaffirm Eurocentricism and because of Blacks' response to Eurocentricism. Some researchers claim that the effects of culture are demonstrated in rumors of inferiority (Howard & Hammond, 1985), fears about "acting White" (Fordham & Ogbu, 1986), subtle forms of oppression (Ogbu, 1993; Price, 2002), and culturally reinforced negative stereotypes (Steele & Aronson, 1998).

Howard and Hammond (1985) define the performance gap as largely a behavioral problem resulting from suppressed expectations for Black children's achievement. "Rumors of inferiority," which are rooted in American racism, discourage Black children from competing academically. Howard and Hammond link the persistence of this belief to the academic debate that emerged in the 1960s and continues into current policy discussions about how to address the achievement gap. These debates, which underscore the persistence of the achievement gap, suppress expectations and encourage policies that are more symbolic than consequential.

Similar to Howard and Hammond, Steele and Aronson (1998) argue that culturally communicated stereotypes suppress the achievement of Black students. They conducted five experiments on how stereotypes undermine the performance of talented and strongly school-identified, Black students on standardized tests. Steele and Aronson's experiments show that making Blacks more conscious of negative stereotypes about their intellectual ability as a group can depress their test performance relative to Whites. Their experiments suggest that cultural explanations of the achievement gap can serve as self-fulfilling prophecies, even when Black students are academically talented and motivated to succeed.

Fordham and Ogbu explain the achievement gap as essentially a rejection of the cultural values that dominate schools. In an ethnographic study (1986), they explored the academic attitudes and behaviors of students attending a mostly Black high school in Washington, DC. They found that the Black peer groups and some adults rejected the behaviors of students that could be construed as "acting White," as embracing the cultural values that characterize mainstream society. Among the school behaviors considered as "acting White" are speaking Standard English, studying hard to get good grades, and actually getting good grades. Ogbu (1988) believes that for people of color, schools remain and are seen as Eurocentric institutions that require them to engage in a White process of schooling.

Fordham and Ogbu's theory of "acting White" is based on earlier fieldwork done by Ogbu. In a series of studies, Ogbu (see 1993 for a synthesis) studied the cultures of different minority groups, including African Americans, Mexican Americans, and Asian Americans living in California in the late 1960s and early 1970s. Ogbu believes that minorities can be divided into two broad categories dependent on the reason for their membership in a society – either voluntary (due to immigration) or involuntary (due to conquest, colonization, or slavery). Whereas voluntary minorities such as European Americans are more secure in their identities and see schooling as a way to achieve economic opportunities, involuntary minorities perceive schooling as a potential form of cultural oppression and repression. African Americans are more likely to perceive U.S. educational institutions as oppressive rather than providing opportunities for social mobility, because they were brought involuntarily to the U.S. and share a history of legal segregation and social discrimination.

Price (2000) studied the school experiences and interpretations of those experiences by six young Black males from varying social classes. His conclusions support Ogbu's theory that schools are Eurocentric institutions that alienate and create obstacles to Black achievement. Price found the classroom to be a site where Black students learned about racial relations of power through the silencing and marginalization of their perspectives and the privileging of others. He found race, gender, and class to be a complex interplay that affected students differently in how they experienced school. Although Price does not provide a direct explanation for the achievement gap, his study suggests that the experiences of Black male students culturally reinforce the differential access to power and privilege that characterize many societies.

Educational Theories. Educational theories about the achievement gap fall into two broad categories – those that re-examine the effects of differential access to resources *between* schools on achievement outcomes (e.g., Hanushek, 1996; Hedges & Greenwald, 1996; Phillips et al, 1998; Roos, 1998) and those that examine the effects of differential access to resources *within* schools on achievement outcomes (e.g., Barr & Dreeban, 1983; Bidwell & Kasarda, 1980; Goodlad, 1990; Oakes, 1985). These researchers conclude that at least part of the achievement gap, whether in terms of achievement differences between Black and White students or achievement differences between economically disadvantaged and advantaged students, can be explained by educational policies and practices that either ameliorate or exacerbate racial, economic, and social inequalities.

Hanushek (1996) provides one of the more comprehensive re-examinations of the relationship between school inputs and student achievement. He compiled and summarized the results from 90 relevant studies published between 1890 and 1990. Hanushek found no strong or systematic relationship between school expenditures and student performance, though he did not rule out the possibility that expenditures might be related to achievement under some circumstances. Rather, he concludes that additional resources have no effect on student achievement in a typical public school.

Hedges and Greenwald (1996) criticized Hanushek's re-examination of findings for being too crude and indiscriminate in the selection of studies to be included in the summary. They especially questioned the merits of aggregating cost data across such a long period of time given dramatic changes in school finance, the demographic characteristics of student enrollments, and expectations for educational attainment. Using more contemporary studies and more sophisticated meta-analytic techniques, Hedges and Greenwald came to a different conclusion – namely, that higher levels of school resources are systematically related to higher levels of student achievement and that the relationship is somewhat larger and more positive for disadvantaged children than advantaged children.

Other researchers have sought to identify specific educational contexts or specific combinations of school resources that matter most in terms of student achievement. Phillips and colleagues (1998) conducted a meta-analysis of cross-sectional data from eight national surveys to examine the achievement gap between Black students and White students at different grade levels.[5] They found that most of the divergence in test scores between Black students and White students with similar skills occur before high school.

Their results suggest that differential access to resources at lower grades may have a greater influence on student achievement than differential access to resources at higher grades.

Roos (1998) found spending in racially segregated schools to be roughly equal within school districts with the largest discrepancies in resources being between schools in different school districts. Roos concludes that intradistrict resource disparities have contributed to differences in educational outcomes between White and middle-class students and Black and poor students, noting especially disparities in teacher quality and the adequacy of facilities. Compared to schools attended by economically advantaged children, the schools attended by economically disadvantaged children usually have higher percentages of minority students, as well as, more inexperienced and under-credentialed teachers. These same schools tend to be overcrowded, oversized, and outdated.

While some researchers have focused on re-examining the effects of resource disparities between schools, other researchers have focused on examining the effects of resource disparities within schools. Barr and Dreeben (1983) argue that rarely are the nature and occurrence of events inside schools considered in examining how resources influence student outcomes or in determining the specific payoff for different forms of resources at different levels of schooling. Nonetheless, differences in both accesses to resources and the use of resources by students can be greater within schools than between schools.

Bidwell and Kasarda (1980) support their claim that the educational experiences of children vary enormously within schools and within classrooms. They found this to be true even in relatively segregated schools where children come from similar neighborhoods and families with similar social backgrounds. Understanding these differences, they argue, provide insights into how educational policies and practices lead to differential outcomes for students.

Instructional grouping and tracking provide primary examples of differential access to resources within schools. During the late 1970s, Goodlad and colleagues initiated an ambitious examination of secondary education in the U.S. They studied a national sample of more than a thousand classrooms in thirty-eight elementary and secondary schools across the country (see Goodlad, 1981, for a description of the study). Goodlad found that instructional grouping and tracking led to much heavier academic demands being placed on high-achieving than on low-achieving students, with poor and minority students being heavily represented in groups that track for low achievers. They argue that such differential access to instructional and curricular resources in schools leads to differences in academic outcomes for Black and White students and economically disadvantaged and advantaged students (1979).

Oakes (1985), who was a colleague with Goodlad on his study, conducted a more in-depth analysis of the 25 schools in the sample with secondary grades (12 middle schools, 12 high schools, and one school spanning K-12). Oakes found that in many cases curricular tracking, such as placing students who were at risk of educational failure into remedial courses, results in educational experiences radically different from those of students in upper-tracked courses, particularly advanced and college preparatory courses. Track-level difference in the content of lessons, the pace of instruction, and student engagement affects how much students learned, creating substantial disparities in achievement between tracks within the schools. Oakes argues in the original study and in subsequent studies (1990) that tracking has particularly negative effects for women and minorities and is one explanation for the achievement gap.

School Readiness. The theories offered above are mostly "static" theories about the achievement gap – that is, they do not try to explain how the gap changes or develops over time for children. School readiness research, however, provides an alternative and more dynamic perspective on the achievement gap.

School readiness can be defined as the skills and resources that children possess from early childhood experiences that upon school entry prepare them for school success. From this perspective, school readiness is shaped by differences in children's early childhood experiences and appears to explain the skill gaps at school entry (Xue & Meisels, 2004). Differences in school readiness prevent some children from taking full advantage of early educational experiences while other, more prepared children, excel in school. The gap widens over time making it more difficult for less ready children to catch up with their peers.

Although the importance of the formative and developmental years and their relationship to school performance is not a new concept, there is growing interest among policymakers, educators, and researchers in understanding the factors that contribute to school readiness and children's subsequent achievement. Multiple factors have been identified as related to children's preparedness and eventual success in school, including children's physical well-being, social development, cognitive skills and knowledge, and their approach to learning (Kagan, Moore & Bredekamp, 1995). While children enter school with different levels of readiness, those who are less ready may be at risk for school failure especially if their parents and teachers do not have the resources to address their educational needs (West, Denton, Germino-Hausken, 2000).

Until recently, little data were available to assess school readiness for children entering kindergarten (Coley, 2002). Although many studies examined the social and cognitive development of young children, very few studies did on a national scale or used a common metric for measuring readiness. Prior to the late 1990s most of the literature on the status of children in the nation's schools was focused on elementary and secondary schools. Little information was available on the entry status of children, their kindergarten experiences, or their progress through the primary grades (West, Denton, Germino-Haushen, 2000).

The U.S. Department of Education, National Center for Education Statistics (NCES), sponsored the *Early Childhood Longitudinal Study, Kindergarten Class 1998-99* or "ECLS-K". The ECLS-K selected a nationally representative sample of 22,782 kindergartners who attended about 1,277 schools during the 1998-99 school year. The ECLS-K is a multi-source, multi-method study that focuses on children's early education beginning with kindergarten through the spring of fifth grade; the study includes measures of children's health status, socio-emotional development, cognitive development, and their family, school/classroom, and community environments. The study collected information directly from the children, their families, teachers, and schools (Denton & West, 2002). As the kindergartners progress through school, the findings are presented in a series of reports.

The first report, *America's Kindergartners: Findings from the Early Childhood Longitudinal Study, Kindergarten Class 1998-99* (West, Denton and Germino-Hausken, 2000), provides a national picture of the knowledge and skills of beginning kindergartners. It reveals that while first-time kindergartners are similar in many ways, differences exist in their knowledge and skills at school entry. In terms of first-time kindergartners' specific skills in reading, 66% are proficient in recognizing letters, 29% are proficient in understanding beginning sounds of words, and 17% are proficient in understanding ending sounds of words. In mathematics, most kindergartners (94%) are proficient in recognizing numbers and shapes and can count to ten, 58% are proficient in understanding relative size, and 20% are proficient in understanding ordinal sequence. In general, though, Black children and children from less advantaged households entered kindergarten less ready than White children and children from more advantaged households.

The second report, *The Kindergarten Year* (West, Denton, and Reaney, 2001) show that children who were considered at risk for school failure during their first year of school did acquire many of the basic skills in reading and mathematics that were not present in kindergarten. Consequently, by the spring of kindergarten, almost all could recognize letters (95%) and make letter-sound connections at the beginning of words (74%), while more than half could make these connections at the end of words (54%). In mathematics, the pattern was similar, with most children (88 %) being able to count beyond ten and understand the mathematical concept of relative size (West, Denton, and Reaney, 2001). Nonetheless, as at risk children acquired fundamental skills, they fall behind their more advantaged classmates who have acquired more advanced skills in reading and mathematics. Specifically, across the kindergarten year, the gap between historically disadvantaged children and advantaged children widens in such areas as recognizing words by sight or being able to add and subtract.

Subsequent reports reveal a similar pattern across the first (Denton & West, 2002) and third grades (Rathbun, West, & Germino-Hausken, 2004). Although all children continued to make progress in gaining fundamental skills in reading and mathematics, the achievement gap continues to widen as better-prepared children moved on to more challenging academic tasks and content. Over the first four years of school, from the start of kindergarten to the end of 3rd grade, almost all children acquire fundamental skills in reading and mathematics. Nearly all children could identify the ending sounds of words, name sight words, and recognize words in context. They could also demonstrate mathematics concepts, such as ordinal sequence, and solve simple addition and subtraction problems. Roughly three-quarters (78%) could make literal inferences based on text and solve simple multiplication and division problems. Almost half (46%) were able to use cues to derive meaning from text and 42% demonstrated an understanding of place value in integers to the hundreds place. Twenty-nine percent were able to make interpretations beyond what was stated in text and 16% could use rate and measurement to solve word problems.

These gains notwithstanding, between the start of kindergarten and the end of 3rd grade, the reading and mathematics achievement gaps widens between Black and White children and poor and non-poor children. Black children and poor children made smaller gains in reading and mathematics by the end of 3rd grade than White children and non-poor children, particularly in the acquisition of more advanced skills. In reading, Black and poor children are less likely to be proficient in making literal inferences, deriving meaning from text, and making interpretations beyond text. In mathematics, Black and poor children are less likely to be proficient in multiplication and division, use of place values, and the calculation of rates and other forms of measurement. Although ECLS-K has not fully released 5th grade results, there is little reason to believe that there will be a significant departure from this pattern of a widening achievement gap at the upper levels of proficiency.

Other researchers have generally confirmed and expanded the results presented in the ECLS-K reports (Coley, 2002; Lee & Burkam, 2002; Xue & Meisels, 2004). Coley (2002), for example, used the ECLS-K data to study school readiness. Coley focused on three measures of school readiness for his analysis: reading skills at kindergarten entry, mathematics skills at kindergarten entry, and home reading experiences. Coley examined the proficiency of entering kindergarten children for specific skills in reading and mathematics for racial and SES inequalities. Coley found major differences in all three areas for children from different racial groups and for children from different SES backgrounds.

Coley also considered reading experiences in the home to be a possible factor in school readiness. Although Colely found statistically significant differences between racial and SES groups of children in their home reading experiences, the magnitudes of these differences were not as great as many of those reported for specific reading and mathematics skills. Nonetheless, a slightly larger proportion of White children than Black children had parents who said that they read to their children every day. The differences between high-SES and low-SES children in home reading experiences were larger, however, with considerably more high-SES children than low-SES children having parents who read to them daily or said that they looked at picture books with them outside of school. Coley concludes that Black and poor children have an "uneven start" upon entering school.

Lee and Burkam (2002) used ECLS-K data to examine differences in school readiness, paying particular attention to differences by race and SES. They note that there is a substantial difference in children's readiness as measured by test scores at the beginning of kindergarten, with the largest differences associated with SES. High-SES children begin kindergarten with test scores in reading, mathematics, and general knowledge higher than the test scores of low-SES children; Black children begin kindergarten with test scores lower than White children. Although differences in readiness are greatest for high- and low-SES groups, racial differences persist even after controlling for the SES of racial groups. These differences are greatest at the extremes of the test score distribution with fewer White children than Black children in the lowest quintile for average test scores. Lee and Burkam conclude that these differences in school readiness are compounded by the quality of kindergartens and elementary schools that racial minorities and poor children attend, thus reinforcing the inequalities that develop even before children reach school age.

Xue and Meisels (2004) also analyzed ECLS-K data, focusing on the potential importance of early literacy skills in children's kindergarten performance. They investigated the impact of early literacy skills on kindergarten children's cognitive development as measured by direct cognitive scores, indirect teacher ratings of children's approaches to learning, and indirect teacher ratings of children's achievement in language and literacy. They found that children who are less prepared or school ready have weaker early literacy skills upon entering kindergarten may need extra support in addition to regular classroom instruction. Like others who have examined the ECLS-K data (Coley, 2002; Lee & Burkam, 2002; West, Denton and Germino-Hausken, 2000), Xue and Meisels document significant differences in school readiness that lead to differences in student learning in the early grades. If left unattended, these differences lead to a widening achievement gap, with many Black children and poor children falling behind their White and more advantaged peers.

Early Identification and Intervention

Most research about promoting school readiness has focused on children's early care and development, particularly on whether federally funded and state supported preschool programs facilitate the social and cognitive development of poor children. These studies show that high-quality child care can contribute to children's social and cognitive development, sometimes dramatically so (Barnett, 1995; Consortium for Longitudinal Studies, 1983; Eckroade, Salehi, & Wode, 1991; Mashburn & Henry, 2004; Schweinhart & Weikart, 1997; Wode & Salehi, 1992). Unfortunately, high-quality programs are relatively rare and expensive. Without a substantial increase in public support, an unlikely scenario given the federal government's unwillingness to fully fund Head Start, such programs will remain the exception and not the rule, especially for poor children.

A more likely scenario is that policymakers and educators will seek to develop early identification strategies to target students with developmental difficulties in the earliest grades. Historically, national education organizations, such as the Association Supervision and Curriculum Development (1987), the National Association for the

Education of Young Children (1988), the National Association of Early Childhood Teacher Educators (1989), the National Association of Elementary School Principals (1989), the National Council of Teachers of English (1989), and the National Council of Teachers of Mathematics (1989), have been reluctant to endorse achievement testing in grades K-2 (Kamii, 1990). According to the National Association for the Education of Young Children (1990), early testing, especially when it is being used in conjunction with high-stakes accountability policies, is both misleading and detrimental to children. Not only does it fail to provide "… valid measures of accountability but it encourages classroom practices that are harmful to young children's development" (p. ix). Despite these concerns and the opposition of national organizations, educators face increasing pressure to strengthen the academic content in early grades and extend testing into earlier grades, including kindergarten.

During the 2000 presidential race, then Governor Bush campaigned for higher standards in reading and the identification of reading difficulties for children in the earliest grades. He advocated holding schools more accountable for early reading achievement, annually testing students in reading in 3rd-8th grades, assessing reading skills in K-2, and increasing the academic content of early childhood programs such as Head Start (Education Week, 4/5/00, p.24). After winning the election, President Bush charged ahead with many of these proposals, resulting in the No Child Left Behind legislation. Although the inclusion of more academic rigor in federally funded preschool programs and the assessment of reading skills in K-2 did not receive the same attention in the final legislation, the pressure to meet higher standards in the middle elementary grades is forcing educators to re-think their testing policies and their K-2 programs, as many fear that "the 3rd and 4th grades are too late to identify children who are falling behind" (Education Week, 2/25/98, p. 25).

While cognizant of the fears of early childhood educators, many school districts are moving ahead with plans for full-day kindergarten, and additional testing in the early grades. Such testing could be used to target resources to help children who fall behind in the early grades, but little is known about how different tests align with the state-based tests used to assess student proficiency in the later grades. If early testing reliably predicts the probability of students achieving different proficiency levels, including advanced proficiency in content areas, it could be used to both decrease the achievement gap and increase the likelihood that schools can achieve AYP through the efficient targeting of resources in the early grades. Such an outcome is consistent with both the intent of NCLB and broader calls to address the achievement gap as a basic challenge to civil rights in the nation.

Summary

Review of the research identifies many explanations for the achievement gap between Black and White students and economically advantaged and disadvantaged students. Although studies generally found that White and economically advantaged children out-perform Black and economically disadvantaged children, studies differed on the question of whether changes in school policies and practices can narrow the achievement gap. Earlier studies in the 1960's sparked an on-going debate about the importance of family background factors compared to school factors in explaining achievement differences. Other studies suggest broad cultural explanations for the achievement gap. Studies that examine differences in student access to resources within schools (e.g., due to ability grouping and tracking) suggested that specific school policies and practices either exacerbate or ameliorate the achievement gap.

Development during children's early years, ages new born to 5, sets the tone for school readiness and creates the backdrop from which the achievement gap emerges. Although young children bring diverse academic knowledge and skills to the classroom when they begin school, much of this diversity is linked to children's social backgrounds, particularly to social class and race.

While high-quality preschool programs have been found to facilitate the social and cognitive development of young children, sometimes dramatically so, such programs are relatively rare and unlikely to eliminate important differences in school readiness when children begin kindergarten. "Schools," according to Lee and Burkam, "face a tremendous challenge in how to accommodate this diversity, so that each child can be successful in school" (2002, pp. 85-86).

No Child Left Behind, although only indirectly targeted at student performance in kindergarten through 3rd grade, is stimulating the development and use of early assessments that will provide school, school district, and state performance information on the acquisition of proficiencies in the earliest grades (Masburn & Henry, 2004). Faced with increasing expectations for achievement and more dire consequences for failing to make AYP, policymakers and educators are looking for ways to identify earlier children who may be at risk of failing to reach achievement standards. Currently, however, there is very little research on how well assessments conducted in the earliest grade predict the acquisition of proficiency levels in the upper grades, where the stakes for meeting AYP are greatest.

The early years of schooling help students become more proficient not only on mandatory state assessments but throughout their education. Although educators should be cautious about identifying children for early assistance, especially if assistance may create negative stereotypes or encourage alternative forms of tracking, earlier interventions may also help schools better target limited resources and address the achievement gap in earlier grades. To do so effectively, educators will need to know more about the achievement gap and how it develops, particularly in the early grades, whether current testing practices accurately predict students' probability for reaching proficiency standards in later grades, whether prediction models are equally reliable for different populations of children (e.g., Black children and poor children), and whether it is feasible to establish performance thresholds that effectively and efficiently identify students who require early intervention.

In the chapters that follow, I describe a study designed to address these needs. Using data from a large metropolitan school district in Maryland, I examine the early development of the achievement gap between Black and White students and economically advantaged and disadvantaged students; changes in the achievement gap as students progress through school; the feasibility of using 2nd grade test scores to predict the probability of reaching proficient and advanced levels of proficiency in the 3rd, 4th, and 5th grades; the suitability of these models for different student populations, specifically Black students and students receiving free-and-reduced price lunches; the identification of students with less than a 50% chance of attaining proficiency in reading and mathematics by the 5th grade; and the accuracy of early identification for the purpose of intervention.

Endnotes

[1] Since 1969, NAEP has provided on-going nationally representative indicators of student academic achievement in multiple subject areas, particularly reading and mathematics. Although not every subject area is assessed every year and not every assessment has a sufficient sample to disaggregate data for all populations of interest, NAEP's annual assessments provide policymakers and the public one of the more reliable estimates of the nature and scope of the achievement gap across time. Since 1998, NAEP collects data on students' eligibility for free and reduced priced meals (FARMS) as an indicator of family economic status. Students' family income in relation to the federally established poverty level determines eligibility for FARMS.

[2] Accommodations were allowed from 1998-2003. Results may differ slightly from previously reported results in reading.

[3] All differences in these NAEP reports were tested for statistical significance at the .05 level.

[4] Accommodations were allowed from 1996-2003. Results may differ slightly from previously reported results in mathematics.

[5] The data set used in the meta analysis included the Equality of Educational Opportunity Study (EEO) 1965, National Longitudinal Survey of Youth (NLSY) 1980, High School and Beyond (HS&B)1980, Longitudinal Study of American Youth (LSAY) 1987, Children of the National Longitudinal Study (CNLSY) 1992, National Education Longitudinal Study (NELS) 1988, 1990 & 1992, Prospects: The Congressional Mandated Study of Educational Growth and Opportunity (Prospects) 1991, and National Assessment of Educational Progress (NAEP) 1971-1996.

CHAPTER III

RESEARCH DESIGN AND ANALYSIS STRATEGY

This chapter sets forth the research design and analysis strategy used in the study to explore the scope of the academic achievement gap between both Black and White students and economically advantaged and disadvantaged students. This chapter considers the potential utility of predicting the academic achievement of these subgroups in later elementary years based on their academic performance in an earlier grade, and then testing the accuracy of those predictions for interventions. More specifically, the chapter describes how the study addresses the research questions set forth in Chapter I. The research questions are as follows:

- What is the achievement gap between Black and White students in the 2nd grade? What is the achievement gap between economically advantaged and disadvantaged students in the 2nd grade? How do these achievement gaps change over time as students progress through the 3rd, 4th, and 5th grades?
- Can student performance on the CTBS/5 in the 2nd grade predict student proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics? Are there differences between White and Black students or economically advantaged and disadvantaged students in how well student performance on the CTBS/5 in the 2nd grade predicts their proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics?

Research Design

Choice of Approach. Central to No Child Left Behind (NCLB) is school accountability for improvement. To enforce the provisions of NCLB, states must implement systems of student testing that document rates of improvement for specific populations of students. Schools that fail to consistently show adequate yearly progress (AYP) face progressively more severe sanctions, including providing families with student transfer options and eventual closure. Although there is federal pressure on states and school districts to hold schools accountable for improving test scores, states have considerable flexibility in devising the means to achieve the standards. Most states are using the successive-groups approach to meet the reporting requirements of NCLB.

Successive-groups Approach. Maryland uses the successive-groups approach for the purposes of school accountability. Maryland compares the achievement of students in 3^{rd}-8^{th} grades in a given year with that of cohorts of students from previous years in 3^{rd}-8^{th} grades who attended the same schools.

Individual school reports present the percentage of students in a given year who attain different levels of proficiency on the MSA. Percentages are reported for the proportion of students and specific subgroups of students who score below (basic), meet (proficient), or exceed (advanced) a performance standard for each grade and subject area. Comparisons are then made for successive years for each grade and subgroups within grades. These comparisons rest on the implicit assumption that the characteristics of the students that affect achievement are relatively stable from year to year for all students attending a given school (Linn & Haug, 2002).

Although this approach to measuring academic achievement is computationally straightforward, it has a number of potential weaknesses. Meyers (2000) argues that proficiency levels are contaminated by factors other than school performance, which undermines their value as markers for school accountability. Differences between students and schools in the effects of family background and community characteristics are not included in the successive-group approach to modeling change. Moreover, changes in scores for the students tested at a given grade from one year to the next may be quite unreliable.

The sources of unreliability are multiple but include the fact that a substantial part of the variability in scores between cohorts is due to non-persistent factors that influence scores in one year but not in another (e.g. teacher on an extended sick leave, teacher strike, small group of disruptive students, and changes in the rules for students included in testing). Linn & Haug (2002) state the following:

> Because so much of the variability in school change scores is attributable to noise, it should not be surprising that schools identified as outstanding in one change cycle for achieving a large change in achievement is unlikely to repeat that performance in the next cycle. The converse is also true. Thus, schools that are identified as needing assistance in one cycle because they fell short of their change target, or even show a decline are unlikely to fall in that category the next change cycle (p.7).

The problem becomes far more difficult as the number of subgroups that must demonstrate AYP increases. A school with a diverse population and more subgroups has many more opportunities to fail (Mathias, 2003). Year to year comparisons for subgroups can have a great deal of volatility, especially in neighborhoods experiencing rapid demographic changes. Although the successive-groups approach may be reasonable for schools with a stable school population, it may be an inappropriate approach in schools with shifting populations (Linn & Haug, 2002).

Because Maryland's school population includes both stable and unstable schools, and unstable schools are concentrated in specific counties within the state, the successive-groups approach may place an uneven burden for accountability on specific schools and school districts. Finally, the successive-groups approach does not provide much useful information about how to address failure to meet AYP. Although disaggregating proficiency scores by grades, subject areas, and subgroups of students highlights specific areas that educators might target for improvement, there is no guarantee that these same areas will continue to be high-priorities areas for the next cohort of students. The successive-groups approach relies on "snapshots" of student performance at different points in time. However, the students captured in these snapshots are actually different students. While teachers in upper-grades can use students' scores from lower grades to plan instruction, the successive-groups approach provides no information about how well lower-grade performance predicts whether students will attain proficiency in the upper grades.

Longitudinal Cohort Approach. An alternative approach to reporting school status is to report school improvement for the same group of students by tracking prior achievement from one grade to the next (Linn, 2001). Rather than compare the proportion of students who attain proficiency in two separate cohorts, this approach focuses on the proportion of students who attain proficiency in the same cohort. Of the two approaches, the longitudinal cohort approach is more closely linked to actual student learning, because an individual student's prior performance is the basis for determining whether schools meet AYP. Although no accountability system can produce direct evidence about the effects of educational decisions in a school, the longitudinal approach provides a more reasonable basis for assessing school practices. Raudenbush (2004) states the following:

> … one might argue that an accountability system that tracks children's test scores longitudinally and that takes into account a few key background characteristics provide the basis for making assumptions [about school practices] reasonable in a rough sense. The validity of a causal inference based on this reasoning would never achieve the level sought in a well-designed inquiry into the effects of a new educational intervention or a clinical trial in medicine. Nonetheless, such a data system could arguably give parents a better estimate of the likely effects of school choices than they would have without such information (p.11).

Besides providing educators and parents with potentially more useful information about student performance, the approach also reduces the "noise" in change scores that may be due to demographic changes in student cohorts between successive years. It also provides the possibility of examining different learning trajectories for specific subgroups of students, essentially controlling for differences between schools and school districts in the burdens imposed by accountability systems due to differences in the social and economic resources available to students and their teachers. The major drawback to the approach is that it is computationally more complex and not all students may have prior achievement information. Nonetheless, when sufficient data are available, the longitudinal cohort approach may provide a more reliable, accurate, and useful estimate of student learning than the successive-groups approach.

This study utilizes the longitudinal cohort approach and tracks the achievement of matched students from one year to the next over four school years (2001-2002, 2002-

2003, 2003-2004, and 2004-2005). Although this is not the typical approach used by school districts within the state for the purposes of accountability, it is not incompatible with the state's approach, and, as argued above, school districts that implement a longitudinal cohort approach may realize a number of important advantages. Moreover, as I will explain below, many school districts have access to sufficient longitudinal data about students to make this approach to examining student performance both a possibility and potentially a valuable tool.

Available Data. The school district that is the research site in this study is located in Maryland. In order to meet the requirements of NCLB, Maryland has mandatory Maryland School Assessment (MSA) census testing in 3rd-8th grades. Currently, state tests are not required in the 1st and 2nd grades, though school readiness screening is required in kindergarten and reported to the Maryland General Assembly. Kindergarten teachers, statewide, use the Work Sampling System (WSS) to evaluate children during the first few weeks of kindergarten. Teachers use a combination of checklists and portfolios to assess and document children's skills, knowledge, behavior and academic accomplishments in seven areas: social and personal development, language and literacy, mathematical thinking, scientific thinking, social studies, the arts, and physical development.

As part of the local school district's testing program, schools also administer the Comprehensive Tests of Basic Skills (CTBS/5) in 2nd grade in the areas of reading, language, and mathematics. Results are reported as percentiles and scale scores. This study utilizes these data along with student demographic information and student performance data on the 3rd, 4th, and 5th grade MSA in reading and mathematics. Free and reduced-price meals or FARMS serves as the proxy for poverty as other socioeconomic data are not available in local school district data.

Use of these data sets has numerous advantages. First, as required by NCLB, MSA involves census testing. All students, including students with disabilities and limited English proficiency, are included in the assessment. The only 3rd grade students who were not assessed using the MSA were a small portion of the population of students (<1%) who were absent during the entire testing period or had severe disabilities[1] that prevented them from participating in MSA even with accommodations. Second, matching student records longitudinally provides a rich database for analyzing changes in individual performance over time (for the purposes of this study - 2nd, 3rd, 4th, and 5th grades). Third, the database allows for controlling for student mobility, since as long as the student stayed in the school district, the student's progress is tracked. Fourth, the data set facilitates the main focus of this study – namely determining the scope of the achievement gap between the achievement gap between Black and White students, as well as economically advantaged and disadvantaged students. Because data are linked to individual students, the data set also facilitates an examination of the utility of using prior achievement to estimate the probability of specific subgroups of students attaining proficiency in subsequent years.

Demographic and Structural Characteristics. During the 2002-2003 school year, the two largest racial groups were Black (35%) students and White (58%) students. All other minority groups combined made up less than 7% of the student population. In this study, I focus the data collection on Black and White students who attended elementary schools in the school district between 2001 and 2005 (roughly 93% of the total population of 3rd grade students).

For the purposes of description, below are the characteristics of the 3rd grade Black and White students who took the MSA in the 2002-2003 school year. Data for selected demographic variables are presented in each row.

Table 3.1

Characteristics of Black-White 3rd Grade MSA Test Takers for the 2002-2003 School Year (n= 6,508)

Demographic Variables	Categories	Number	Frequency
RACE	Black	2,472	38%
	White	4,036	62%
FARMS	Recipient	1,952	30%
	Non- Recipient	4,556	70%
GENDER	Male	3,320	51%
	Female	3,188	49%
ESL	Recipient	23	<1%
	Non-Recipient	6,485	99%
SPECIAL EDUCATION	Recipient	964	15%
	Non-Recipient	5,544	85%
MOBILITY (intradistrict)	Change	840	14%
	No Change	5,668	86%

Study Group. Not all students had sufficient data to be included in the study. To be included in the study, students had to meet three criteria. First, each student had attended an elementary school in the school district during the 2001-2002, 2002-2003, 2003-2004, and 2004-2005 school years. Second, each student had been assessed with the CTBS/5 in the 2nd grade during the 2001-2002 school year. Third, each student had taken the MSA in the 3rd grade during 2002-2003, in the 4th grade during 2003-2004, and in the 5th grade during 2004-2005. Even given these strict criteria, the vast majority of students had sufficient data to be included in the study. A total of 84% (n=5,431) of the eligible population of students remain in the study group.

Table 3.2 describes the demographic characteristics of the study group. These characteristics are very similar to the 3rd grade population of Black and White students who took the MSA in 2002-2003 (see Table 3.1). Nonetheless, there are slightly fewer Black students in the study sample compared to the 3rd grade population (36% v.38%), slightly more FARMS students, (32% v.30%), slightly fewer special education students (14% v.15%), and slightly more a history of intradistrict mobility (17% v. 14%). Both the study sample and the 3rd grade population have the same percentage of English as second language learners (<1%), as well as the same percentage of male (51%) and female (49%) students.

Overall, a comparison of Tables 3.1 and 3.2 provides no evidence that restricting the records to only those students with full data biases the study group. The resulting study group is remarkably representative of the Black and White students who participated in the MSA in the 3rd grade.

Table 3.2

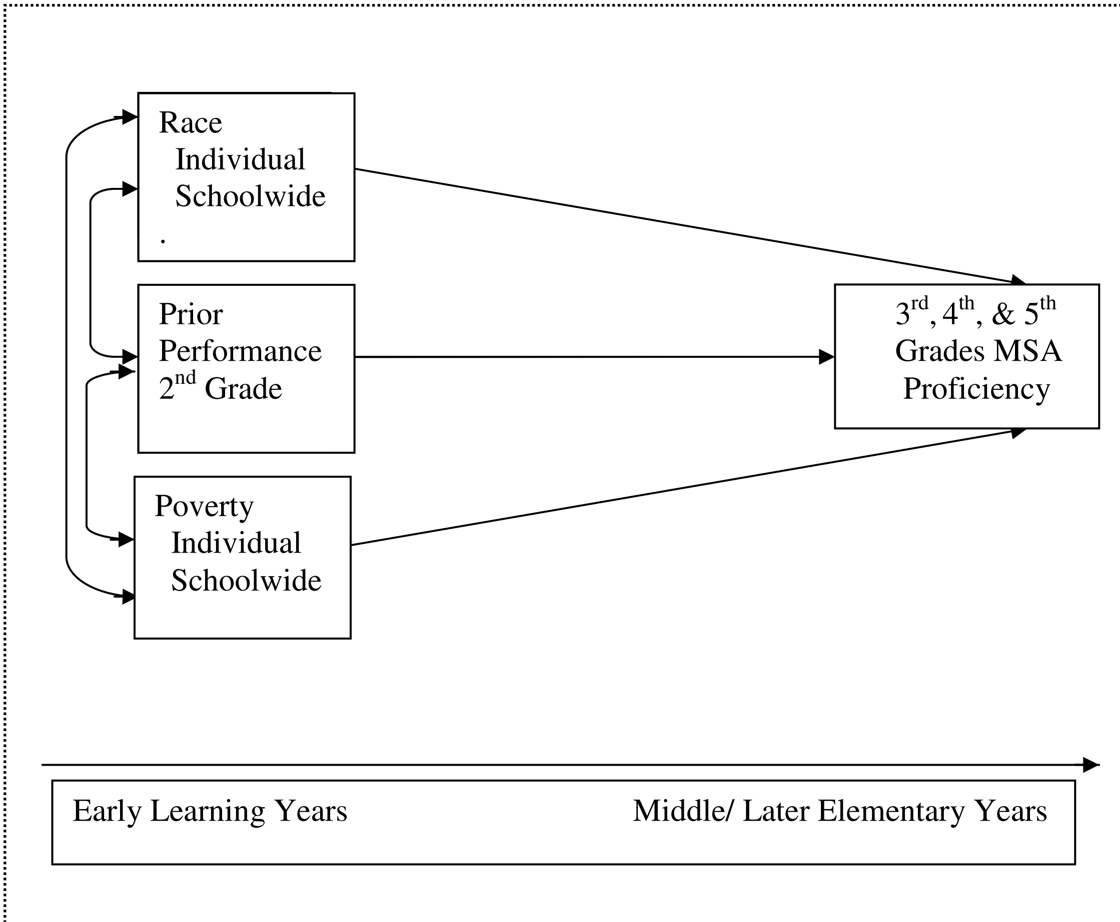
Characteristics of the Study Group for the 2002-2003 School Year (n= 5,431)

Demographic Variables	Categories	Number	Frequency
RACE	Black	1,957	36%
	White	3,474	64%
FARMS	Recipient	1,752	32%
	Non- Recipient	3,679	68%
GENDER	Male	2,775	51%
	Female	2,656	49%
ESL	Recipient	16	<1%
	Non-Recipient	5,415	99%
SPECIAL EDUCATION	Recipient	752	14%
	Non-Recipient	4,679	86%
MOBILITY (intradistrict)	Change	899	17%
	No Change	4,532	83%

Analysis Strategy

This study draws upon prior research in education, economics, sociology, and psychology to construct a model that includes three factors – race (individual and schoolwide), prior performance in 2nd grade, and poverty (individual and schoolwide) - that are presumed to influence 3rd, 4th, and 5th grade MSA proficiency. Figure 3.1 represents an exploratory research design that outlines the research model utilized in this study. The model is structural in nature and identifies possible relationships among the factors. Solid lines connect constructs and sets of measures with solid arrows indicating the direction of effects.

Figure 3.1 Research model for explanatory research design



Description of Variables. Data were imported into the Statistical Package for the Social Sciences Version 11.0 or SPSS data file and matched on student ID. The variables used to tap the constructs in the model are described below.

Individual race. There are 1,957 Black students (36%) and 3,474 White students (64%). A dummy-coded variable (RACE) was created from students 2002-2003 records, with 1 = Black and 0 = White. All other racial/ethnic groups are excluded from the data set and the analysis.

Individual poverty. There are 1,752 (32%) students who are recipients of free or reduced-price meals and 3,679 (68%) students who are not recipients of free or reduced-price meals. A dummy-coded variable (FRL03) was created from students 2002-2003 records, with 1=FARMS recipient and 0=Non-FARMS recipient.

Prior performance. As part of the local school district testing program, the schools administer the Comprehensive Tests of Basic Skills (CTBS/5) in the spring of 2nd grade in the areas of reading (READ2) and mathematics (MATH2). The CTBS/5 that was developed by CTB/McGraw-Hill Terra Nova is a standardized achievement test which compares the child's performance with the performance of other children across the country in the same grades. The CTB/McGraw Hill has a long history in educational assessment with acceptable levels of validity and reliability. Students in the study group were tested in the spring of 2002.

Scale scores are used for the analysis. A continuous variable (CTB02COR) was created for CTBS/5 reading and a continuous variable (CTB02COM) was created for CTBS/5 mathematics. Each variable is centered on its mean, such that negative scale scores are lower than average and positive scale scores are higher than average.

MSA proficiency. The Maryland School Assessment (MSA) is administered to elementary school students in the 3rd, 4th, and 5th grades. MSA was developed in partnership with Harcourt Assessment Inc. for the reading assessments and with CTB/McGraw-Hill for the mathematics assessments. Results are reported as scale scores and proficiency levels (basic, proficient, or advanced). Dummy variables were created for the proficiency levels. The scale scores were centered to give them a meaning comparable to the CTBS/5 scale score in 2nd grade. The 3rd grade cohort took Maryland

School Assessment (MSA) in reading (MSA03READ) and mathematics (MSA03MATH) during the second half of the 2002-2003; MSA in reading (MSA04READ) and mathematics (MSA04MATH) in the 4^{th} grade during the second half of the 2003-2004 school years; and the MSA in reading (MSA05READ) and mathematics (MSA05MATH) in the 5^{th} grade during the second half of the 2004-2005 school years.

Schoolwide race. To examine the possible effects of school characteristics associated with race, the racial enrollment of schools was included in the model. A dummy-coded variable (SWR) was created based on 50% or more of study group's Black students in each school (50% or more schoolwide enrollment = 1, and less than 50% schoolwide enrollment = 0).

Schoolwide poverty. To examine the possible effects of school characteristics associated with poverty, the poverty enrollment of schools was included in the model. The 50% eligibility rate for free and reduced-price is often used as the criterion for identifying "high poverty schools" (Orfield & Lee, 2005). A dummy-coded variable (SWP) was created based on 50% or more of the study group students receiving FARMS in each school (50% or more schoolwide poverty = 1, and less than 50% schoolwide poverty = 0).

Interaction terms. The interaction variables were created to examine the relationships between prior performance and race, and prior performance and poverty. These interaction terms determine if the relationship between prior performance and future performance varies by race or poverty – that is whether 2^{nd} grade CTBS scores predict future MSA scores equally well for Black students and White students, as well as, FARMS students and Non-FARMS students. The interaction variable for prior performance in reading is ICTB2RXR for race and is ICTB2RXP and poverty. The interaction variable for prior performance in mathematics is ICTB2RXM for prior performance for race and ICTB2MXP for poverty.

Data Analysis. The Statistical Package for the Social Sciences Version 11.0, (SPSS) was used to enter and build the data set and to analyze the data. For documentation purposes, a codebook was created. The codebook includes variable names, descriptive titles, variable types (e.g., numeral or alpha), value labels, missing data codes, and field length. Advantages of SPSS include the ability of the statistical software package to handle large data sets, ease of data entry and cleaning data functions, data reduction or "crunching" functions, and efficiency and accuracy of subsequent statistical analyses.

The primary statistical technique that was used in this study to analyze the research questions is logistic regression. Logistic regression estimates the probability of a certain event occurring or of a certain trait being observed in some population of interest. As a statistical technique, it is most appropriate for modeling the probability of discrete outcomes (e.g., the probability of achieving proficiency or advanced proficiency at a specific grade level, the probability of being retaining or be promoted to the next grade, or the probability of graduating or dropping out of school). Logistic regression can also model the extent to which a specific combination of variables may increase or decrease the likelihood of an event occurring or of observing some trait (Cabrera, 1994). In the case of this study, the independent or predictor variables are race (individual and schoolwide), poverty (individual and schoolwide), and prior performance, which are used to predict the probability of achieving proficiency or advanced proficiency on the MSA at

3rd, 4th, and 5th grades. The specified interaction terms are used to test whether the relationship between prior and future achievement vary by student, race, or poverty.

When the dependent variable can only have two values, the assumptions necessary for hypothesis testing and estimation using ordinary least squares (OLS) regression are no longer valid. Whereas OLS assumes homoscedasticity (variance of the error term *e* is constant for all values of the independent variables), normality (errors are normally distributed for each set of values of the independent variables), and linearity (independent variables are a perfect linear combination of other independent variables), these assumptions are neither true nor necessary in logistic regression (Menard, 2001). Using alternative hypothesis testing techniques that are robust to the violation of these assumptions, logistic regression makes it possible to estimate the individual effects of variables on the probability of an event, as well as, the extent to which such effects vary significantly from chance.

Analysis in logistic regression is based on the logistic distribution, which is an *S*-shaped, asymptotic curve. The slope of the curve varies, depending on the values of the independent variables. Like the linear regression coefficient in OLS, the logistic regression coefficient can be interpreted as the change in the dependent variable associated with a one-unit change in the independent variable. However, with logistic regression, the combination of effects is constrained to fall within the range of probability – that is, between 0 (no chance) and 1 (certainty) of an events occurrence. In this study, for example, MSA proficiency is coded as “0” for fail or “basic” and “1” for pass or “proficient and advanced “. The resulting outcome is the probability of a student with some combination of factors (e.g., Black v. White, poor v. non-poor, and a students’ 2nd grade scale score on the CTBS/5) acquiring proficiency or advanced proficiency in a subsequent grade (3^{rd} – 5^{th}).

Logistic regression directly models the probability of an event occurring or of a trait being observed. The formula for a logistic regression can be expressed as follows:

$$Prob(event) = e^z / 1+e^z$$

where *e* is the base of the natural logarithms, and *z* is a linear combination of the effects of the independent variables used to predict the event. Logistic regression expresses this function as the natural logarithm of the log odds, which conforms to a nonlinear, *S*-shaped, asymptotic curve. The probability estimates based on the log odds is always constrained to fall between 0 and 1, regardless of the values for *z* (Menard, 2001).

In logistic regression, the log-likelihood function replaces the maximum likelihood in OLS. The log-likelihood function indicates how likely it is to obtain the observed probability value for (*y)* given the values of the independent variables and parameters. The logistic regression model seeks to assess the effects of the independent variables upon the probability function through an iterative process of estimation whereby estimates for the intercept and for betas are chosen to maximize the likelihood of reproducing the observed probability of an event or trait (Cabrera, 1994; Menard, 2001).

Logistic regression has many advantages. Logistic regression is quite flexible as to the unit of analysis. The logistic regression model can be used when the unit of analysis is the individual subject or group. This micro data approach can be applied when the independent variables are categorical such as race and poverty, or when the variables are continuous such as prior performance. More importantly, logistic regression permits the actual modeling of probability and the accurate testing of hypotheses regarding the effects of a set of independent variables on the likelihood that some event will occur or some trait will be observed (Cabrera, 1994).

However, disadvantages of logistic regression center around its complexity. It is expressed in an odd metric (typically log-odds) that has a non-linear relationship with observed probability. It is computationally complex and the interpretation of coefficients is not as intuitively obvious as it is in OLS regression. Computer programs such as SPSS do not perform all relevant (or desirable) calculations, and final calculations sometimes require calculator or spreadsheet assistance.

Nonetheless, given these disadvantages, logistic models can and do yield powerful insights into the probability of policy-relevant events, such as the future performance of students on the MSA. These insights can be converted into useful information for policymakers, teachers, and parents that without predictive models would be unavailable.

Endnote

[1] These students were assessed with an alternate assessment to the MSA, the Independence Mastery Assessment Program (IMAP). During the 2004 assessment, IMAP was replaced with the Alternate-Maryland School Assessment (Alt-MSA).

CHAPTER IV

FINDINGS

Overview

This chapter presents the findings of the study. Specifically, this chapter explores the scope of the academic achievement gap between both Black and White students and economically advantaged and disadvantaged students; it also considers the feasibility of predicting whether students will meet proficiency requirements in later grades based on their performance on a commonly used standardized test in the 2nd grade. In the research, race and poverty have been associated with poor performance on standardized achievement tests (Borman, Stringfield, & Rachuba, 2000; Coleman et al., 1966; Jencks & Phillips, 1998; Kim & Sunderman, 2005; Kozol, 1992; Lee & Burkam, 2002; Orfield & Lee, 2005). Because of the accountability requirements of No Child Left Behind (NCLB), there is mounting pressure on local school districts to identify children in historically underachieving populations and to intervene early (Masburn & Henry, 2004). Research on the importance of school readiness (Coley, 2002; Lee & Burkam, 2002; West, Denton and Germino-Hausken, 2000; Xue and Meisels, 2004) and early learning experiences suggests that early intervention can be successful and a useful tool in addressing the achievement gap (Barnett, 1995; Consortium for Longitudinal Studies, 1983; Mashburn & Henry, 2004; Schweinhart & Weikart, 1997).

As the Maryland School Assessment (MSA) is a new form of assessment, developed only recently as a response to NCLB, little is known about how predictable performance is, using earlier or non-MSA forms of assessments. Using a longitudinal cohort approach, this study tracks the achievement of matched students within a school district from one year to the next, over four school years (2001-2002, 2002-2003, 2003-2004, and 2004-2005).

The results of these analyses addresses the first set of research questions regarding the achievement gap between Black and White students and economically advantaged and disadvantaged students, and the second set of questions regarding the feasibility of predicting proficiency on the MSA from student performance on the Comprehensive Test of Basic Skills (CTBS/5). I discuss the implications of these results, including the practicality of using 2nd grade achievement scores to identify students for early intervention, more thoroughly in Chapter V.

- What is the achievement gap between Black and White students in the 2nd grade? What is the achievement gap between economically advantaged and disadvantaged students in the 2nd grade? How do these achievement gaps change over time as students progress through the 3rd, 4th, and 5th grades?
- Can student performance on the CTBS/5 in the 2nd grade predict student proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics? Are there differences between White and Black students or economically advantaged and disadvantaged students in how well student performance on the CTBS/5 in the 2nd grade predicts their proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics?

Analytic Strategy

The first set of research questions pertains to the achievement gap for Black and White students and economically advantaged and disadvantaged students. To determine if there is a difference in student performance for these groups of students, MSA mean scale scores, MSA pass rates, MSA pass-fail combinations, and MSA proficiency levels are examined. Each measure represents a different approach to determining the scope and nature of the achievement gap in the school district.

Traditionally, educational researchers have been more concerned about student learning in terms of growth over time rather than accountability. Thus, the nature of the achievement gap is discussed often in terms of score gains on standardized achievement tests. In keeping with this approach, mean scale scores for different subgroups are examined first.

NCLB mandated adequate yearly progress (AYP) at the school, school district, and state levels and established an alternative perspective on measuring the achievement gap – namely, differences between student subgroups in achieving proficiency. However, the method of showing progress was each state's prerogative. Maryland chose annual measurable objectives, that is, continuous equal distance targets which culminate with all students reaching a designated proficiency level in reading and mathematics by 2014. To address the accountability requirements of NCLB, MSA annual pass rates and MSA proficiency levels are also examined for Black and White students and economically advantaged and disadvantaged students.

Student results on MSA are not just about the percentage of students passing or reaching proficiency in a particular grade. Passing once does not guarantee that a student will never fail or achieve proficiency on the MSA in a subsequent grade. To address this difference in student performance, I examined individual student's performance over time. Students may "pass all" of the assessments, "fail all" of the assessments, "end with a pass" – (fail/fail/pass, fail/pass/pass, or pass/fail/pass) or "end with a fail" –

(pass/fail/fail, fail/pass/fail, or pass/pass/fail). Students who end with a pass might be thought of as showing progress, whereas students who end with a fail might be thought of as falling behind. Currently, this measure is not published at the state nor school district level, but does provide useful information for AYP.

According to the Maryland School Performance Program Report of 2003, three performance or proficiency levels define student achievement. Advanced proficiency is designated as a “highly challenging and exemplary level of achievement indicating outstanding accomplishment by students”. Proficient is “the minimum academic achievement level expected for every student”. Basic is the level of achievement indicating “more work is needed to attain proficiency”. As a final measure of the achievement gap, I examine differences between Black and White students and economically advantaged and disadvantaged students in the percentages that attain not only proficiency but also advanced proficiency in reading and mathematics.

The second set of research questions address the predictability of 3^{rd}, 4^{th}, and 5^{th} grade MSA proficiency from prior performance in 2^{nd} grade for different student subgroups. The dependent measures of these analyses using logistic regression are six separate indicators of whether students passed the reading and mathematics assessments taken in 3^{rd}, 4^{th}, and 5^{th} grades (three indicators for reading and three indicators for mathematics). The independent measures are prior performance in the 2^{nd} grade, race, and poverty. I use the pass rate for these analyses because they are the measure of achievement and the achievement gap for which schools are held most accountable. The dependent measures are coded as dichotomous – that is 0 = failed or (basic proficiency only) and 1 = passed (proficiency or advanced proficiency).

The predictor variables individual race and individual poverty are dummy-coded. Individual race is coded as 0 = White and 1 = Black. Individual poverty as indicated by students who receive free or reduced price meals is coded as 0 = Non-FARMS and 1 = FARMS. The predictor variables for 2nd grade performance are CTBS/5 scale scores in reading (CTB02C0R) and mathematics (CTB02C0M) that are centered on 0 – that is, negative scores indicate lower than mean performance and positive scores indicate higher than mean performance.

The second set of predictor variables is a set of interaction variables for CTBS/5 scale scores in reading and mathematics (also centered on 0), individual race and individual poverty. ICTB2RXR is the interaction variable for CTBS/5 reading and individual race. ICTB2RXP is the interaction variable for CTBS/5 reading and individual poverty. ICTB2MXR is the interaction variable for CTBS/5 mathematics and individual race. ICTB2MXP is the interaction variable for CTBS/5 mathematics and individual poverty. These variables test whether the relationship between the CTBS/5 scores and the likelihood of passing the MSA is the same for Black and White students, as well as, whether the relationship is the same for economically advantaged and disadvantaged students.

The third set of predictor variables are schoolwide race and schoolwide poverty. The predictor variables schoolwide race and schoolwide poverty are dummy-coded. Schoolwide race is coded as 0 = majority White enrollment and 1 = majority Black enrollment. Schoolwide poverty as indicated by students who receive free or reduced price meals is coded as 0 = majority Non-FARMS enrollment and 1 = majority FARMS enrollment.

Models estimate the probability (in log odds) of students from different subgroups with specific scores on the 2nd grade CTBS/5 acquiring proficiency or advanced proficiency in a subsequent grade (3rd through 5th). Controls for whether a student attends a minority (50% or higher) elementary school or poverty (50% or higher) elementary school are also included in the models.

Results

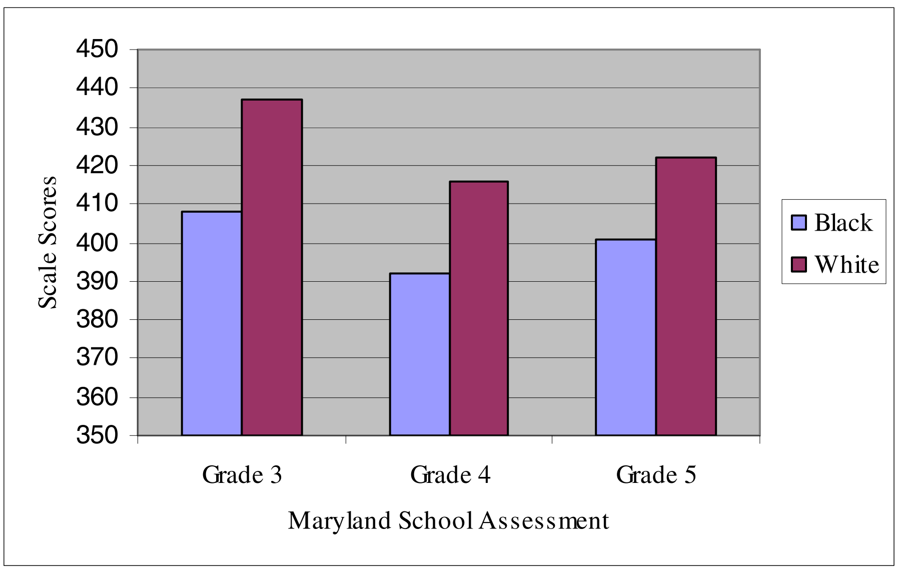
As noted above, the achievement gap on the MSA can be examined in different ways – as either the difference in mean scale scores, the difference in pass rates, the difference in the pass-fail combinations, or the difference in students attaining each proficiency level (basic, proficient or advanced). With respect to the first research question about the achievement gap, the gap between Black and White students is examined in terms of (1) differences in annual mean scale scores on the MSA reading and mathematics assessments; (2) differences in the percentage of students who passed the MSA (attaining either proficient or advanced) in each grade; (3) differences in MSA pass-fail patterns across grades (e.g., the percentage of students who passed the assessments in all grades or failed the assessment in all grades); and (4) differences in the percentage of students attaining each of the three designated MSA proficiency levels (basic, proficient, and advanced). To address the first research question, the analysis is repeated for economically advantaged and disadvantaged students.

Nature of the Race Gap

MSA Mean Scale Scores. The general trend for the study group indicates a decline in reading scale scores between the 3rd and 4th grades with a trend toward increasing scores in the 5th grade. In reading, the study group criterion-referenced test (CRT) mean scale scores were 427 in the 3rd grade, 407 in the 4th grade, and 414 in the 5th grade.

Figure 4.1 presents the mean scale scores on the CRT portions of the MSA for Black and White students. White students scored consistently higher than Black students. The difference in scores diminished somewhat in the 3rd and 4th grades and between the 4th and 5th grades. On average, Black students scored 29 points lower than White students in the 3rd grade (408 v.437), 24 points lower in the 4th grade (392 v. 416), and 20 points lower in the 5th grade (401 v. 421).

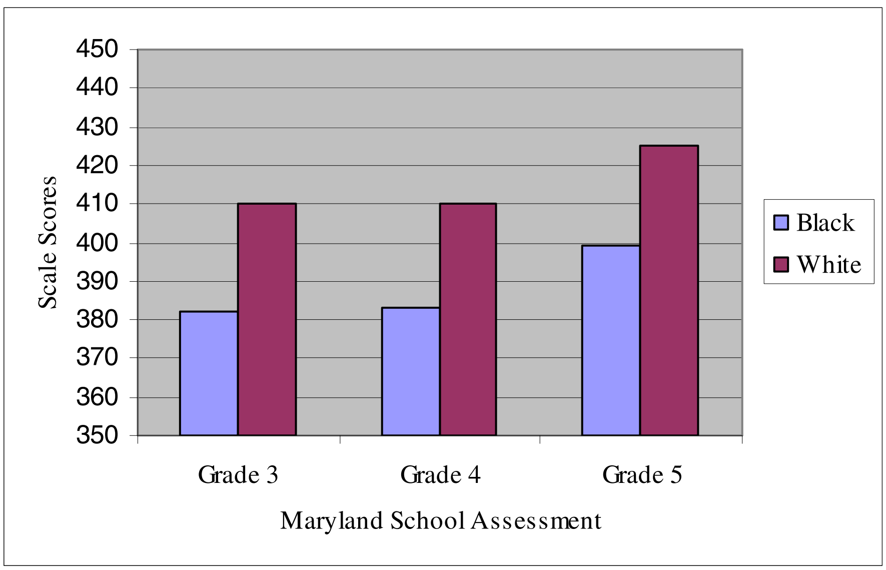
Figure 4.1 Black and White students reading mean scale scores on MSA in 3rd, 4th, and 5th grades (n=5,431)



The general study group trend in mathematics suggests no change in mean scale scores between the 3rd and 4th grades with notable gains in the 5th grade. In mathematics, the study group CRT mean scale score was 400 in the 3rd grade, 400 in the 4th grade, and 416 in the 5th grade.

Figure 4.2 presents Black and White students' mean scale scores on the CRT portion of the MSA mathematics assessment. There is a noticeable achievement gap in the mean scale scores of Black and White students. There was almost no change from 3rd to 4th grades. Although the mean scale scores rose for both groups in 5th grade, the decline in the overall gap between the 3rd and 5th grades amounted to only 2 points. The mean scale score for Black students was 28 points lower in the 3rd grade (382 v. 410), 27 points lower in the 4th grade (383 v. 410), and 26 points lower in the 5th grade (399 v. 425).

Figure 4.2 Black and White students mathematics mean scale scores on MSA in 3rd, 4th, and 5th grades (n=5,431)



MSA Pass Rates. The MSA pass rates, the percentage of Black and White students that attained proficiency or advanced levels in reading and mathematics in the 3rd, 4th, and 5th grades, are presented next. The general trend for the study group in reading and mathematics is somewhat different for the pass rates than the scale scores. Whereas the general trend for reading scale scores was a drop between the 3rd and 4th grades with a trend toward increasing scores in the 5^{th} grade, the pass rates increased between the 3^{rd} and 4^{th} grades and flatten or slightly decreased in the 5^{th} grade. The trend in mathematics scale scores indicates no change between the 3^{rd} and 4^{th} grades with notable gains in the 5^{th} grade, but the mathematics pass rates display an opposing pattern with increases in the early grades and a slight decline in the later grade. Regardless, both the scale scores and the pass rates reveal a persistent achievement gap across the elementary years.

In reading, the pass rate for Black students was 23 percentage points lower than the passage rate for White students in the 3^{rd} grade (52.4 v. 75.2), 15 percentage points lower in the 4^{th} grade (73.5 v. 88.9), and 17 percentage points lower in the 5^{th} grade (70.4 v. 87.8); in mathematics, the passage rate for Black students was 26 percentage points lower in the 3^{rd} grade (53.4 v. 79.3), 23 percentage points lower in the 4^{th} grade (61.1 v. 84.5), and 22 percentage points lower in the 5^{th} grade (59.8 v. 81.3). Although Table 4.1 suggests a narrowing of the achievement gap between the 3^{rd} and 5^{th} grades, more than one-quarter of Black students in reading and more than one-third in mathematics had failed to attain proficiency by the end of the 5^{th} grade.

Table 4.1

Percentage of Black and White Students Who Passed MSA Reading and Mathematics in 3rd, 4th, and 5th grades (n= 5,431)

MSA	Grade 3	Grade 4	Grade 5
	Reading		
Black	52.4	73.5	70.4
White	75.2	88.9	87.8
Racial Gap	**22.8**	**15.4**	**17.4**
	Mathematics		
Black	53.4	61.1	59.8
White	79.3	84.5	81.3
Racial Gap	**25.9**	**23.4**	**21.5**

MSA Pass-Fail Combinations. For Black and White students, the different pass-fail combinations on the MSA between the 3rd and 5th grades are presented below in Table 4.2. Most White students passed the reading and mathematics assessments each year (reading - 72%, and mathematics – 72.6%). White students also had the lowest percentage of students failing the assessments all three years (reading – 6.2%, and mathematics – 9.4%). Less than half of Black students passed all three years of the MSA (reading – 47.1%, and mathematics 44%) and higher percentages failed the assessments between the 3rd and 5th grades (reading 17.7%, and mathematics 27.6%).

The “end in pass” category indicates gains in reducing the achievement gap in both reading and mathematics, as higher percentages of Black students than White students progressed from failing to passing the assessments in reading and mathematics

(23.2% v. 15.9% in reading, 15.9% v. 8.6% in mathematics). These gains in closing the achievement gap, however, are largely offset by the higher percentage of Black students than White students who fail to sustain proficiency between the 3rd and 5th grades (12% v. 5.9% in reading, 12.5% v. 9.3% in mathematics). In reading, for every two Black students who attain proficiency, one Black student fails to sustain proficiency; in mathematics, the ratio is nearly one to one.

Table 4.2

Percentage of Black and White Students' Progress on MSA Reading and Mathematics in 3rd, 4th, and 5th Grades (n=5,431)

	Passed All	Failed All	End in Pass	End in Fail
Reading				
White n=3,474	72.0	6.2	15.9	5.9
Black n=1,957	47.1	17.7	23.2	12.0
Mathematics				
White n=3,474	72.6	9.4	8.6	9.3
Black n=1,957	44.0	27.6	15.9	12.5

MSA Proficiency Levels. As discussed above, MSA mean scale scores, pass rates, and pass-fail combinations all show a persistent achievement gap in the elementary grades, but somewhat different pictures of the school district's success in reducing the gap. Yet another way to examine the achievement gap is to consider the percentages of students attaining not only proficiency but also advanced proficiency status. Figure 4.7 presents these results for reading in the form of "stacked bar graph".

As depicted in Figure 4.3, there is a general trend in the study group for more students to attain advanced proficiency in reading in later grades, but the increases are greater for White students than Black students. As the achievement gap narrows at the basic level, it widens at the advanced level for Black students. Roughly, 16% of White students attained advanced proficiency in the 3rd grade compared to 4% of the Black students. By the 4th grade, 27% of the White students and 8% of the Black students had attained advanced proficiency, and by the 5th grade 43% of the White students and 18% of the Black students had achieved the MSA "exemplary level of performance" on the reading assessment. Despite improvements in performance for both Black and White students, the gap increased from 12 to 25 percentage points between the 3rd and 5th grades at the advanced level.

Figure 4.3 Proficiency levels on MSA reading in 3rd, 4th, and 5th grades for Black and White students (n=5,431)

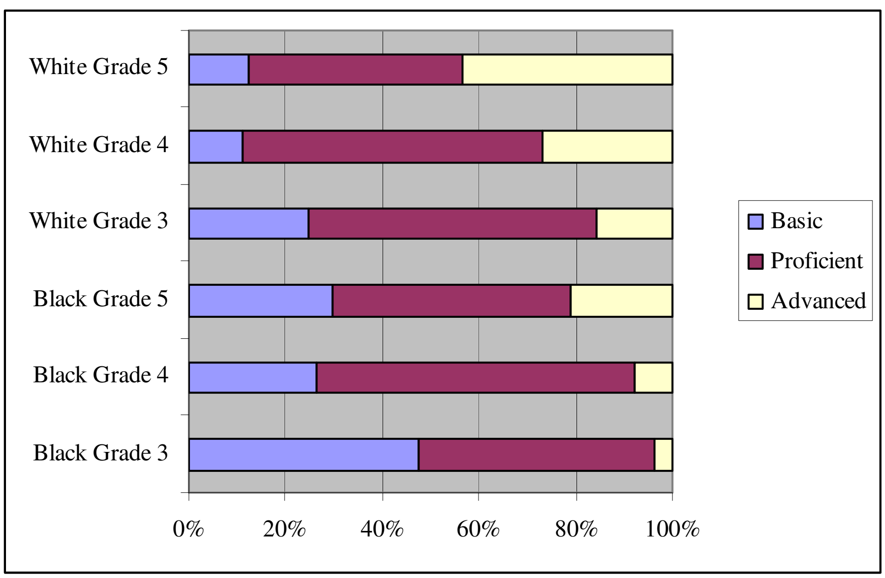
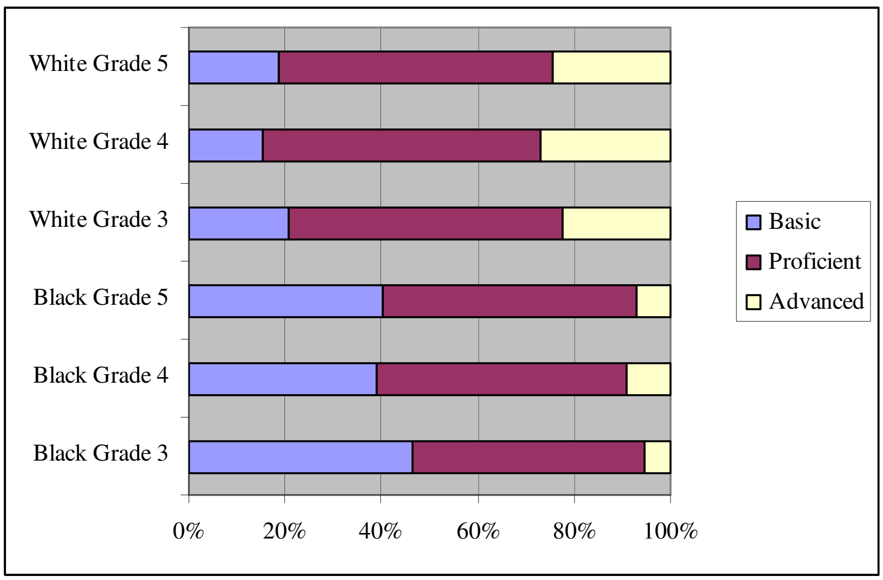


Figure 4.4 presents the percentage of students attaining each proficiency level for mathematics. Overall, there is less change across grades in the percentage of students

attaining advanced proficiency in mathematics compared to reading, regardless of race. Roughly 22% of White students had attained advanced proficiency by the 3rd grade, 27% by the 4th grade, and 25% by the 5th grade. By comparison, the percentage of Black students at each grade level was 6%, 9%, and 7% respectively. Between the 3rd and 5th grades, the achievement gap at the advanced proficiency level in mathematics increased only slightly (from 16 percentage points to 18 percentage points), mirroring the relatively small changes across grades at all levels of proficiency.

Figure 4.4 Proficiency levels on MSA mathematics in 3rd, 4th, and 5th grades for Black and White students (n=5,431)



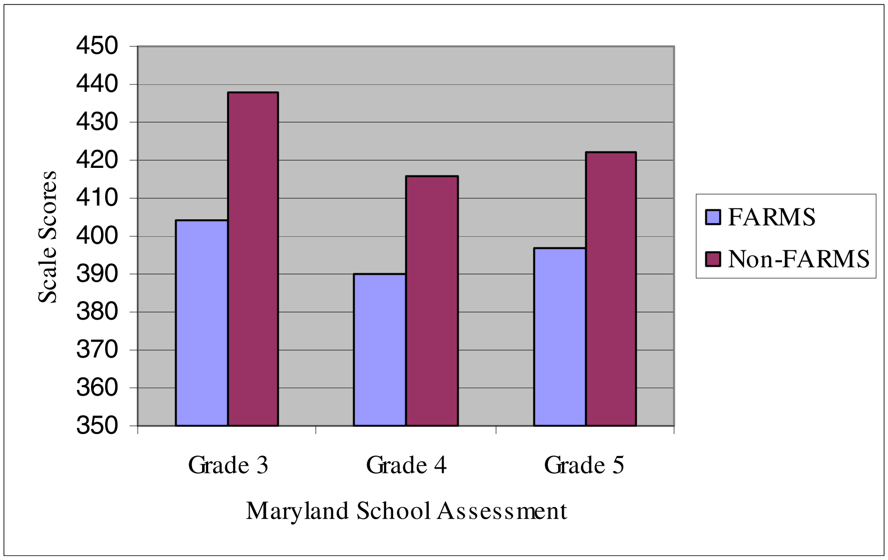
Nature of the Poverty Gap

To address the first research question, the poverty gap is examined in terms of (1) differences in economically advantaged and disadvantaged students' mean scale scores on MSA reading and mathematics assessments in 3rd, 4th, and 5th grades; (2) differences in the percentage of economically advantaged and disadvantaged students who passed the MSA (proficient or advanced); (3) differences in the percentage of economically advantaged and disadvantaged students with various pass-fail combinations; and (4) differences in the percentage of economically advantaged and disadvantaged students at each proficiency level.

MSA Mean Scale Scores. For reading, the general trend for the study group indicates a decline in scale scores between the 3rd and 4th grades with a trend toward increasing scores in the 5th grade. In reading, the study group's CRT mean scale scores were 427 in the 3rd grade, 407 in the 4th grade, and 414 in the 5th grade. The difference on the overall trend between reading and mathematics may be the result of changes in the reading assessment that occurred during the 2003-2004 school year.

Figure 4.5 presents the mean scale scores on the criterion-referenced test (CRT) portions of the MSA for FARMS and Non-FARMS students. Non-FARMS students scored consistently higher in reading than FARMS students. The difference in scores diminishes somewhat between the 3rd and 4th grades but remained relatively constant between the 4th and 5th grades. On average, FARMS students score 34 points lower than Non-FARMS students in the 3rd grade (404 v. 438), 26 points lower in the 4th grade (390 v. 416), and 25 points lower in the 5th grade (397 v 422).

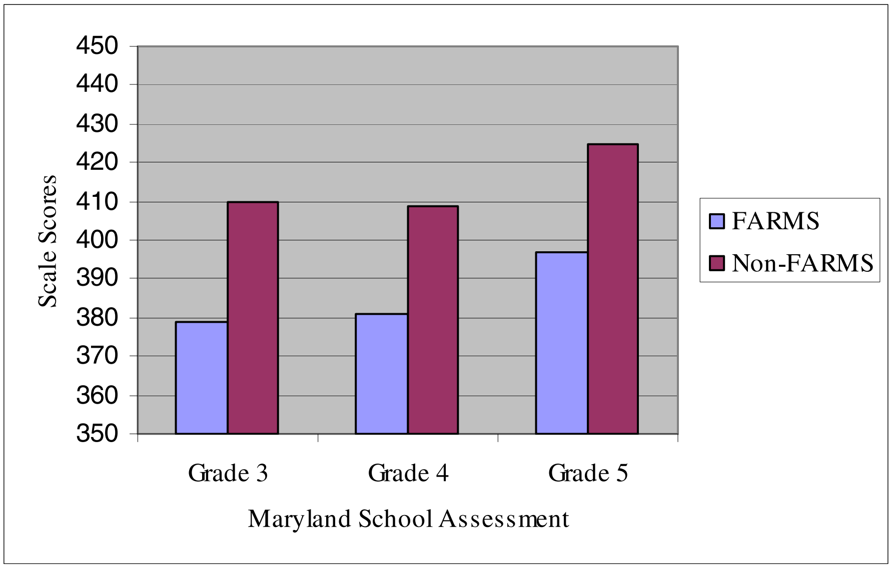
Figure 4.5 FARMS and Non-FARMS students reading mean scale score on MSA in 3rd, 4th, and 5th grades (n=5,431)



For mathematics, the general trend for the study group suggests little change in mean scale scores between the 3rd and 4th grade with notable gains in the 5th grade. In mathematics, the study group's CRT mean scale score was 400 in the 3rd grade, 400 in the 4th grade, and 416 in the 5th grade.

Figure 4.6 presents mean scale scores on the CRT portion of the MSA mathematics assessment. As with reading, there is noticeable achievement gap in the mean scale scores of Non-FARMS and FARMS students. The difference in scale scores declined slightly each year, though the overall reduction in the gap between the 3rd grade and 5th grade was only 4 points. The mean scale score for FARMS students was 31 points lower than Non-FARMS students in the 3rd grade (379 v. 410), 28 points lower in the 4th grade (381 v. 409), and 27 points lower in the 5th grade (397 v. 424).

Figure 4.6 FARMS and Non-FARMS students mathematics mean scale score on MSA in 3rd, 4th, and 5th grades (n=5,431)



MSA Pass Rates. While the mean scale scores identify an achievement gap, they do not indicate the pass rates for students or attainment of the various proficiency levels reported by the MSA. Pass rates indicate the percentage of students that attained proficiency or advanced status in reading and mathematics in the 3rd, 4th, and 5th grades.

The trend in reading and mathematics is somewhat different for the pass rates than the mean scale scores on MSA. Whereas the mean scale scores in Figure 4.5 show a drop in achievement between the 3rd and 4th grades in reading and an increase in scores between the 4th and 5th grades, the trend for pass rates is just the opposite with increases between the 3rd and 4th grades and no change or even a slight decline between the 4th and 5th grades. Mathematics pass rates also display an opposing pattern to the mean scale scores in Figure 4.6 with increases in the early grades and a flattened trend in the later grades. Regardless, both the scale scores and the pass rates reveal a persistent achievement gap across the elementary grades, though these gaps are somewhat smaller when judged by pass rates.

In reading, the pass rate for FARMS students was 28 percentage points lower than the passage rate for Non-FARMS students in the 3rd grade (47.9 v. 76.1), 18 percentage points lower in the 4th grade (71.3 v. 89.1), and 21 percentage points lower in the 5th grade (67.0 v. 88.4). In mathematics, the pass rate for FARMS students was 28 percentage points lower than the pass rate for Non-FARMS students in the 3rd grade (51.1 v. 79.0), 25 percentage points in the 4th grade (59 v. 84.2), and 22 percentage points in the 5th grade (59.2 v. 81.6). Although Table 4.3 suggests a narrowing of the achievement gap between the 3rd and 5th grades in both reading and mathematics, a third or more of all FARMS students did not attain proficiency in these subjects by the end of the 5th grade.

Table 4.3

Percentage of FARMS and Non-FARMS Students Who Passed MSA Reading and Mathematics in 3rd, 4th, and 5th Grades (n= 5,431)

MSA	Grade 3	Grade 4	Grade 5
	Reading		
FARMS	47.9	71.3	67.0
Non-FARMS	76.1	89.1	88.4
Poverty Gap	**28.2**	**17.8**	**21.4**
	Mathematics		
FARMS	51.1	59.0	59.2
Non-FARMS	79.0	84.2	81.6
Poverty Gap	**27.9**	**25.2**	**22.4**

MSA Pass-Fail Combinations. Table 4.4 indicates the disparity in passes and failures for FARMS and Non-FARMS students over time. Most (73%) Non-FARMS students passed all of the reading or mathematics assessments over the three-year period. Non-FARMS students had the fewest "fail all" on either MSA (reading - 6%, and mathematics – 9.9%). Comparatively, less than half of FARMS students passed all three assessments in reading (42.7%) and mathematics (40.8%), and three times as many FARMS students failed the assessments each year (reading 19.6% and mathematics 28.7%).

The "end in pass" results for FARMS students compared to Non-FARMS students indicate a closing of the achievement gap with higher percentages of FARMS students going from fail to pass than Non-FARMS students (24.4% v. 15.7% in reading, 15.7% v. 9.1% in mathematics). But the "end in fail" category also shows that students, especially FARMS students, do not always sustain proficiency, as there are higher percentages of FARMS students than Non-FARMS students who pass an assessment but fail in subsequent grades (13.3% v. 5.6% in reading, 14.8% v. 8.4% in mathematics). Although more students achieve proficiency than fall behind, the higher rate of failure to sustain proficiency by FARMS students largely eliminates the school district's gains in reducing the achievement gap.

Table 4.4

Percentage of FARMS and Non-FARMS Students' Progress on MSA Reading and Mathematics in 3rd, 4th, and 5th Grades (n= 5,431)

	Passed All	Failed All	End in Pass	End in Fail
Reading				
Non-FARMS n=3679	72.7	6.0	15.7	5.6
FARMS n=1752	42.7	19.6	24.4	13.3
Mathematics				
Non-FARMS n=3679	72.6	9.9	9.1	8.4
FARMS n=1752	40.8	28.7	15.7	14.8

MSA Proficiency Levels. As discussed earlier, another way to examine the achievement gap is to consider the percentages of students attaining not only proficiency but also advanced proficiency status. There is a general trend for the study group for more students to attain advanced proficiency in reading in subsequent grades, but the increases are greater for Non-FARMS students than FARMS students. In other words, even if the achievement gap narrows at the basic level of proficiency, it widens at the advanced level. Roughly 16% of Non-FARMS students attained advanced proficiency in the 3rd grade compared to 3% of the FARMS students. By the 4th grade 26% of Non-FARMS students and 7% of FARMS students had attained advanced proficiency, and by the 5th grade 18% of FARMS students and 43% of Non-FARMS students had achieved what the MSA describes as an "exemplary level of performance" on the reading assessment. Despite improvements in performance for both Non-FARMS and FARMS students, the gap increased from 13 percentage points to 25 percentage points between the 3rd and 5th grades at the advanced level.

Figure 4.7 Proficiency levels on MSA reading in 3rd, 4th, and 5th grades for FARMS and Non-FARMS students (n=5,431)

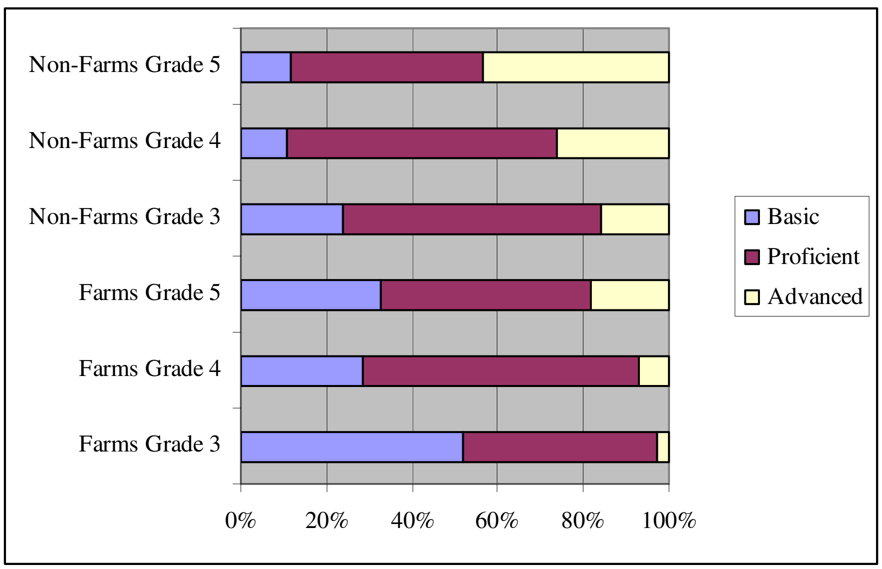
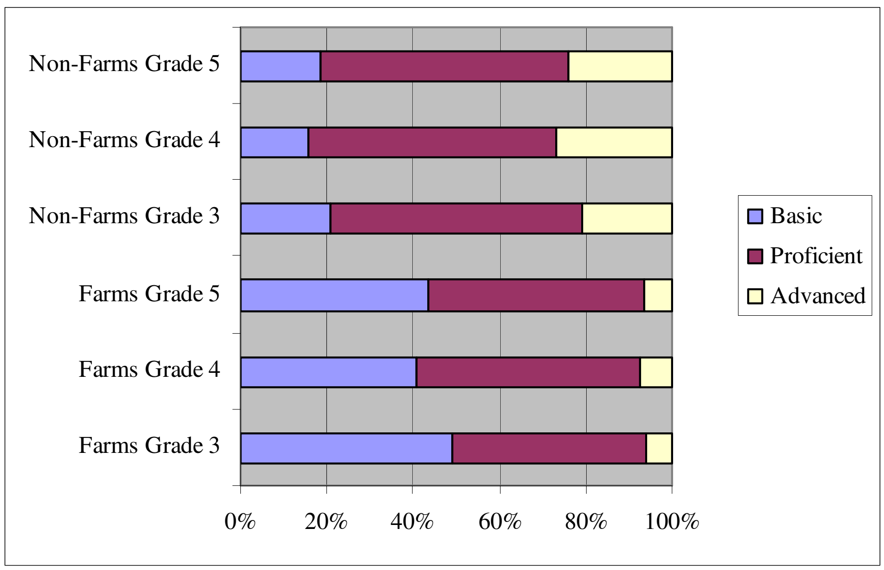


Figure 4.8 presents the percentage of students attaining each proficiency level for mathematics. Overall, there is less change across grades in the percentage of students attaining advanced proficiency in mathematics compared to reading, regardless of FARMS status.

Roughly 21% of Non-FARMS students had attained advanced proficiency by the 3rd grade, 27% by the 4th grade, and 24% by the 5th grade. By comparison, the percentage of FARMS students at each grade level was 6%, 8%, and 6% respectively. Between the 3rd and 5th grades, the achievement gap at the advanced proficiency level in mathematics increased only slightly (from 15 percentage points to 18 percentage points), mirroring the relatively small changes across grades at all levels of proficiency.

Figure 4.8 Proficiency levels on MSA mathematics in 3rd, 4th, and 5th grades for FARMS and Non-FARMS students (n=5,431)



Summary

The nature of the racial gap and the nature of the poverty gap were studied by examining MSA mean scale score, pass rates, pass-fail patterns, and proficiency levels. Depending on the analysis or measure, there is some variation in the interpretation of results for the school district.

The nature of the achievement gap is that White and economically advantaged students score consistently higher in reading and mathematics than Black and economically disadvantaged students on the MSA. The difference in mean scale scores in reading diminishes somewhat between the 3^{rd} and 4^{th} grades and remains relatively constant between the 4^{th} and 5^{th} grades. For mathematics, there is also a noticeable achievement gap in the mean scale scores across the grades. Although the difference in mean scale scores declines slightly each year, the reduction in the gap between the 3^{rd} grade and 5^{th} grades was relatively small.

Pass rates for Black students are lower than White students, as are the pass rates for economically disadvantaged students when compared to economically advantaged students. Although there appears to be a narrowing of the achievement gap between the 3^{rd} and 5^{th} grades in both reading and mathematics, nearly a third or more of Black and economically disadvantaged students fail to attain proficiency in these subjects by the end of the 5^{th} grade.

For the MSA pass-fail combinations, higher percentages of White and economically advantaged students pass all three years of the assessments and lower percentages fail to pass the assessments each year. Although higher percentages of Black and economically disadvantaged students progress from failing to passing the assessment in subsequent grades, these gains in reducing the achievement gap are largely offset by the higher percentages of Black and economically disadvantaged students who fail to sustain proficiency between the 3^{rd} and 5^{th} grades.

Although the general trend for the study group is for more students to attain advanced proficiency in reading in subsequent grades, the increases are greater for White and economically advantaged students than Black and economically disadvantaged students. In other words, as the achievement gap narrows at the basic level of proficiency, it widens at the advanced level. In reading, by the end of the 5^{th} grade, the gap between students attaining advanced proficiency for economically advantaged and disadvantaged students is 18 percentage points for White and Black students is 25 percentage points. Overall, there is less change in the achievement gap in regard to students attaining advanced proficiency in mathematics, mirroring the relatively small changes across grades for all students at all proficiency levels.

Predicting Proficiency

Logistic regression analysis was used to determine how well student performance on the CTBS/5 in the 2^{nd} grade predicts student proficiency on the MSA in the 3^{rd}, 4^{th}, and 5^{th} grades in reading and mathematics. The same analysis was repeated for each grade (3^{rd}, 4^{th}, and 5^{th}) and subject - reading (Tables 4.5, 4.6, and 4.7) and mathematics (Tables 4.8, 4.9, and 4.10).

Three different models were fit to the data. The simplest model includes prior performance, poverty, and race. This model estimates the achievement gap controlling for prior achievement. In addition to prior performance, individual race, and individual poverty, the second model includes the interaction terms of prior performance and individual race, and prior performance and individual poverty. This model examines whether the relationship between poor performance and student proficiency on the MSA is different for Black and White students and FARMS and Non-FARMS students. The third model includes prior performance, individual race, and individual poverty, the interaction terms, and school demographics - majority Black and majority FARMS. This final model examines whether relationships on the second model might be influenced by the characteristics of the schools attended by students.

Coefficients for all models are expressed as log odds - that is, as an estimate of the change in the probability of a student achieving MSA proficiency in reading or mathematics with a unit change in the value of the independent variable. Positive coefficients increase the odds of passing, and negative coefficients decrease the odds. Coefficients near zero tend to have no effect on the likelihood of an outcome and have significance levels greater than a selected criterion for p value. For this analyses, *p* is set at <.10.

MSA Proficiency in 3rd Grade Reading. In Table 4.5, Model 1, prior performance, poverty, and race are all statistically significant. Prior performance in the 2nd grade (.624) is positively and most strongly related to MSA proficiency in reading. Both FARMS status (-.493) and race (-.262) are negatively related to MSA proficiency in reading though the relationship with FARMS status is noticeably stronger. Model 1 indicates that advantaged students and White students are more likely to obtain proficiency on MSA reading in 3rd grade than poor students and Black students, even after controlling for student prior performance in the 2nd grade. Model 1 accurately predicted 67.6% failures and 90.7% correct passes for an overall percentage correct of 83.1% on the MSA reading in 3rd grade.

Model 2 includes the same variables and interaction terms for poverty and race. There is little change in the magnitude of the coefficients, but there is a slight reduction in the significance level for race (from <.01 to <.05). The logistic coefficients for the interaction term poverty and reading are not statistically significant, indicating that the relationship between prior performance and reading proficiency in the 3rd grade does not vary by either poverty status or race. Model 2, like Model 1, accurately predicted 67.6%

failures and 90.7% correct passes for an overall percentage correct of 83.1% on the MSA reading in 3^{rd} grade.

Model 3 includes the same variables as Model 1 and Model 2 and two school demographic variables that examines the effects of majority FARMS (over 50%) and majority Black enrollment (over 50%). Again, there is little change in the magnitude of the coefficients, but a slight reduction in the significance level of race (from <.05 to <.10). For 3^{rd} grade reading, neither majority FARMS nor majority Black enrollment is significantly associated with the probability of obtaining reading proficiency. Between the 2^{nd} and 3^{rd} grades, the strongest predictor of obtaining proficiency is 2^{nd} grade CTBS/5 reading performance followed by poverty status and then race. Model 3 accurately predicted 68.4% failures and 90.2% correct passes for an overall percentage correct of 83% on the MSA reading in 3^{rd} grade.

Table 4.5

Logistic Regression for Probability of MSA Reading Proficiency in 3rd Grade from CTBS/5 Reading Performance in 2nd Grade

	Log-Odds Coefficients[b] (n=5,431)		
Independent Variables	Model 1	Model 2	Model 3
Constant	1.567***	1.569***	1.607***
<u>Prior Performance</u>			
CTBS/5 Reading	.624***	.626***	.624***
<u>Poverty</u>			
FARMS	-.493***	-.527***	-.480***
<u>Race</u>			
Black	-.262**	-.236*	-.224~
<u>Interaction Terms</u>			
CTBS/5 FARMS		-.023	-.023
CTBS/5 Black		.017	.018
<u>School Demographics</u>			
Majority FARMS			-.144
Majority Black			.023

***p<.001, **p<.01, *p<.05, ~p<.10

Note. Coefficients are in log-odds. Positive coefficients increase the odds of passing; negative coefficients decrease the odds. Poverty and race are dummy-coded variables. The continuous variable CTBS/5 reading is centered on 0.

MSA Proficiency in 4th Grade Reading. In Table 4.6, Model 1, prior performance, poverty, and race are all statistically significant. Prior performance in the 2nd grade (.456) is positively related to MSA reading proficiency in reading in the 4th grade, but not as strongly related as it was to MSA proficiency in the 3rd grade. Both FARMS status (-.395) and race (-.412) are negatively related to MSA proficiency in reading though the relationship with FARMS status is noticeably stronger. Model 1 indicates that advantaged students and White students are more likely to obtain proficiency on MSA reading in 4th grade than poor students and Black students, even after controlling for student prior performance. Model 1 accurately predicted 36.9% failures and 95.7% correct passes for an overall percentage correct of 86% on the MSA reading in 4th grade.

Model 2 includes the same variables and interaction terms for poverty and race. The magnitude of the coefficient for poverty increased with the inclusion of the interaction terms, while the coefficient for race decreased slightly. The model indicates that the achievement gap between FARMS and Non-FARMS students is greater for students with higher levels of performance – that is, CTBS/5 scores in the 2nd grade are a weaker predictor of MSA reading proficiency in the 4th grade for FARMS students (-.084 + .489 = .405) than for Non-FARMS students. Although the coefficient for race dropped slightly, the interaction term is non-significant, indicating that the effects of prior performance are the same for Black and White students. Model 2 accurately predicted 36.2% failures and 96% correct passes for an overall percentage correct of 86% on the MSA reading in 4th grade.

Model 3 includes the same variables as Model 1 and Model 2 along with majority FARMS (over 50%) and majority Black enrollment (over 50%). The magnitude of the coefficients remains the same and there is little if any, change in significance levels. Of note is that students in elementary schools with more than half of their students participating in FARMS are less likely to obtain reading proficiency than students in schools with fewer students participating in FARMS, regardless of individual prior performance, poverty status, and race. There is no relationship, however, between proficiency and Black enrollment given the other variables in the model. Model 3 accurately predicted 37.1% failures and 95.8% correct passes for an overall percentage correct of 86% on the MSA reading in 4th grade.

Table 4.6

Logistic Regression for Probability of MSA Reading Proficiency in 4th Grade from CTBS/5 Reading Performance in 2nd Grade

	Log-Odds Coefficients[b] (n=5,431)		
Independent Variables	Model 1	Model 2	Model 3
Constant	2.733***	2.806***	2.841***
Prior Performance			
CTBS/5 Reading	.456***	.489***	.486***
Poverty			
FARMS	-.395***	-.627***	-.541***
Race			
Black	-.412**	-.364**	-.369*
Interaction Terms			
CTBS/5 FARMS		-.084*	-.082*
CTBS/5 Black		.013	.015
School Demographics			
Majority FARMS			-.260**
Majority Black			.081

***p<.001, **p<.01, *p<.05, p<.10

Note. Coefficients are in log-odds. Positive coefficients increase the odds of passing; negative coefficients decrease the odds. Poverty and race are dummy-coded variables. The continuous variable CTBS/5 reading is centered on 0.

MSA Proficiency in 5th Grade Reading. In Table 4.7, Model 1, prior performance, poverty, and race are all statistically significant. Prior performance (.425) is positively related to MSA proficiency in reading, thus slightly less so in the 5th grade than the 4th grade. FARMS status (-.594) and race (-.442) are negatively related to MSA proficiency in reading. Model 1 indicates that advantaged students and White students are more likely to obtain proficiency on MSA reading in 5th grade than poor students and Black students, even after controlling for prior performance. These relationships are noticeably stronger for FARMS status and slightly weaker for race in the 5th grade compared to the

4^{th} grade. Model 1 accurately predicted 37.6% failures and 94.7% correct passes for an overall percentage correct of 84.2% on the MSA reading in 5^{th} grade.

Model 2 includes the same variables and interaction terms for poverty and race. Prior performance, poverty, and race are all statistically significant. The magnitude for the coefficient for poverty increases and the magnitude of the coefficient for race decreases noticeably with the inclusion of the interaction term. As in the 4^{th} grade, the achievement gap between FARMS and Non-FARMS students is greater for students with higher levels of prior performance – that is, the CTBS/5 scores in the 2^{nd} grade are a weaker predictor of reading proficiency in the 5^{th} grade for FARMS student (-.071 + .430 = .359) than Non-FARMS students (.430). The achievement gap between Black and White students is less for students with higher levels of prior performance – that is, the CTBS/5 scores in the 2^{nd} grade are a better predictor of reading proficiency in the 5^{th} grade for Black students (.061 + .430 = .491). Model 2 accurately predicted 37.6% failures and 94.7% correct passes for an overall percentage correct of 84.1% on the MSA reading in 5^{th} grade.

Model 3 includes the same variables as Model 1 and Model 2, and the two school demographic variables that examine the effects of majority FARMS (over 50%) and majority Black enrollment (over 50%). Prior performance and poverty remain statistically significant, though the magnitude of the coefficient declines somewhat from Model 2. Race is no longer statistically significant after including school demographics in the model. However, majority Black enrollment is positively related (.065) to reading proficiency and is statistically significant. Majority FARMS is statistically significant and negatively related (-.447) to reading proficiency in the 5^{th} grade. The pattern displayed across the analysis indicates that the poverty status of schools becomes increasingly important in predicting reading proficiency in the upper grades even after controlling for individual prior performance, poverty status, and race. Model 3 accurately predicted 38.4% failures and 94.8% correct passes for an overall percentage correct of 84.4% on the MSA reading in 5th grade.

Table 4.7

Logistic Regression for Probability of MSA Reading Proficiency in 5th Grade from CTBS/5 Reading Performance in 2nd Grade

	Log-Odds Coefficients[b] (n=5,431)		
Independent Variables	Model 1	Model 2	Model 3
Constant	2.583***	2.592***	2.675***
Prior Performance			
CTBS/5 Reading	.425***	.430***	.424***
Poverty			
FARMS	-.594***	-.780***	-.637***
Race			
Black	-.442***	-.277*	-.094
Interaction Terms			
CTBS/5 FARMS		-.071*	-.068*
CTBS/5 Black		.061~	.065~
School Demographics			
Majority FARMS			-.447***
Majority Black			-.150

***p<.001, **p<.01, *p<.05, ~p<.10

Note. Coefficients are in log-odds. Positive coefficients increase the odds of passing; negative coefficients decrease the odds. Poverty and race are dummy-coded variables. The continuous variable CTBS/5 reading is centered on 0.

MSA Proficiency in 3rd Grade Mathematics. In Table 4.8, Model 1, prior performance, poverty, and race are all statistically significant. Prior performance (.568) is positively and most strongly related to MSA proficiency in mathematics. FARMS status (-.490) and race (-.395) are negatively related to MSA proficiency in mathematics though the relationship with FARMS status is noticeably stronger. Model 1 indicates that advantaged students and White students are more likely to obtain proficiency on MSA mathematics in 3rd grade than poor students and Black students, even after controlling for student prior performance in the 2nd grade. Model 1 accurately predicted 64.4% failures and 91.1% correct passes for an overall percentage correct of 83.1% on the MSA mathematics in 3rd grade.

Model 2 includes the same variables and interaction terms for poverty and race. The magnitude of the coefficient for poverty increases with the inclusion of the interaction terms, while the coefficient for race decreases slightly. The model indicates that the achievement gap between FARMS and Non-FARMS students is greater for students with higher levels of performance – that is, CTBS/5 scores in the 2nd grade are a weaker predictor of MSA mathematics proficiency in the 3rd grade for FARMS students (-.069 + .607 = .519) than for Non-FARMS students. Although the coefficient for race dropped slightly, the interaction term is non-significant, indicating that the effects of prior performance are the same for Black and White students. Model 2 accurately predicted 65.4% failures and 90.5% correct passes for an overall percentage correct of 83% on the MSA mathematics in 3rd grade.

Model 3 includes the same variables as Model 1 and Model 2, and two school demographic variables that test the effects of majority FARMS (over 50%) and majority Black enrollment (over 50%). The magnitude of the coefficient for FARMS status decreases slightly as race became non-significant. Of note is that students in elementary schools with more than half of their students participating in FARMS are less likely to obtain reading proficiency than students in schools with fewer students participating in FARMS (-.068), regardless of individual prior performance, poverty status, and race. However, majority Black enrollment is positively related (.206) to proficiency in mathematics and is statistically significant. Model 3 accurately predicted 65.4% failures and 90.5% correct passes for an overall percentage correct of 83% on the MSA mathematics in 3rd grade.

Table 4.8

Logistic Regression for Probability of MSA Mathematics Proficiency in 3rd Grade from CTBS/5 Mathematics Performance in 2nd Grade

	Log-Odds Coefficients[b] (n=5,431)		
Independent Variables	Model 1	Model 2	Model 3
Constant	1.803***	1.829***	1.872***
<u>Prior Performance</u>			
CTBS/5 Mathematics	.568***	.607***	.586***
<u>Poverty</u>			
FARMS	-.490***	-.608***	-.556***
<u>Race</u>			
Black	-.395***	-.357**	-.187
<u>Interaction Terms</u>			
CTBS/5 FARMS		-.069~	-.068~
CTBS/5 Black		.018	.019
<u>School Demographics</u>			
Majority FARMS			-.187*
Majority Black			-.206~

***p<.001, **p<.01, *p<.05, ~p<.10

Note. Coefficients are in log-odds. Positive coefficients increase the odds of passing; negative coefficients decrease the odds. Poverty and race are dummy-coded variables. The continuous variable CTBS/5 mathematics is centered on 0.

MSA Proficiency in 4th Grade Mathematics. In Table 4.9, Model 1, prior performance and poverty are all statistically significant. Prior performance in the 2nd grade (.525) is positively related to MSA mathematics proficiency, but slightly less strong than in 3rd grade. FARMS status (-.479) and race (-.458) are negatively related to MSA proficiency in mathematics. Model 1 indicates that advantaged students and White students are more likely to obtain proficiency on MSA mathematics in 4th grade than FARMS and Black students, even after controlling for student prior performance. Model 1 accurately predicted 53.8% failures and 93.4% correct passes for an overall percentage correct of 83.9% on the MSA mathematics in 4th grade.

Model 2 includes the same variables and interaction terms for poverty and race. The magnitude of the coefficient for poverty increased with the inclusion of the interaction terms, while the coefficient for race decreased. The model indicates that the achievement gap between FARMS and Non-FARMS students is greater for students with higher levels of performance – that is, CTBS/5 scores in the 2nd grade are a weaker predictor of MSA mathematics proficiency in the 4th grade for FARMS students (-.125 + .572 = .447) than for Non-FARMS students (.572). Although the coefficient for race dropped slightly, the interaction term is non-significant, indicating that the effects of prior performance are the same for Black and White students. Model 2 accurately predicted 54.5% failures and 93% correct passes for an overall percentage correct of 83.8% on the MSA mathematics in 4th grade.

Model 3 includes the same variables as Model 1 and Model 2 along with majority FARMS (over 50%) and majority Black enrollment (over 50%). The magnitude of the coefficients remains the same and there is little, if any, change in significance levels. Of note is that students in elementary schools with more than half of their students participating in FARMS are less likely to obtain mathematics proficiency than students in schools with fewer students participating in FARMS (-.123), regardless of prior performance, poverty status, and race, decreases their chances of passing MSA mathematics in 4th grade. There is no relationship, however, between proficiency and Black enrollment given the other variables in the model. Model 3 accurately predicted

54.6% failures and 93.1% correct passes for an overall percentage correct of 83.9% on the MSA mathematics in 4th grade.

Table 4.9

Logistic Regression for Probability of MSA Mathematics Proficiency in 4th Grade from CTBS/5 Mathematics Performance in 2nd Grade

	Log-Odds Coefficients[b] (n=5,431)		
Independent Variables	Model 1	Model 2	Model 3
Constant	2.283***	2.368***	2.417***
Prior Performance			
CTBS/5 Mathematics	.525***	.572***	.570***
Poverty			
FARMS	-.479***	-.756***	-.667***
Race			
Black	-.458***	-.390**	-.328*
Interaction Terms			
CTBS/5 FARMS		-.125***	-.123**
CTBS/5 Black		.022	.020
School Demographics			
Majority FARMS			-.284**
Majority Black			-.028

***p<.001, **p<.01, *p<.05, ~p<.10

Note. Coefficients are in log-odds. Positive coefficients increase the odds of passing; negative coefficients decrease the odds. Poverty and race are dummy-coded variables. The continuous variable CTBS/5 mathematics is centered on 0.

MSA Proficiency in 5th Grade Mathematics. In Table 4.10, Model 1, prior performance, poverty, and race are all statistically significant. Prior performance (.492) is positively related to MSA proficiency in mathematics, though slightly less so in the 5th grade than the 4th grade. FARMS status (-.487) and race (-.220) are negatively related to MSA proficiency in mathematics. Model 1 indicates that advantaged students and White students are more likely to obtain proficiency on MSA mathematics in 5th grade than poor students and Black students, even after controlling for prior performance. Model 1 accurately predicted 54.2% failures and 92% correct passes for an overall percentage correct of 82% on the MSA mathematics in 5th grade.

Model 2 includes the same variables and interaction terms for poverty and race. Prior performance, poverty, and race are all statistically significant. The magnitude for the coefficients for poverty increased as did race slightly with the inclusion of the interaction terms. As in the 4th grade, the achievement gap between FARMS and Non-FARMS students is greater for students with higher levels of prior performance – that is, the CTBS/5 scores in the 2nd grade are a weaker predictor of reading proficiency in the 5th grade for FARMS student (-.093 + .538 = .445) than Non-FARMS students (.538). There is a slight change in the magnitude of the race coefficient, and a reduction is significance level (from $<.01$ to $<.05$). The interaction term for race is non-significant, indicating that the effects of prior performance are the same for Black and White students. Model 2 accurately predicted 55.6% failures and 91.8% correct passes for an overall percentage correct of 82.2% on the MSA mathematics in 5th grade.

Model 3 includes the same variables as Model 1 and Model 2 along with majority FARMS (over 50%) and majority Black enrollment (over 50%). Prior performance and poverty remain statistically significant, though the magnitude of the coefficient declines somewhat from Model 2. Race, however, is no longer statistically significant after including school demographics in the model. Majority FARMS is statistically significant and negatively related (-.345) to mathematics proficiency in the 5th grade. The pattern displayed across the analysis indicates that the poverty status of schools becomes increasingly important in predicting mathematics proficiency in the upper grades even after controlling for individual prior performance, poverty status, and race. There is no relationship, however, between proficiency and Black enrollment given the other variables in the model. Model 3 accurately predicted 55.3% failures and 91.8% correct passes for an overall percentage correct of 82.1% on the MSA mathematics in 5th grade.

Table 4.10

Logistic Regression for Probability of MSA Mathematics Proficiency in 5th Grade from CTBS/5 Mathematics Performance in 2nd Grade

	Log-Odds Coefficients[b] (n=5,431)		
Independent Variables	Model 1	Model 2	Model 3
Constant	1.889***	1.957***	2.013***
<u>Prior Performance</u>			
CTBS/5 Mathematics	.492***	.538***	.535***
<u>Poverty</u>			
FARMS	-.487***	-.668***	-.557***
<u>Race</u>			
Black	-.220**	-.230*	-.160
<u>Interaction Terms</u>			
CTBS/5 FARMS		-.093**	-.090**
CTBS/5 Black		-.012	-.013
<u>School Demographics</u>			
Majority FARMS			-.345***
Majority Black			-.020

***p<.001, **p<.01, *p<.05, ~p<.10

Note. Coefficients are in log-odds. Positive coefficients increase the odds of passing; negative coefficients decrease the odds. Poverty and race are dummy-coded variables. The continuous variable CTBS/5 mathematics is centered on 0.

Summary

Findings for predicting MSA proficiency for reading and mathematics are parallel. Prior performance in the early learning years is positively related to proficiency in reading and mathematics in the middle and later elementary years. White and economically advantaged students are more likely to achieve proficiency on MSA reading and mathematics in 3rd, 4th, and 5th grades than Black and disadvantaged students.

In 4th and 5th grades, the interaction relationship of prior performance and poverty in the early learning years is predictive of MSA proficiency in the middle and later elementary years in both reading and mathematics. The interaction relationship of prior performance and race is not predictive. Neither of the interaction terms, prior performance and poverty nor prior performance and race are predictive for 3rd grade reading.

In terms of school demographics, “majority FARMS schools,” with the exception of 3rd grade reading, had poorer performance on the MSA in all grades and subjects. For the school demographic, “majority Black schools,” findings revealed that with the exception of 3rd grade mathematics, school race is not a contributing factor to success or failure.

The probability of predicting passing MSA reading or mathematics is stronger for White and more affluent students. This is because there is more variation in the scores of Black and poor students than there is for White and more affluent students.

CHAPTER V

DISCUSSION and IMPLICATIONS

Overview

The reauthorization of the Elementary and Secondary Education Act, "No Child Left Behind" or NCLB has placed raising achievement overall for students and closing the achievement gap on the national agenda. NCLB's intent is to hold public schools accountable for higher levels of achievement for all students, including historically under achieving minority student populations and economically disadvantaged subgroups. Current legislation requires that all students attain state-established levels of proficiency in reading and mathematics by 2014. Maryland, like other states, must demonstrate not only overall achievement gains by making adequate yearly progress (AYP) toward its goal but must demonstrate that it is doing so for all students, including minority students and students who participate in free-and-reduced priced meal services (FARMS).

I investigated the feasibility of using early testing to identify students at risk of failing a state-based assessment in later-elementary grades. More specifically, I examined the relationship between scores on the Comprehensive Tests of Basic Skills (CTBS/5) 2nd grade reading and mathematics assessment and students' subsequent performance on the Maryland School Assessment (MSA) in the 3rd, 4th, and 5th grades. Using assessment data from a large metropolitan school district, two sets of research questions were posed as:

- What is the achievement gap between Black and White students in the 2nd grade? What is the achievement gap between economically advantaged and disadvantaged students in the 2nd grade? How do these achievement gaps change over time as students progress through the 3rd, 4th, and 5th grades?
- Can student performance on the CTBS/5 in the 2nd grade predict student proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics? Are there differences between White and Black students or economically advantaged and disadvantaged students in how well student performance on the CTBS/5 in the 2nd grade predicts their proficiency on the MSA in the 3rd, 4th, and 5th grades in reading and mathematics?

The study identifies a persistent achievement gap between Black and White students and between economically advantaged and disadvantaged students in the school district. Unlike what has been observed in recent national trend data using mean scale scores (e.g., National Assessment of Educational Progress), the achievement gap narrows somewhat in the school district that is the focus of this study. The nature of the achievement gap in the school district, however, is somewhat more complex when examined using pass rates, pass-fail combinations, and advanced proficiency status. Although there is a narrowing of the gap in the percentage of students who attain proficiency between the 3rd and 5th grades, these gains are largely offset by the percentage of Black and economically disadvantaged students who fail to sustain proficiency in subsequent grades. Moreover, as the gap in the pass rate narrows, there is a widening gap between Black and White students and between economically advantaged and disadvantaged students who attain advanced levels of proficiency, especially in reading.

Students' 2nd grade CTBS/5 scores predict whether students pass the reading and mathematics MSA in the 3rd, 4th, and 5th grades, though the strength of the association declines in later grades. FARMS status (both individual and schoolwide) is also a consistent predictor of failure to attain proficiency, especially in the later grades. Moreover, using FARMS status, minority status, and students 2nd grade CTBS/5 score, it is possible to identify and target for early intervention a majority of the students who will fail either the reading or mathematics assessment in a subsequent grade. Thus, early identification and intervention is feasible and may enhance the capacity of state and local education leaders to meet the ambitious achievement goals set by NCLB.

I discuss these findings in greater detail next. I begin with a discussion of the achievement gap, followed by a discussion of the feasibility of using the 2nd grade CTBS/5 scores to predict subsequent MSA performance of four different populations of students – Non-FARMS (non-poor) and FARMS (poor) White students and Non-FARMS (non-poor) and FARMS (poor) Black students. I conclude with a discussion of the potential implications of these findings for schools and policymakers.

Discussion

I organized the discussion according to the research questions that I posed for the study. In discussing the results for the achievement gap, I consider each of the analyses performed in Chapter IV, focusing on the potential policy implications and the merits of each approach for examining the achievement gap. In discussing the results for the prediction models, I focus on the overall findings of these analyses, consider the relative accuracy of the models for different subgroup combinations and explore the feasibility of using these models to identify students most likely to fail subsequent assessments. In discussing the feasibility of using the models, I consider two different identification strategies: (1) a threshold criteria on the 2nd grade CTBS/5 scores based on a prediction model for FARMS Black students, and (2) a threshold criteria on the 2nd grade CTBS/5 scores based on within school district percentiles for all students.

Racial and Poverty Gaps. Findings in Chapter IV consistently indicate an achievement gap between White and Black students and economically advantaged and disadvantaged students, but subtle differences in the progress made by the school district in narrowing these gaps. The achievement gap on the MSA were examined in different ways – as the difference in mean scale scores, the difference in pass rates, the difference in pass-fail combinations, and the difference in students attaining each proficiency level (basic, proficient, or advanced). Examining the achievement gap in different ways provides additional information about the nature and scope of the achievement gap that may be useful to local practitioners and policymakers.

Mean Scale Scores. The most traditional approach to examining is a comparison of mean scale scores. Education researchers report mean scale scores in education journals, publications, and national reports. Mean scale scores are used to show growth or change in achievement for individual students or cohorts of students across time. The federally funded National Assessment for Educational Progress (NAEP) has provided the primary analysis of the achievement gap in the U.S. since 1969, when the National Center for Education Statistics began surveying students to determine what students know and can do in specific subject areas.

The first analysis of the achievement gap in Chapter IV used a strategy similar to that used by NAEP to examine the achievement gap. I calculated the mean scale scores on the MSA from the criterion-referenced test (CRT) portions of the assessment and compared the mean scale scores for different subgroups of students. I examined the mean scale scores to determine relative gains or losses over time. The disaggregation of data permits the identification of changes over time for schools or groups of students that may not be apparent in global analyses of scores. The popularity of such an examination is that they provide a relatively straightforward and easily calculable set of comparisons with which to examine achievement differences between groups of students (assuming the use of a comparable assessment). This is especially true when there are a large number of students.

In reading, the general trend for the study group is a decline in mean scale scores between the 3rd and 4th grades with a trend toward increasing scores in the 5th grade. This trend is consistent for Black and White students, as well as economically advantaged and disadvantaged students, though the rate of change varied slightly between groups. Although White and economically advantaged students consistently out-scored their peers in the study group, the analysis suggests that the school district made modest progress in closing the achievement gap between the 3rd and 5th grades. The difference in mean scale scores between White and Black students and economically advantaged and disadvantaged students diminishes by 9 points over this time period.

For mathematics, the overall study group trend suggests little change in mean scale scores between the 3rd and 4th grade with modest gains in the 5th grade. Once again the overall trend is consistent for all the subgroups examined in the study. As in reading, White and economically advantaged students consistently out score their peers in the study group; nonetheless, the analysis indicates a slight narrowing of the achievement gap in the school district. The difference in mean scale scores between White and Black students declines by 2 points between the 3rd and 5th grades, while the difference in these same scores between economically advantaged and disadvantaged students declines by 4 points.

Pass Rates. While mean scale scores can provide a running picture of achievement levels for different subgroups, they do not indicate the pass rates for students or attainment of the various proficiency levels by students as mandated by state and federal policies. In an age of high-stakes accountability, school districts are more likely to be interested in how successful they are in meeting their annual yearly progress (AYP) goals and how this progress compares across groups of students. Because accountability policies like NCLB emphasize proficiency levels and de-emphasize the reporting of mean scale scores to the public, pass rates are likely to be more informative and more politically meaningful for educators interested in addressing the achievement gap and raising the overall performance of students.

Interestingly, the general trend for the study group for pass rates in reading and mathematics is different from the general trend represented by the mean scales scores in reading and mathematics. While the mean scale scores decline between the 3rd and 4th grades but increase between the 4th and 5th grades, pass rates increase between the 3rd and 4th grades and flatten or even decline slightly between the 4th and 5th grades.

Although the overall trend for pass rates differs from the overall trend for mean scale scores, the analysis presented in Chapter IV suggests that the school district also made modest progress in closing the achievement gap in pass rates. The analysis suggests that the narrowing of the gap is somewhat smaller in reading but somewhat larger in mathematics when judged by pass rates for both Black students and economically disadvantaged students. Between the 3^{rd} and 5^{th} grades, differences between White and Black students decline 5 percentage points in reading and 4 percentage points in mathematics; between these same grades, differences between economically advantaged and disadvantaged students decline by 7 percentage points in reading and 6 percentage points in mathematics. Although there is a narrowing of the achievement gap between the 3^{rd} and 5^{th} grades in both reading and mathematics, nearly a third or more of all Blacks students and economically disadvantaged students failed to attain proficiency in these subjects by the end of the 5^{th} grade.

The scale scores and the pass rates reveal somewhat different pictures of changes in achievement in the school district, though each identifies a persistent achievement gap across the elementary years. Trends in mean scale scores suggest more positive trends over time in the school district, both for students overall and for specific subgroups; trends in pass rates, however, are less positive, indicating possible declines in the percentage of students attaining proficiency and smaller reductions in the achievement gap. The less positive results for the analysis of pass rates may reflect the growing difficulty associated with bringing previously low and moderately achieving students up to an acceptable level of proficiency. Whereas the changes in the mean scale scores reflect changes at all levels of achievement, changes in pass rates reflect changes at the lower ends of the scale.

Pass-Fail Combinations. In Maryland, accountability and school improvement results are published in an annual "Report Card". Although these Report Cards provide useful information regarding overall MSA performance, they do not provide information about how well students do on a sequence of assessments. To reduce the achievement gap, students must not only attain proficiency, they must also sustain proficiency in subject areas in subsequent grades. Neither annual mean scale scores nor annual pass rates reveal the percentage of students who succeed or fail to do so.

To better understand patterns of passing and failing MSA across grades, I categorized students into four distinct groups – students who passed all of the assessments in reading or mathematics in the 3rd, 4th, and 5th grades; students who failed all of the assessments; students who failed an assessment in an earlier grade but passed in 5th grade; and students who passed an assessment in an earlier grade but failed in 5th grade. The findings confirmed that the greater the proportions of Black students and economically disadvantaged students who attain and sustain proficiency across the elementary grades, the greater the reduction in the school district's achievement gap and the greater the progress toward meeting AYP goals.

The analyses in Chapter IV indicate that nearly three-quarters of White students and economically advantaged passed the reading and mathematics assessments at each grade and 10% or fewer failed these assessments in every grade. By contrast, less than half of Black students and economically disadvantaged students passed all of the assessments, while 18% or more failed the reading assessments and 25% or more failed the mathematics assessments in every grade (see Tables 4.2 and 4.4). These students represent no change in proficiency status across grades – in each case, students either passed the assessment or failed the assessment in the 3rd grade and maintained that status in subsequent grades.

Roughly one-fifth of White students and economically advantaged students changed their proficiency status in reading and mathematics between the 3rd and 5th grades compared to roughly one-third of Black students and economically disadvantaged students. A greater percentage of historically under achieving students changed their status from passing to failing, but a greater proportion of these same students failed to retain proficiency, offsetting much of these gains. If every student who achieved proficiency had sustained proficiency between the 3rd and 5th grades, the achievement gap would have been narrowed to less than 14 percentage points in reading and less than 19 percentage points in mathematics.

There are a number of possibilities for changes in the proficiency status of students, including students who barely passed or failed previous assessments, positive and negative changes in the educational experiences of students, or changes in students' personal situations (e.g., physical and mental health or family life). Nonetheless, helping students achieve proficiency and sustain this status in subsequent grades is a primary concern of all schools and school districts in this era of high-stakes accountability. An examination of the various pass-fail combinations across grades provides additional insights into the nature of the achievement gap and the school district's progress in meeting AYP goals not obvious from an examination of either mean scale scores or annual pass rates.

Proficiency Levels. A fourth way to examine the achievement gap is to consider the percentages of students attaining not only proficiency but also advanced proficiency status. This approach is a combination of an analysis of mean scale scores and an analysis of pass rates because it characterizes the achievement gap at both moderate and higher levels of achievement – that is, at both the proficiency and advanced proficiency levels in reading and mathematics. I conducted this analysis in Chapter IV to determine what is happening to the achievement gap at the advanced levels of proficiency even if the achievement gap narrows at the minimal level of proficiency mandated by the state.

In this study, as in other studies (Denton & West, 2002; Rathbun, West, & Germino-Hausken, 2004; West, Denton, & Reaney, 2001), there is a general trend for the achievement gap to narrow at the minimal level of proficiency but widen at the highest level of proficiency. The trend is most pronounced in reading, where greater changes in proficiency status occurred between the 3rd and 5th grades. In reading, the achievement gap narrowed to roughly 20 percentage points at the minimal level of proficiency but widened to roughly 25 percentage points at the advanced level (see Figures 4.3 and 4.7); in mathematics, the achievement gap also narrowed to roughly 20 percentage points at the minimal level of proficiency but widened to roughly 18 percentage points at the advanced level (see Figure 4.4 and 4.8). These analyses cast a cautionary shadow on the analysis of pass rates at minimal levels of proficiency. Even if the achievement gap is eliminated at levels of performance mandated by high-stakes accountability policies, meaningful differences in achievement may still exist at higher levels of performance between White and Black students and economically advantaged and disadvantaged students.

Summary. White students and economically advantaged students had higher mean scale scores, pass rates, and advanced proficiency rates in reading and mathematics than Black students and economically disadvantaged students on the state assessments in each grade. White students and economically advantaged students also had more positive pass-fail combinations than Black students and economically disadvantaged students with the exception of the percentage of students who achieved proficiency by the 5th grade after failing an assessment in an earlier grade. Overall, though, the data indicate that the school district made noticeable progress in reducing the achievement gap between the 3rd and 5th grades, especially in reading. These gains are greatest when measured by mean scale scores, smaller when measured by pass rates, and somewhat complicated when measured by pass-fail combinations and the percentage of students attaining advanced proficiency.

Most students, regardless of race or economics, are at the proficient level or "the minimum academic achievement level expected for every student" in reading and mathematics by the end of the 5th grade. However, the gains made by Black students and economically disadvantaged students are partially offset by the inability of students to sustain proficiency in later grades. There is also a general trend for more White students and economically advantaged students to attain advanced proficiency in subsequent grades, while more Black students and economically disadvantaged students attain the minimum level of proficiency in reading or mathematics. In other words, as the achievement gap narrows at the basic level of proficiency, it widens at the advanced level where students are expected to be demonstrating "an exemplary level of achievement" or "outstanding accomplishment".

One implication of the analyses in Chapter IV is that no single approach to examining the achievement gap provides a comprehensive picture of the gap's nature and scope. Within the context of high-stakes accountability policies, local practitioners and policymakers will probably focus on narrowing the pass rate between subgroups of students on state-mandated assessments, but this approach fails to capture important differences in pass-fail combinations and changes in the achievement gap at higher levels of proficiency. By combining these approaches to examining the achievement gap, local practitioners and policymakers may gain important insights into how to help students sustain proficiency and narrow the achievement gap at both the lower and upper levels of proficiency.

Predicting Passing. Logistic regression shows that there is a strong and relatively reliable relationship between 2nd grade achievement and attaining proficiency on the MSA in subsequent grades, though the relationship varies by grade and subject matter. In reading, the relationship is strongest at the 3rd grade (.624 log odds), then declines in the 4th grade (.486 log odds), and declines slightly further in the 5th grade (.424 log odds). (See Tables 4.5, 4.6, and 4.7.)

In mathematics, the relationship between 2nd grade achievement and attaining proficiency in subsequent grades is more stable, perhaps because there is less change in proficiency status across grades in mathematics compared to reading. Nonetheless, the relationship is strongest at the 3rd grade (.586 log odds), slightly weaker at the 4th grade (.570 log odds), and weaker yet again at the 5th grade (.535 log odds). (See Tables 4.8, 4.9, and 4.10.)

One interpretation of the weakening of the relationship between 2nd grade achievement and attaining proficiency in subsequent grades is that the school district made progress in raising the achievement of students who had lower scores in the 2nd grade, especially in reading. The pass-fail combinations reviewed above provide some support for this interpretation, though the same combinations also suggest that part of the weakening may be due to students with higher scores failing to sustain proficiency across grades.

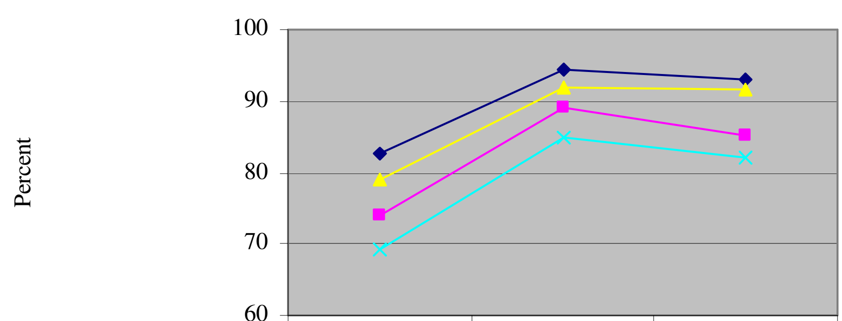
Next to 2nd grade performance, poverty status is the strongest predictor of whether students attain proficiency in later grades. Both individual FARMS status and school FARMS status decrease the likelihood of attaining proficiency. Students' individual and school racial enrollment play a smaller role. After entering the interaction terms into the model, the analysis confirms the results of other studies – namely, that the net effects of child poverty are substantial and largely independent of those of race (Payne & Biddle, 1999; Rumberger, 1983). School demographics also play a role in predicting student proficiency on the MSA in reading and mathematics. Schools with 50% or more FARMS students are (with the exception of 3rd grade reading) associated with lower pass rates in all grades and subjects. Unlike findings in some other studies (Borman, McNulty-Eitle, Michael, Eitle, Lee, Johnson, Cobb-Roberts, Dorn, & Shircliffe, 2004; McMillan, Kaufman, Hausken, &Bradley, 1993), however, this study does not find the racial composition of the school to be an important predictor. Findings reveal that majority Black enrollment made little or no difference in the probability of students attaining proficiency with the exception of 3rd grade mathematics.

There is also some indication that the effects of prior achievement varies by poverty status and race – that is, that prior achievement is a less important predictor of proficiency for some groups of students compared to others. In the 4th and 5th grades, the relationship between prior achievement and proficiency in reading is weaker for economically disadvantaged students compared to economically advantaged students (that is, prior achievement is a better predictor of later performance for economically advantaged students than economically disadvantaged students). However, just the opposite is true for race in the 5th grade, with prior achievement being a better predictor of proficiency in reading for Black students than White students. In mathematics, there is a consistent interaction between FARMS status and 2nd grade achievement; at all grades prior achievement is a better predictor of attaining proficiency for economically advantaged students compared to economically disadvantaged students. There are no interactions with race.

These interactions are difficult to interpret but one disturbing possibility is that family income becomes a more important predictor of student performance as students enter subsequent grades. Such an interpretation is consistent with the proficiency models reported in Chapter IV. In reading, the relationship of FARMS status to proficiency increases across grades from -.480 log odds in the 3rd grade to -.637 log odds in the 5th grade as does the relationship between the schools FARMS status and the probability of attaining proficiency from -.144 log odds in the 3rd grade to -.447 log odds in the 5th grade (see Tables 4.5, 4.6, and 4.7). A less pronounced but similar pattern occurs in mathematics, particularly regarding the effects of the school's poverty status from -.187 log odds in the 3rd grade to -.345 log odds in the 5th grade (see Tables 4.8, 4.9, and 4.10). In other words, as students enter subsequent grades, their personal poverty status and the poverty status of their classmates has a stronger (and increasingly more negative) effect on the likelihood that students attain proficiency, regardless of student's prior performance in the 2nd grade.

Using the results of the logistic regressions from Chapter IV, Figure 5.1 presents the probability of passing the MSA reading assessment in 3rd, 4th, and 5th grades for different subgroups given an average 2^{nd} grade CTBS/5 reading score. The figure demonstrates that the performance gap is greatest for poor and non-poor students, regardless of race. There is a trend towards more students attaining proficiency by the 5^{th} grade; however, roughly 15% of poor Whites and 18% of poor Blacks failed to attain proficiency in reading by the end of the 5^{th} grade even if they had an average scale score on the 2^{nd} grade CTBS/5 reading assessment. Although the figure does not include the poverty status of schools, it clearly indicates the persistent and negative effects of FARMS status as students enter subsequent grades. (Calculations are included in Appendix A.)

Figure 5.1 Probability of passing MSA reading in 3^{rd}, 4^{th}, and 5^{th} grades with an average 2^{nd} grade CTBS/5 scale score

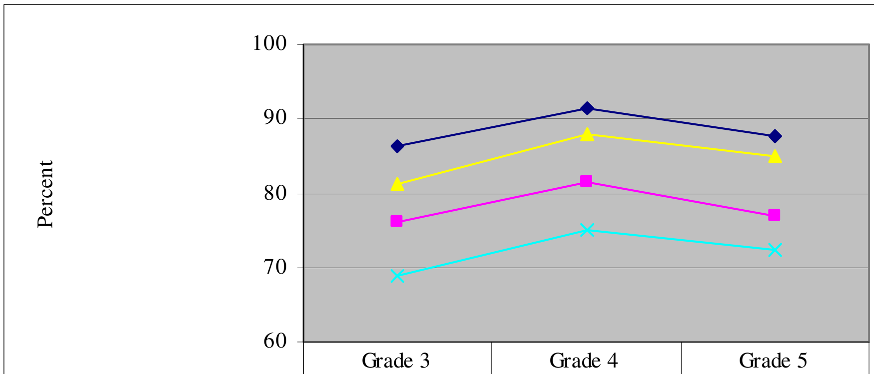


	Grade 3	Grade 4	Grade 5
Non-Poor White	82.7	94.3	93.0
Poor White	73.9	89.0	85.1
Non-Poor Black	79.1	92.0	91.5
Poor Black	69.1	85.0	82.1

Figure 5.2 presents the probability of passing the MSA mathematics assessment in 3^{rd}, 4^{th}, and 5^{th} grades for different subgroups given an average score on the 2^{nd} grade CTBS/5 mathematics assessment. As with reading, Figure 5.2 indicates that the performance gap is greatest for poor and non-poor students, regardless of race. There

also appears to be less of a reduction in the achievement gap in mathematics, as well as less progress in attaining proficiency in this subject area. By the end of the 5th grade, approximately 23% of poor Whites and 28% of poor Blacks fail to attain proficiency in mathematics even if they had an average scale score on the 2nd grade CTBS/5 assessment. Again, the overall pattern is toward a convergence in probabilities by race and a consistent negative effect of poverty status on the probability of attaining proficiency in the subsequent grades. (Calculations are included in Appendix B.)

Figure 5.2 Probability of passing MSA mathematics in 3rd, 4th, and 5th grades with an average 2nd grade CTBS/5 scale score



	Grade 3	Grade 4	Grade 5
Non-Poor White	86.2	91.4	87.6
Poor White	76.0	81.6	76.8
Non-Poor Black	81.3	87.9	84.9
Poor Black	68.9	75.0	72.4

Identifying Students from Prior Performance. The logistic regressions clearly indicate that MSA proficiency in reading and mathematics is associated with 2nd grade CTBS/5 scale scores, though the relationship varies somewhat for different subgroups and grades. But how *well* does 2nd grade performance predict proficiency at each grade? How *accurately* does a specific value on the 2nd grade CTBS/5 scale score identify students who actually attain and fail to attain proficiency in subsequent grades?

The feasibility of using the models presented in Chapter IV to identify students depends in part on the criterion used to identify students – that is, the value on the 2nd grade CTBS/5 scale score used to categorize students as likely to fail and likely to attain proficiency. The higher the criterion the larger the number of students identified as requiring intervention, the lower the criterion the smaller the number of students identified as requiring intervention. The ideal criterion is one that maximizes the proportion of students accurately identified as requiring assistance (true positives), while minimizing the proportion of students falsely identified as not requiring assistance (false negatives).

To determine a possible criterion on the 2nd grade CTBS/5 assessments, I used Model 2 in Tables 4.5 through 4.10. These models include prior performance, student race and FARMS status, and possible interactions with prior performance between student race and FARMS status. For each subgroup (non-poor White, non-poor Black, poor White, and poor Black), I calculated the value on the 2nd grade CTBS/5 that indicates students have less than a 50/50 chance of attaining proficiency in the 3rd, 4th, and 5th grades. I treat race and FARMS status as discreet variables in doing so. I then use the highest criterion value or the most inclusive value to calculate the percentage of students that would be identified as requiring assistance, the percentage of students accurately identified as requiring and not requiring assistance, and the percentage of students accurately identified who require assistance (i.e., who actually failed to attain proficiency in a subsequent grade). (Calculations are included in Appendices C & D.)

In reading, the calculated criterion was a scale score of 594 (roughly 13 points below the average score) whereas in mathematics, the calculated criterion was a scale score of 541 (roughly 17 points below the average scale score). In each instance, the selected criterion is the value that corresponds to a less than 50/50 chance of passing a subsequent assessment for poor Black students (the most inclusive criterion for all four subgroups). Using this criterion, I then calculated the percentage of accurate predictions for each subgroup at each grade – that is, the percentage of students that would be falsely identified as requiring intervention (false positives) and the percentage of students that would be falsely identified as not requiring an intervention (false negatives). (Calculations are included in Appendices E-I.)

Table 5.1 shows the results for reading. Using a scale score of 594 as the criterion, slightly more than one-third of the students (38%) would be identified as requiring intervention. The criterion identifies larger proportions of poor students requiring intervention (roughly 60% of all poor Black students) and smaller proportions of non-poor students (roughly 23% of non-poor Whites). Although over 80% of the study group is identified correctly in the 3rd grade, overall accuracy declines in subsequent grades (a pattern consistent with the previously discussed declining relationship between 2nd grade performance and reading proficiency in subsequent grades). There are also clear differences in the accuracy of predictions for different subgroups. Overall, the model is more accurate for non-poor Whites (85% in the 3rd grade, 81% in the 4th grade and 5th grades) than other groups, but this is largely because non-poor Whites have the lowest proportion of students failing to make proficiency. In other words, it is easier to predict the proficiency status of non-poor Whites by chance than it is to predict the proficiency status of any of the other subgroups.

While the overall accuracy of predictions declines with grade, the accuracy of predictions for the target population (students who actually require intervention) increases between the 3rd and the 5th grades. Moreover, these predictions are most accurate for poor Whites, poor Blacks, and non-poor Blacks, with accurate predictions ranging from a low of 84% to a high of 92%. The increase in accuracy for these subgroups can be explained in at least three ways. First, as explained earlier, poverty status increases in importance in predicting proficiency in the later grades. Second, 2nd grade performance is more strongly related to proficiency in the 5th grade for Blacks than Whites. Third, identifying more students for intervention in subsequent grades decreases the likelihood of false negatives, even though it increases the likelihood of false positives in higher grades (an explanation consistent with the decrease in overall accuracy in subsequent grades).

Table 5.1

Percentage of Students Using Adjusted Scale Scores Correctly Identified in Reading on the MSA

Grade 3	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
Study Group (n=5431)	37.5	81.3	78.4
Non-Poor White (n=2778)	23.0	84.5	69.3
Poor White (n-696)	52.0	78.3	82.9
Non-Poor Black (n=901)	44.5	77.5	79.1
Poor Black (n=1056)	59.8	78.1	83.9
Grade 4			
Study Group (n=5431)	37.5	74.4	85.5
Non-Poor White (n=2778)	23.0	81.2	76.9
Poor White (n-696)	52.0	64.7	84.5
Non-Poor Black (n=901)	44.5	69.6	84.3
Poor Black (n=1056)	59.8	67.0	92.2
Grade 5			
Study Group (n=5431)	37.5	75.2	84.3
Non-Poor White (n=2778)	23.0	81.1	74.4
Poor White (n-696)	52.0	67.7	86.2
Non-Poor Black (n=901)	44.5	70.9	86.0
Poor Black (n=1056)	59.8	68.4	88.4

Table 5.2 shows the results for students using the criterion for the 2nd grade mathematic assessment. Using a scale score of 541, slightly less than one-third (32%) of students would be identified as requiring some form of an intervention. As in reading, over 80% of the study group was identified correctly at the 3rd grade, with the overall accuracy of predictions decreasing with grade. There are also clear differences in the overall accuracy of predictions for specific subgroups. The proficiency status of non-poor Whites is more accurately predicted by 2nd grade performance than the proficiency status of any other groups (roughly 87% at each grade compared to a low of 74% for poor Whites in the 4th grade). Once again, this is largely due to the higher proportion of non-poor Whites that achieved proficiency in mathematics at each grade. The less diversity there is in the proficiency status of students, the higher the likelihood of predicting students' status by chance. Once again, the pattern in accuracy across grades is just the opposite for accurately identifying the target population across grade than it is for accurately identifying students overall. In subsequent grades, the proportion of false negatives decreases for each subgroup. Overall, the proportion of students accurately identified who require intervention is highest for poor Black students (80%, 83%, & 82% respectively at each grade) and lowest for non-poor Whites (66%, 71%, and 66% respectively at each grade). Although these differences are less pronounced in mathematics than they are in reading, they may be explained by many of the same reasons – greater effects of poverty status and the smaller likelihood of false negatives with larger numbers of students being identified as requiring intervention.

Table 5.2

Percentage of Students Using Adjusted Scale Scores Correctly Identified in Mathematics on the MSA

Grade 3	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
Study Group (n=5431)	32.0	82.6	74.4
Non-Poor White (n=2778)	17.8	87.1	65.8
Poor White (n-696)	43.4	77.9	75.3
Non-Poor Black (n=901)	39.7	79.1	74.6
Poor Black (n=1056)	55.3	77.1	80.2
Grade 4			
Study Group (n=5431)	32.0	81.3	77.9
Non-Poor White (n=2778)	17.8	87.0	70.9
Poor White (n-696)	43.4	73.6	76.6
Non-Poor Black (n=901)	39.7	76.7	77.6
Poor Black (n=1056)	55.3	75.6	83.1
Grade 5			
Study Group (n=5431)	32.0	80.9	74.4
Non-Poor White (n=2778)	17.8	86.5	65.5
Poor White (n-696)	43.4	75.4	74.7
Non-Poor Black (n=901)	39.7	74.8	72.7
Poor Black (n=1056)	55.3	74.9	82.1

Although the above analysis identifies a potential criterion, it does not identify, necessarily, the optimal criterion – that is, the scale score that minimizes the percentage of students falsely identified as not requiring intervention while maximizing the percentage of students accurately identified as requiring intervention. One way of identifying the optimal criterion is to look for the point where the overall accuracy of predictions decreases the proportions of students identified as requiring intervention while decreasing the proportion of false negatives and false positives. To test for this threshold, I examined the accuracy of models based on students scoring at the 15th percentile or lower, the 20th percentile or lower, the 25th percentile or lower, the 30th percentile or lower, the 35th percentile or lower and the 40th percentile or lower. I present these results in Tables 5.3 and 5.4. (Calculations are included in Appendices J-N.)

Generally speaking, the optimal criterion is the 30th percentile in reading or if slightly less than one-third of the population of students is identified for intervention, the proficiency status of most students will be correctly identified (a low of 70% in 4th and 71% in 5th grades). (See Table 5.3.) Lower scale scores reduce the overall accuracy of predictions and increase the proportion of false negative; higher scale scores decrease the proportion of false negatives but also decrease the overall accuracy of the models (i.e., increase the proportion of false positives). In mathematics, the optimal criterion is also the 30th percentile. The proficiency status of most students will be correctly identified, (a low of 74% in 4th grade and 75% in 5th grade). (See Table 5.4.) Using a criterion at the 30th percentile identifies 30% of the 2nd graders as requiring intervention while minimizing the number of false positives and false negatives.

Table 5.3

Percentage of Students Based on the 30th Percentile Correctly Identified in Reading on the MSA

Grade 3	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
Study Group (n=5431)	30.7	82.8	70.4
Non-Poor White (n=2778)	18.2	86.1	60.9
Poor White (n-696)	43.4	78.3	73.5
Non-Poor Black (n=901)	34.9	80.5	70.3
Poor Black (n=1056)	51.5	79.3	77.5
Grade 4			
Study Group (n=5431)	30.7	79.0	78.9
Non-Poor White (n=2778)	18.2	84.8	69.4
Poor White (n-696)	43.4	70.4	78.6
Non-Poor Black (n=901)	34.9	76.8	78.4
Poor Black (n=1056)	51.5	70.9	85.4
Grade 5			
Study Group (n=5431)	30.7	78.8	75.6
Non-Poor White (n=2778)	18.2	84.9	68.4
Poor White (n-696)	43.4	70.8	76.2
Non-Poor Black (n=901)	34.9	75.9	75.1
Poor Black (n=1056)	51.5	70.5	79.9

Table 5.4

Percentage of Students Based on the 30th Percentile Correctly Identified in Mathematics on the MSA

Grade 3	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
Study Group (n=5431)	31.5	82.6	73.6
Non-Poor White (n=2778)	17.4	87.1	64.6
Poor White (n-696)	42.7	77.7	74.3
Non-Poor Black (n=901)	39.1	79.1	73.7
Poor Black (n=1056)	55.0	77.0	79.9
Grade 4			
Study Group (n=5431)	31.5	81.4	77.1
Non-Poor White (n=2778)	17.4	87.1	69.6
Poor White (n-696)	42.7	74.0	76.1
Non-Poor Black (n=901)	39.1	76.7	76.5
Poor Black (n=1056)	55.0	75.5	82.7
Grade 5			
Study Group (n=5431)	31.5	81.0	73.7
Non-Poor White (n=2778)	17.4	86.6	64.2
Poor White (n-696)	42.7	75.6	74.0
Non-Poor Black (n=901)	39.1	75.5	72.7
Poor Black (n=1056)	55.0	74.8	81.7

The students most difficult to identify correctly are those with scale scores floating around the study group mean. These students may improve or not over time depending on other circumstances such as good instruction in the later years or intervention.

Although school district research and testing offices can calculate a criterion based on each subgroup's likelihood of attaining proficiency for each grade, a uniform criterion based on a percentile is probably more easily calculated and justified to parents and students in a school district. While the proposed 30th percentile identifies a relatively large proportion of 2nd graders, it only identifies roughly 5% (.30 x 1/6th) of students in a K-5 elementary school. If such a concentration of resources increases the likelihood that elementary schools meeting AYP and the spirit of NCLB, focusing on 2nd grade students with the greatest likelihood of failing to attain proficiency in subsequent grades is probably worth it.

Summary. These findings confirm the existence of an achievement gap in the school district. The nature of the poverty gap is one in which economically advantaged students score consistently higher than economically disadvantaged students on the MSA in reading and mathematics. The nature of the racial gap is one that White students score consistently higher than Black students on the MSA in reading and mathematics, though the difference in achievement is largely explained by differences in family income and the family income of students' classmates (West, Denton, and Reaney, 2001). The study expands these findings by noting the persistence of this trend between the 3rd, 4th, and 5th grades. Although progress has been made in the school district in closing the achievement gap, the achievement gap persists, especially when comparing the proficiency status of Non-FARMS and FARMS students.

The overall accuracy of the model for predicting proficiency on the MSA reading or mathematics assessments is stronger for White students and more affluent students, as there is more variation in the scores of Black students and poor students and than there is for White students and more affluent students. However, the maximum criterion for predicting proficiency status for all students is roughly scores that fall below and above the 30^{th} percentile. Students who scored below this level in the 2^{nd} grade have the lowest probability of achieving proficiency in subsequent grades and the highest probability of being accurately identified as either attaining or failing to attain proficiency.

Implications for Policy

Historically, although educational public policy on schooling has contributed to the success of the U. S., the benefits have not all been equally shared, especially for those outside the mainstream culture (Fass, 1989). In addition, educational public policy often results in conflicting and increasing demands on public schools without the provision of adequate resources to accomplish the goals.

The passage of the No Child Left Behind Act or NCLB mandates test-based accountability procedures coupled with sanctions to increase the likelihood of compliance. According to the latest PDK-Gallop Poll (2006), almost 70% of American adults surveyed said that NCLB had no effect or is actually hurting public schools (Education Week, 8/30/06), even though the basic mandate of the legislation – to hold schools accountable for every student's achievement, regardless of race, social class, language-minority status, or learning disability – is largely consistent with public calls for greater equality in educational opportunities (Lee & Burkam, 2002).

Nonetheless, using high stakes accountability models to evaluate schools and dole out incentives and sanctions without taking into account the distribution of student subgroups creates special challenges and hardships for schools that enroll large minority populations and students from economically disadvantaged backgrounds (Sunderman & Kim, 2005). Such schools function with fewer resources than schools in more affluent neighborhoods. Not surprisingly, the schools with the fewest resources, largest classes, and the least prepared teachers are all too often those with the poorest performance on standardized tests and the greatest likelihood of being at risk of failure (Kozol, 1991).

Maryland has chosen to move from a baseline performance measure in 2003 to a stair-step approach that includes regular increments until all students reach proficiency in basic subject areas by 2014. Schools must meet AYP requirements in a given year for all students and specific subgroups of students in achieving a state-established set of performance objectives in both reading and mathematic. Although states may assign different performance objectives and increase thresholds at different rates, AYP is the metric by which all schools and school districts are evaluated under NCLB (Hess, 2005).

One strategy to consider in addressing the pressure to raise achievement to unprecedented levels is to identify students early who may have difficulty passing the MSA. As I have shown, using prior performance on a 2nd grade test can help local educators identify students with the greatest likelihood of failing to achieve proficiency in the 3rd, 4th, and 5th grades. Using the 30th percentile and lower on the 2nd grade scale scores as a cut off, it is possible to accurately identify three-quarters or more of students who will fail to attain proficiency in reading and mathematics in subsequent grades. From an economical standpoint, the sooner that a student is on grade level, the less overall cost in time and resources to the state and school districts. More specifically, a student who is below grade level, and is identified in the 2nd grade, and receives a successful intervention, is less costly than a student who is not identified and continues to fall behind even more year after year. Over time, not only does the failure to bring students to required levels of performance become more costly for the public, but also worse yet are the accumulating psychological and cognitive costs to students. Students who are unable to obtain basic or enabling skills early on are less likely to become "life-long learners" and more likely to become dropouts (Jencks & Phillips, 1998). Not only would less time and money be spent on remediation in the later learning years, but more students may be set on a path where they may have more opportunities for higher education and better jobs – a personal benefit and a benefit to society, as well.

Although "whole school reform" is currently popular in the allocating of federal and state resources, particularly with regards to Title I funds, high-stakes accountability may dictate a reconsideration of current strategies for allocating resources within and between school districts. One such reconsideration might be a return to early identification and intervention models designed to provide students with the greatest likelihood of failure additional supports to meet the ambitious performance standards set by the state in response to NCLB. Funding for such an approach, especially for developing appropriate remediation models for at-risk students, would facilitate the implementation of early identification and remediation in schools districts across the state and country.

This is not to say that early intervention should be funded to the exclusion of later grades, but it should be part of a comprehensive "whole school" strategy. Interventions could also target students moving from elementary to middle school and middle school to high school, key transitional points that often exacerbate the risk that students will fall behind or even eventually drop out of school. Some early interventions such as full-day kindergarten and public school pre-kindergarten may also prove less costly in the long run. Given the strong relationship between economic disadvantage and failure to achieve proficiency found in the study, these early interventions should target preschool providers and elementary schools that serve low-income families.

Implications for School Districts

In Maryland, the performance of successive cohorts of students is used to estimate the improvement of schools and for accountability. Such estimates of improvement can be quite volatile due to non-persistent factors, such as changes in the demographics of student enrollment, teacher reassignment, and curriculum coverage. This volatility results in some schools being recognized as outstanding while other schools are identified as needing improvement -- not because of the effectiveness of any intervention or special assistance given to schools but because of factors that schools cannot control (Linn & Haug, 2002).

Although some states, including Maryland, are discussing alternative models for assessing student performance, the successive cohort model is likely to be the standard for some time. In the meantime, school districts should consider supplementing required cohort analyses with longitudinal models that track the individual performance of students on yearly assessments. Although more difficult logistically, longitudinal analyses are the “most direct and valid way to account for changes in student achievement” (Linn & Haug, 2002), and, as I demonstrate in this study, they are quite feasible with the type of data collected and available from many Maryland school districts.

This study demonstrates how school administrators and teachers can use existing assessment data to track the performance of individual students and identify individual students at risk of failing state-mandated assessments during the elementary school years. By targeting students in 2^{nd} grade (or earlier when assessment data are available), whether by using a more complex approach to setting a criterion (points below the mean for specific groups of students) or a simpler approach to setting a criterion (the lowest percentile ranking that balances the need to narrowly target students with the need to accurately identify students at risk of failure) schools can identify students in the early grades who require intervention or remediation.

At the classroom level, teachers can use appropriately established criterion and prior performance to identify students who may require more individualized instruction in preparing for state assessments. Although not examined in depth by this study, school districts can provide assessment histories for students and, using similar forms of analysis, even identify students with the greatest likelihood of failing to sustain proficiency in subsequent grades. These forms of individualized data, especially in conjunction with teacher’s individual student evaluations and professional judgments, could enhance substantially the ability of individual teachers and administrators to target scarce instructional resources toward students who need them the most.

Such strategies, regardless of how comprehensive they might be, will never be 100% accurate. As seen in the study, even using relatively sophisticated modeling techniques, the identified criteria still resulted in false negative and false positive identifications. Student performance is affected by more than classroom instruction; health and emotional problems may also account for the failure of students to either attain or sustain proficiency. Test scores, even when coupled with teacher judgment, will not always identify every student who might benefit from early remediation; nonetheless, as I demonstrate in this study, they can be used to successfully identify roughly three-quarters of students who will fail to attain proficiency in subsequent grades.

Identifying and addressing learning problems and academic gaps earlier can help educators raise individual student's performance on assessments, as well as, increase the probability that schools will meet challenging performance standards. As all schools are not equal – that is, some schools face greater challenges in raising performance standards than others – successful implementation of early identification and remediation will require the careful distribution of existing school improvement resources. Many of these resources will need to be targeted at the early grades and elementary schools with disproportionate enrollments of at-risk students. Although identifying nearly one-third of the students in the 3rd grade (or earlier) as requiring intervention may seem like a ambitious strategy, this number of students, when considered over the course of the whole six-year elementary school experience, is not very large. Assuming that remediation is successful and students require less intensive support in later grades, the targeted population would equal roughly 5% of the total elementary school enrollment.

Implications for Future Research

This study highlights the gaps in school achievement between Black and White students and economically advantaged and disadvantaged students. Although not investigated as part of this study, similar achievement gaps have been documented for Hispanic children and children with learning disabilities. National assessments, such as NAEP, have identified similar achievement gaps for Hispanic students, and state performance reports have underscored potential difficulties in raising the performance of students with learning disabilities to the same performance level as their peers. Given the large population of Hispanics or Latino students living in the state and the U. S., as well as, the push to attend to the developmental needs of mainstreamed students in special education programs, the school performance of these students and their schools certainly warrants the same kind of analytic attention and policy-related concerns.

It may also be possible to improve the overall accuracy of the prediction models by using more advanced modeling techniques, such as hierarchical linear modeling, and additional information about student performance from kindergarten and classroom teachers. National organizations, such as Educational Testing Service (ETS) and the National Research Council (NRC), have voiced concerns about using one measure as a judge of student performance, especially in the context of high-stakes decisions about placement and promotion (Barton, 1999; NRC, 1999). Although there is no reason to assume that identifying students for additional services poses a risk of being denied other services, the inclusion of additional factors might provide the basis for more accurate and more efficient identifications of students at risk of failure. Research into how to improve the model and modeling technique demonstrated in this study is surely warranted.

Policymakers and education researchers may also want to explore the feasibility of developing models that predict with reasonable accuracy students who fail to sustain proficiency across the grades. In examining the achievement gap, I argued that examining different combinations of pass-fail may be especially informative for local educators interested in increasing the likelihood that specific populations of students meet AYP. In the school district that was the focus of this study, between 12% and 15% of Black students and FARMS students failed to sustain proficiency in later grades. If these students could be identified early for remediation, it would both improve the overall accuracy of predictions (most of these students represent false negatives – students predicted not to fail) and reduce the achievement gap. Future research needs to further examine what are some of the factors that help to explain why some students attain but fail to sustain proficiency in later grades. Following students or tracking their progress over a longer period of time and particularly as they make the transition from elementary school to middle school, and middle school to high school may provide additional insights into why students fail to achieve or sustain proficiency beyond the early grades.

Finally, early identification is a meaningless strategy unless it can be coupled with successful remediation. Although I demonstrate in this study that nearly three-quarters of students at risk of failing to attain proficiency can be identified using 2^{nd} grade CTBS/5 reading and mathematics scale scores, this doesn't answer what to do with students after they are identified for intervention. Prior research clearly demonstrates that early identification and intervention can be successful, but far less is known about the forms of early intervention that might be most appropriate for increasing the likelihood that students attain proficiency on state-mandated assessments. It is quite likely that successful remediation will need to be aligned to not only the content of assessments in different states but to local curricula and educational programs. Research in this area is critical if early identification is to be helpful tool to achieving local, state, and federal education goals.

Given the current accountability policies and concern for students' academic achievement, additional research into how to expand prediction models to include other historically underachieving student populations, how to improve the accuracy of early identification models, how to identify students who fail to sustain proficiency, and how to successful remediate achievement gaps within local contexts would be helpful to policymakers and practitioners. The findings of this study, along with the findings of other studies (Lee & Burkam, 2002; Slavin, Madden, Karweit, Dolan, & Wasik, 1992), underscore the potential importance of early identification and intervention as a strategy for decreasing the achievement gap and increasing local capacity to meet the requirements of NCLB. Additional research in these areas, especially the area of successful early remediation, would help to make such a strategy a powerful tool for local school districts.

Personal Reflections

My interest in educational research came from my interest in trying to provide the best education for my own children. Along the way, I learned that it was as important for them to learn how to fail, as well as, how to succeed. Failing need only be temporary and can provide motivation to do better next time. Success is the love of learning.

Over the years, my experiences with public schools have only been positive, and I have always been impressed with how much they do accomplish. I truly believe that there are many dedicated educators and administrators who want to close the achievement gap for all students, but they can’t do it alone. This dissertation is just my small effort at trying to help identify and target attention toward reducing the achievement gap. I hope that this dissertation in some small way increases the ability of educators and administrators to address this critical educational and social challenge.

APPENDIX A

MSA Reading Pass Probability for Different Student Populations with Average 2nd Grade Achievement

Grade 3

Model 2	Constant	Prior Performance	FARMS	Race	FARMS & Prior Perform	Race & Prior Perform	Log Odds Ratio	Pass Prob
White	1.569	0.000	0.000	0.000	0.000	0.000	1.569	0.827
White Poor	1.569	0.000	-0.527	0.000	0.000	0.000	1.042	0.739
Black	1.569	0.000	0.000	-0.236	0.000	0.000	1.333	0.791
Black Poor	1.569	0.000	-0.527	-0.236	0.000	0.000	0.806	0.691

Grade 4

Model 2	Constant	Prior Performance	FARMS	Race	FARMS & Prior Perform	Race & Prior Perform	Log Odds Ratio	Pass Prob
White	2.806	0.000	0.000	0.000	0.000	0.000	2.806	0.943
White Poor	2.806	0.000	-0.627	0.000	-0.084	0.000	2.095	0.890
Black	2.806	0.000	0.000	-0.364	0.000	0.000	2.442	0.920
Black Poor	2.806	0.000	-0.627	-0.364	-0.084	0.000	1.731	0.850

Grade 5

Model 2	Constant	Prior Performance	FARMS	Race	FARMS & Prior Perform	Race & Prior Perform	Log Odds Ratio	Pass Prob
White	2.592	0.000	0.000	0.000	0.000	0.000	2.592	0.930
White Poor	2.592	0.000	-0.780	0.000	-0.071	0.000	1.741	0.851
Black	2.592	0.000	0.000	-0.277	0.000	0.061	2.376	0.915
Black Poor	2.592	0.000	-0.780	-0.277	-0.071	0.061	1.525	0.821

Note. Log Odds Ratio = $\log_e[p/(1-p)]$

APPENDIX B

MSA Mathematics Pass Probability for Different Student Populations with Average Achievement

Grade 3

Model 2	Constant	Prior Performance	FARMS	Race	FARMS & Prior Perform	Race & Prior Perform	Log Odds Ratio	Pass Prob
White	1.829	0.000	0.000	0.000	0.000	0.000	1.829	0.862
White Poor	1.829	0.000	-0.608	0.000	-0.069	0.000	1.152	0.760
Black	1.829	0.000	0.000	-0.357	0.000	0.000	1.472	0.813
Black Poor	1.829	0.000	-0.608	-0.357	-0.069	0.000	0.795	0.689

Grade 4

Model 2	Constant	Prior Performance	FARMS	Race	FARMS & Prior Perform	Race & Prior Perform	Log Odds Ratio	Pass Prob
White	2.368	0.000	0.000	0.000	0.000	0.000	2.368	0.914
White Poor	2.368	0.000	-0.756	0.000	-0.125	0.000	1.487	0.816
Black	2.368	0.000	0.000	-0.390	0.000	0.000	1.978	0.879
Black Poor	2.368	0.000	-0.756	-0.390	-0.125	0.000	1.097	0.750

Grade 5

Model 2	Constant	Prior Performance	FARMS	Race	FARMS & Prior Perform	Race & Prior Perform	Log Odds Ratio	Pass Prob
White	1.957	0.538	0.000	0.000	0.000	0.000	1.957	0.876
White Poor	1.957	0.538	-0.668	0.000	-0.093	0.000	1.196	0.768
Black	1.957	0.538	0.000	-0.230	0.000	0.000	1.727	0.849
Black Poor	1.957	0.538	-0.668	-0.230	-0.093	0.000	0.966	0.724

Note. Log Odds Ratio = $\log_e[p/(1-p)]$

APPENDIX C

Points below the Mean Predicted from Prior Performance for MSA Reading in 3rd, 4th, and 5th Grades

Grade 3

Model 2	Constant	Prior Perform	FARMS	Race	Prior Perform by FARMS	Prior Perform by Race	Points Below Mean	Mean Scale Score	Scale Score
White	1.569	0.626	0.000	0.000	0.000	0.000	25.06	607	581
Poor White	1.569	0.626	-0.527	0.000	0.000	0.000	16.65	607	590
Black	1.569	0.626	0.000	-0.236	0.000	0.000	21.29	607	585
Poor Black	1.569	0.626	-0.527	-0.236	0.000	0.000	12.88	607	594

Grade 4

Model 2	Constant	Prior Perform	FARMS	Race	Prior Perform by FARMS	Prior Perform by Race	Points Below Mean	Mean Scale Score	Scale Score
White	2.806	0.489	0.000	0.000	0.000	0.000	57.38	607	549
Poor White	2.806	0.489	-0.627	0.000	-0.084	0.000	53.80	607	553
Black	2.806	0.489	0.000	-0.364	0.000	0.000	49.94	607	557
Poor Black	2.806	0.489	-0.627	-0.364	-0.084	0.000	44.81	607	562

Grade 5

Model 2	Constant	Prior Perform	FARMS	Race	Prior Perform by FARMS	Prior Perform by Race	Points Below Mean	Mean Scale Score	Scale Score
White	2.592	0.430	0.000	0.000	0.000	0.000	60.28	607	546
Poor White	2.592	0.430	-0.780	0.000	-0.071	0.000	50.47	607	556
Black	2.592	0.430	0.000	-0.277	0.000	0.061	47.15	607	559
Poor Black	2.592	0.430	-0.780	-0.277	-0.071	0.061	36.55	607	570

Note. Points below the mean = ((constant + FARMS + race)/(prior performance + interaction terms))*10

APPENDIX D

Points below the Mean Predicted from Prior Performance for MSA Mathematics in 3rd, 4th, and 5th Grades

Grade 3

Model 2	Constant	Prior Perform	FARMS	Race	Prior Perform by FARMS	Prior Perform by Race	Points Below Mean	Mean Scale Score	Scale Score
White	1.829	0.588	0.000	0.000	0.000	0.000	31.11	558	526
Poor White	1.829	0.588	-0.608	0.000	-0.069	0.000	23.53	558	534
Black	1.829	0.588	0.000	-0.357	0.000	0.000	25.03	558	532
Poor Black	1.829	0.588	-0.608	-0.357	-0.069	0.000	16.65	558	541

Grade 4

Model 2	Constant	Prior Perform	FARMS	Race	Prior Perform by FARMS	Prior Perform by Race	Points Below Mean	Mean Scale Score	Scale Score
White	2.368	0.572	0.000	0.000	0.000	0.000	41.40	558	516
Poor White	2.368	0.572	-0.756	0.000	-0.125	0.000	36.06	558	521
Black	2.368	0.572	0.000	-0.390	0.000	0.000	34.58	558	523
Poor Black	2.368	0.572	-0.756	-0.390	-0.125	0.000	27.34	558	530

Grade 5

Model 2	Constant	Prior Perform	FARMS	Race	Prior Perform by FARMS	Prior Perform by Race	Points Below Mean	Mean Scale Score	Scale Score
White	1.957	0.538	0.000	0.000	0.000	0.000	36.38	558	521
Poor White	1.957	0.538	-0.668	0.000	-0.093	0.000	28.97	558	529
Black	1.957	0.538	0.000	-0.230	0.000	0.000	32.10	558	525
Poor Black	1.957	0.538	-0.668	-0.230	-0.093	0.000	23.80	558	534

Note. Points below the mean = ((constant + FARMS + race)/(prior performance + interaction terms))*10

APPENDIX E

MSA Reading Correct and Incorrect Predictions Based on Adjusted Scale Scores for the Study Group (n=5,431)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	1405	628	1	629	2034	37.5%	81.3%	78.4%
> 594	387	2383	627	387	3397			
	1792	3011	628	1016	5431			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	773	1227	34	1261	2034	37.5%	74.4%	85.5%
> 594	131	2219	1047	131	3397			
	904	3446	1081	1392	5431			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	846	1065	123	1188	2034	37.5%	75.2%	84.3%
> 594	158	1445	1794	158	3397			
	1004	2510	1917	1346	5431			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	1213	517	8	525	1738	32.0%	82.6%	74.4%
> 541	418	2403	872	418	3693			
	1631	2920	880	943	5431			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	1011	720	7	727	1738	32.0%	81.3%	77.9%
> 541	287	2298	1108	287	3693			
	1298	3018	1115	1014	5431			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	1068	661	9	670	1738	32.0%	80.9%	74.4%
> 541	368	2342	983	368	3693			
	1436	3003	992	1038	5431			

Appendix F

MSA Reading Correct and Incorrect Predictions Based on Adjusted Scale Scores for Non-Poor White Students (n=2,778)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	374	264	1	265	639	23.0%	84.5%	69.3%
> 594	166	1449	524	166	2139			
	540	1713	525	431	2778			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	166	454	19	473	639	23.0%	81.2%	76.9%
> 594	50	1252	837	50	2139			
	216	1706	856	523	2778			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	174	408	57	465	639	23.0%	81.1%	74.4%
> 594	60	776	1303	60	2139			
	234	1184	1360	525	2778			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	281	206	7	213	494	17.8%	87.1%	65.8%
> 541	146	1438	700	146	2284			
	427	1644	707	359	2778			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	224	266	4	270	494	17.8%	87.0%	70.9%
> 541	92	1327	865	92	2284			
	316	1593	869	362	2778			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	252	237	5	242	494	17.8%	86.5%	65.5%
> 541	133	1366	785	133	2284			
	385	1603	790	375	2778			

APPENDIX G

MSA Correct and Incorrect Predictions Based on Adjusted Scale Scores for Poor White Students (n=696)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	266	96	0	96	362	52.0%	78.3%	82.9%
> 594	55	250	29	55	334			
	321	346	29	151	696			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	142	213	7	220	362	52.0%	64.7%	84.5%
> 594	26	242	66	26	334			
	168	455	73	246	696			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	163	187	12	199	362	52.0%	67.7%	86.2%
> 594	26	173	135	26	334			
	189	360	147	225	696			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	220	82	0	82	302	43.4%	77.9%	75.3%
> 541	72	259	63	72	394			
	292	341	63	154	696			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	170	132	0	132	302	43.4%	73.6%	76.6%
> 541	52	273	69	52	394			
	222	405	69	184	696			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	198	103	1	104	302	43.4%	75.4%	74.7%
> 541	67	265	62	67	394			
	265	368	63	171	696			

APPENDIX H

MSA Correct and Incorrect Predictions Based on Adjusted Scale Scores for Non-Poor Black Students (n=901)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	269	132	0	132	401	44.5%	77.5%	79.1%
> 594	71	377	52	71	500			
	340	509	52	203	901			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	156	240	5	245	401	44.5%	69.6%	84.3%
> 594	29	376	95	29	500			
	185	616	100	274	901			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 594	166	207	28	235	401	44.5%	70.9%	86.0%
> 594	27	265	208	27	500			
	193	472	236	262	901			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	258	100	0	100	358	39.7%	79.1%	74.6%
> 541	88	388	67	88	543			
	346	488	67	188	901			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	208	147	3	150	358	39.7%	76.7%	77.6%
> 541	60	374	109	60	543			
	268	521	112	210	901			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 541	210	147	1	148	358	39.7%	74.8%	72.7%
> 541	79	375	89	79	543			
	289	522	90	227	901			

APPENDIX I

MSA Correct and Incorrect Predictions Based on Adjusted Scale Scores for Poor Black Students (n=1,056)

Reading

Grade 3 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 594	496	136	0	136	632	59.8%	78.1%	83.9%
> 594	95	307	22	95	424			
	591	443	22	231	1056			

Grade 4 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 594	309	320	3	323	632	59.8%	67.0%	92.2%
> 594	26	349	49	26	424			
	335	669	52	349	1056			

Grade 5 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 594	343	263	26	289	632	59.8%	68.4%	88.4%
> 594	45	231	148	45	424			
	388	494	174	334	1056			

Mathematics

Grade 3 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 541	454	129	1	130	584	55.3%	77.1%	80.2%
> 541	112	318	42	112	472			
	566	447	43	242	1056			

Grade 4 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 541	409	175	0	175	584	55.3%	75.6%	83.1%
> 541	83	324	65	83	472			
	492	499	65	258	1056			

Grade 5 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 541	408	174	2	176	584	55.3%	74.9%	82.1%
> 541	89	336	47	89	472			
	497	510	49	265	1056			

APPENDIX J

MSA Reading Correct and Incorrect Predictions Based on the 30th Percentile for the Study Group (n=5,431)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	1262	403	0	403	1665	30.7%	82.8%	70.4%
> 607	530	2608	628	530	3766			
	1792	3011	628	933	5431			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	713	933	19	952	1665	30.7%	79.0%	78.9%
> 607	191	2513	1062	191	3766			
	904	3446	1081	1143	5431			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	759	827	79	906	1665	30.7%	78.8%	75.6%
> 607	245	1683	1838	245	3766			
	1004	2510	1917	1151	5431			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	1200	506	6	512	1712	31.5%	82.6%	73.6%
> 540	431	2414	874	431	3719			
	1631	2920	880	943	5431			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	1001	706	5	711	1712	31.5%	81.4%	77.1%
> 540	297	2312	1110	297	3719			
	1298	3018	1115	1008	5431			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	1059	646	7	653	1712	31.5%	81.0%	73.7%
> 540	377	2357	985	377	3719			
	1436	3003	992	1030	5431			

Appendix K

MSA Reading Correct and Incorrect Predictions Based on the 30th Percentile for Non-Poor White Students (n=2,778)

Reading

Grade 3 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 607	329	176	0	176	505	18.2%	86.1%	60.9%
> 607	211	1537	525	211	2273			
Totals	540	1713	525	387	2778			

Grade 4 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 607	150	346	9	355	505	18.2%	84.8%	69.4%
> 607	66	1360	847	66	2273			
Totals	216	1706	856	421	2778			

Grade 5 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 607	160	305	40	345	505	18.2%	84.9%	68.4%
> 607	74	879	1320	74	2273			
Totals	234	1184	1360	419	2778			

Mathematics

Grade 3 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 540	276	201	5	206	482	17.4%	87.1%	64.6%
> 540	151	1443	702	151	2296			
Totals	427	1644	707	357	2778			

Grade 4 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 540	220	259	3	262	482	17.4%	87.1%	69.6%
> 540	96	1334	866	96	2296			
Totals	316	1593	867	358	2778			

Grade 5 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 540	247	231	4	235	482	17.4%	86.6%	64.2%
> 540	138	1372	786	138	2296			
Totals	385	1603	790	373	2778			

APPENDIX L

MSA Reading Correct and Incorrect Predictions Based on the 30th Percentile for Poor White Students (n=696)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	236	66	0	66	302	43.4%	78.3%	73.5%
> 607	85	280	29	85	394			
Totals	321	346	29	151	696			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	132	164	6	170	302	43.4%	70.4%	78.6%
> 607	36	291	67	36	394			
Totals	168	455	73	206	696			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	144	149	9	158	302	43.4%	70.8%	76.2%
> 607	45	211	138	45	394			
Totals	189	360	147	203	696			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	217	80	0	80	297	42.7%	77.7%	74.3%
> 540	75	261	63	75	399			
Totals	292	341	63	155	696			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	169	128	0	128	297	42.7%	74.0%	76.1%
> 540	53	277	69	53	399			
Totals	222	405	69	181	696			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	196	101	0	101	297	42.7%	75.6%	74.0%
> 540	69	267	63	69	399			
Totals	265	368	63	170	696			

APPENDIX M

MSA Reading Correct and Incorrect Predictions Based on the 30th Percentile for Non-Poor Black Students (n=901)

Reading

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	239	75	0	75	314	34.9%	80.5%	70.3%
> 607	101	434	52	101	587			
Totals	340	509	52	176	901			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	145	168	1	169	314	34.9%	76.8%	78.4%
> 607	40	448	99	40	587			
Totals	185	616	100	209	901			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 607	145	156	13	169	314	34.9%	75.9%	75.1%
> 607	48	316	223	48	587			
Totals	193	472	236	217	901			

Mathematics

Grade 3 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	255	97	0	97	352	39.1%	79.1%	73.7%
> 540	91	391	67	91	549			
Totals	346	488	67	188	901			

Grade 4 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	205	145	2	147	352	39.1%	76.7%	76.5%
> 540	63	376	110	63	549			
Totals	268	521	112	210	901			

Grade 5 Scale Score	Basic	Proficient	Advanced	Incorrect Prediction	Totals	Percent Identified	Percent Correctly Identified	Percent Basic Correctly Identified
<= 540	210	141	1	142	352	39.1%	75.5%	72.7%
> 540	79	381	89	79	549			
Totals	289	522	90	221	901			

APPENDIX N

MSA Reading Correct and Incorrect Predictions Based on the 30th Percentile for Poor Black Students (n=1,065)

Reading

Grade 3 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 607	458	86	0	86	544	51.5%	79.3%	77.5%
> 607	133	357	22	133	512			
Totals	591	443	22	219	1056			

Grade 4 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 607	286	255	3	258	544	51.5%	70.9%	85.4%
> 607	49	414	49	49	512			
Totals	335	669	52	307	1056			

Grade 5 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 607	310	217	17	234	544	51.5%	70.5%	79.9%
> 607	78	277	157	78	512			
Totals	388	494	174	312	1056			

Mathematics

Grade 3 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 540	452	128	1	129	581	55.0%	77.0%	79.9%
> 540	114	319	42	114	475			
Totals	566	447	43	243	1056			

Grade 4 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 540	407	174	0	174	581	55.0%	75.5%	82.7%
> 540	85	325	65	85	475			
Totals	492	499	65	259	1056			

Grade 5 Scale Score	**Basic**	**Proficient**	**Advanced**	**Incorrect Prediction**	**Totals**	**Percent Identified**	**Percent Correctly Identified**	**Percent Basic Correctly Identified**
<= 540	406	173	2	175	581	55.0%	74.8%	81.7%
> 540	91	337	47	91	475			
Totals	497	510	49	266	1056			

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