Understanding the Education Trajectories of Young Black Men in New York City: Elementary and Middle-School Years

(*Prepared for the Black Male Donor Collaborative*)

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Executive Summary

For some time it has been widely known that Black males are underrepresented in most categories associated with academic success and overrepresented in categories associated with failure. This is true in most schools throughout the United States and it is certainly true in schools in New York City. Most of the existing research on the academic challenges confronting Black males provides documentation on the extent of poor performance among Black males, but has generally not proven helpful in the design and implementation of effective interventions.

The Metropolitan Center for Urban Education at New York University, led by Professor Pedro Noguera, and the Center for Research on Fathers, Children and Family Well-Being (CRFCFW) at Columbia University, under the direction of Professor Ron Mincy, have undertaken a joint study for the Black Male Donor Collaborative (BMDC).

The *Trajectory Study* tells the story of the different educational paths taken by all Black males in the expected 2007 graduation cohort who attended New York City Schools since at least 4th grade. Findings illuminate the areas in and out of school that, if left unaddressed, can adversely affect the life chances of low-income Black male students in New York City. Key findings are presented below, followed by a list of recommendations.

Trajectory Study

One reason for the endemic limitations in the research on Black males is that few prior studies have explored variations in educational trajectories within these broad groupings of students over time. We know a lot about the young men with the worst outcomes, but very little about when the signs of trouble *first become manifest*. Also, of those Black males that do succeed, we only know that they managed to avoid failure. The absence of a more nuanced analysis of the evolution of achievement of Black males and the prevalence of an analytical perspective that reifies existing stereotypes of academic failure among black males contributes to the prevalent notion that black males have monolithic experiences and outcomes. To make targeted decisions about how, when, and where to intervene, *we need to know more about the educational complex pathways that shape outcomes for Black male students in the public school system.*

Using longitudinal data on a cohort of Black male students in New York City Schools provided by the New York Department of Education, we undertook three analyses to obtain new insights about variations in academic achievement among Black male students. We focus specifically on the early years—from elementary school through middle school—because several studies show that indicators from these years are strong predictors of which students are likely to drop out later. We focus on math scale scores as opposed to the ELA exam so that we can include Black male English Learners who did not take the same ELA exams as their peers.

The goal of our first analysis was to understand what characteristics of students, schoolmates, and schools attended by Black male students, especially those factors amenable to policy change, were associated with growth in math performance scores during the elementary and middle-school years. *Perhaps the most troubling finding of this analysis was the realization that math proficiency for Black males declined over time.*

After including all the theoretically relevant variables, we found that the 4th-grade standardized math scores of subsidized-lunch and retained students were *substantially lower* on average compared to other students across New York State, essentially remaining flat over time. Standardized scores of special education students in the cohort showed a modest upward trend while the standardized math scores of mobile students showed a somewhat larger, but still negligible, downward trend.

Finally, the average math scores of Black male students' classmates were the only variable, potentially amenable to policy manipulation that had a significant association with the growth of their standardized math scores. This suggests that *putting Black male students in more challenging learning environments may be the best way to increase math proficiency over time.* In New York City where many schools are characterized by extremely high levels of racial and socio-economic isolation, finding ways to increase diversity in school enrollment will be essential.

Our second analysis sought to determine if the academic achievement of the Black males in our sample clustered into common performance trajectory groupings in the five years prior to their entry into high school (expected 4th through 8th grade). In further exploring the limited trend between 1999 and 2003, we observed six performance trajectory patterns emerging among our sample. Four of the predicted trajectory groupings performed below proficiency levels (Level 3) assigned to just under three-quarters (73.2%). All but two of the trajectory patterns maintained relatively flat trajectories with slight declines over time, consistent with research that has found that performance gaps tend to be rigid and remain persistent over time (see Jencks & Phillips, 1998 for an example).

At the same time, two of the below-proficiency trajectory groupings—of which about one-quarter of our sample were assigned—"changed tracks" during the middle-school years, suggesting that middle school can be a place where significant growth or decline in math proficiency can take place. The *declining math performer trajectory* grouping took a particularly steep fall in the middle-school years and, alternatively and most surprisingly, the *improving math* *performer* trajectory grouping that started between the *persistently low* and *declining* group made strong gains in middle school.

In our final analysis we examined the extent to which trajectory groupings combined with middle school characteristics (where the twists and turns happened) predicted how well students performed in their first year of high school. We found *that patterns of performance on the math exam in elementary and middle-school years continue into their first year of high school,* as measured by the number of courses they passed in 9th grade.

In addition, some of the individual indicators were each unique predictors of credit completion in the final model. The most notable indicators were as follows:

- Ninth-grade course completion was significantly lower for students assigned to the *declining performance cluster* than for students assigned to all other performance clusters, and lower for students who ever classified as special education students.
- The kinds of schools the students entered played a role on how some groupings performed in high school:
    - Middle school characteristics reduced the effect of membership in the lowest-performing cluster and the improving cluster on performance; and
    - Students who attended middle schools with fewer schoolmates who qualified for subsidized lunch and more schoolmates who obtained higher math scores on standardized exams also completed more courses in the 9th grade.

Overall Recommendations

As a result of our analyses, the research team strongly recommends the following:

- Provide intensive academic support to 2nd to 5th grade students who are not performing at a grade level;

- Provide intensive case management for 6^{th}, 8^{th}, and 9^{th} graders at as many schools as possible, using the following indicators: irregular attendance, disruptive behavior, non-submission of homework, and academic difficulties in the classroom as a trigger for deliberate intervention;
- Increase access to high-quality diverse schools to reduce racial and socio-economic isolation of the most academically vulnerable students;
- Provide guidance to schools on how to use and interpret the ARIS data system to carefully monitor progress of Black male students;
- Develop strategies to recruit and retain cohorts of teachers with a record of effectiveness in high-need schools (focus on middle schools).

Introduction

Black males are underrepresented in most categories associated with academic success and overrepresented in categories associated with failure. On standardized measures of achievement, Black students score below White students in all core academic areas including science, mathematics, reading, and writing (Fashola & Cooper, 1999). The achievement gap for Black males is even wider than for other groups.

For example, whereas science and math achievement continues to be higher for White, Asian, and Latino males than for females from these groups, Black males perform at a lower rate than Black females in these subject areas (Metro Center, 2009; Noguera, 2008). Black males are severely underrepresented in the most rigorous academic programs, including gifted programs, honors courses, and Advanced Placement courses, while being vastly overrepresented in remedial academic tracks (Jencks & Phillips, 1998; Darling-Hammond, 2002). Additionally, Black males have the highest rates of special education classification, including classifications as mildly mentally retarded, emotionally disturbed, and/ or learning disabled (Dunn, 1968; Klingner, 2004; Heller, Holtzman & Messick, 1982; Donovan & Cross, 2002). Furthermore, of all demographic groups, Black males have the highest rates of expulsions, suspensions, and detentions (Gregory, Skiba, & Noguera, 2010; Skiba, 2001).

Research offers only general lessons typically focused on the overrepresentation of Black males in categories that predict poor performance and likelihood of dropping out, such as: 1) Rates of suspension, expulsion from school, and arrests in school settings (Meier, Stewart, and England, 1989; Skiba, 2002); 2) Special education classifications of mildly mentally retarded, emotional disturbance, and/or learning disabled (Orfield, 2004; NCCRESt, 2004); and 3)

Enrollment in poorly resourced, poor performing schools (Rothstein, 2004) that are highly segregated by race and class (Orfield & Lee, 2006).

Few prior studies take into account the possible variations in educational trajectories within these broad groupings. We know a lot about the young men with the worst outcomes, but very little about when the signs of trouble first become manifest. We also know relatively little about those who succeed other than that they managed to avoid failure. The absence of a more nuanced analysis of the evolution of achievement of Black males and the prevalence of an analytical perspective that reifies existing stereotypes of academic failure among Black males contributes to the notion that Black males have monolithic experiences and outcomes. To make targeted decisions about how, when, and where to intervene, we need to know more about the complex pathways and educational experiences that shape outcomes for Black male students in the public school system.

Fortunately, new longitudinal data on the performance of Black male students in the New York City School System, including the schools they attended, has the potential to yield new insights about these complex pathways. These insights are potentially important because New York City has the largest school district in the United States, with a heavy concentration of Black and Latino students. The performance of Black males in the New York City School System is worse than their counterparts in most other large school districts in the nation. For example, in 2006, only 10 of the nation's largest 50 school districts had lower overall graduation rates (49%) than New York City (Swanson, 2009).

With the gap between graduation rates of Black and White students at 25.7%, New York City ranks among the highest schools in the nation with performance disparities (Orfield, 2004). Further, performance of Black male students in New York City has grown worse over time.

Black males in New York City confront a wide array of obstacles, including disproportionate placement in special education classes (Metro Center, 2009) and disproportionate rates of discipline (Annenberg, 2008). Finally, in 2006, the total graduation rate for Black males in New York City was only 26 percent (Schott Foundation, 2006). Despite numerous initiatives carried out in New York City over the last several years, including reforms that appear to have benefited many students in the system, there is little evidence that these reforms have mitigated the severe challenges faced by this population.

This study presents initial analyses of these data to provide a longitudinal perspective on the variation in the educational pathways among Black male student in New York City Schools for a recent graduation cohort[1] and to further explore the factors amenable to policy intervention that may influence their success or failure. Our central research questions are: 1) What are the patterns of educational trajectories of Black males in New York City Schools? and 2) How are these educational trajectories associated with factors that may determine academic achievement? We focus specifically on the early years—from elementary school through middle school—because several studies show that indicators from these years are strong predictors of which students are likely to drop out later (Belfanz and Herzog, 2005; Alexander et al., 1997; Parthenon Group, 2005). Our research consists of four key steps:

- First, determine patterns among trajectory groupings of students within the cohort studies utilizing several statistical procedures;

[1] Note that by the term *graduation cohort* we are referring to students who, based on the year they began kindergarten, would **be expected** to graduate after four years of high school. Students who dropped out before the expected graduated date, were retained at some point in their academic experience, left NYC public schools due to transfer or unknown reasons, or did not graduate after four years of high school are still considered members of this cohort.

- Second, link these trajectories to the schools they attended, exploring and comparing the factors within and across the different types of groupings;

- Third, examine how trajectories and middle school factors predict academic performance in their first year in high school (as measured by course credit completion); and

- Fourth, use this analysis of trajectories to identify the critical points of intervention so that policies and programs can be designed to reinforce the pathways that positively influence academic outcomes for Black male students.

This report is organized as follows. We begin with a review of the research literature that informed our work. We then describe general characteristics of the sample of young men included in our research and the schools they attended before high school. Next, we present findings from our growth-model analysis (HLM) to look at how individual performance on standardized math exams changed over time. We identify factors that influenced the student samples' performance trajectories before entering 9th grade. To gain a better sense of how, if at all, individual math performance may influence trajectory patterns, we provide findings from our trajectory grouping analysis using a heuristic grouping model as a tool for examining common pathways over time. Finally, we examine students' five-year math performance trajectories and middle school characteristics to predict 9th-grade academic performance (as measured by credit completion). In the conclusion, we summarize our results and present recommendations policymakers should employ in addressing the academic needs of Black males in New York City.

Literature Review

Prior research points to factors in three domains that affect academic achievement: 1) Family background characteristics 2) Individual student-level characteristics; and 3) School characteristics. Except for the first domain, each domain includes factors that educational policymakers can change in an effort to improve academic achievement. For example, two widely used school policies, which we observe as student-level characteristics, involve retention and special education classification. Both may occur in elementary school, but there is much controversy about their validity and subsequent impact on academic achievement, attainment, and earnings (Jimerson, 2001; Roderick, Nagaoka et al., 2005; Harry & Anderson, 1994; Noguera & Wing, 2008; Oswald, Best et al., 2006). Mobility is a third student-level characteristic, which can be affected by policy decisions. All of the school-level characteristics are amenable to policy change and, in turn, can be organized into four categories: 1) School enrollment; 2) School resources; 3) School climate; and 4) School type enrollment. We use this typology to organize our review of the literature, focusing especially on policy levers.

Family Background

Prevailing differences in family resources and parenting behaviors/practices account for a large share of race/ethnic differences in cognitive development in early childhood. Many family background characteristics are associated with academic achievement. These include family socioeconomic status (SES) (e.g., a composition of family income and parental education and employment/occupation), parental marital status, home environment, language use, parent-child interaction, parental warmth, discipline, and mental health (Brooks-Gunn, Klebanov & Duncan, 1996; Cooksey, 1997; Duncan & Brooks-Gunn, 1997; Farkas & Beron, 2001; Hart & Risley, 1995, 1999; Jencks & Phillips et al., 1998; Smith, Brooks-Gunn & Klebanov, 1997). Because these characteristics are highly correlated, it is difficult to disentangle the independent contributions of each.

For example, family SES is highly associated with family structure, which, in turn, is associated with academic achievement. Many single women trying to raise children without the financial, emotional, and other support of the father have difficulty maintaining their children's emotional and social well being and cognitive development (Amato, 2005). Studies also associate the presence of family resources with the quality of parental investment in their children (Brooks-Gunn & Duncan, 1997). Indeed, parenting practices and parental investment are often related to income, with the outcomes most visible at the extremes (e.g., reduced parental involvement is associated with delinquent behavior, drug addiction, childhood injuries, accidents, and poor health) (Barber, 2000)[2].

In addition, family SES and family structure are highly associated with parental mental health. Depression among custodial mothers, which usually detracts from effective parenting, is related to negative outcomes for their children (Currie, 2005). However, children who are close with at least one stable adult are less likely to develop behavior problems in spite of sometimes severe conditions (Barber, 2000). This is an especially important finding because a growing body of research demonstrates that the mother's education level, which is highly correlated with family SES, and well-being are strong predictors of children's academic achievement (Bianchi, Subaiya & Kahn, 1999; Currie, 2005; West, Denton & Germino-Hausken, 2000; Zhan & Pandey, 2004).

Finally, foreign-born students may have superior academic achievement than native-born students for a variety of reasons, including language retention, higher expectations of parents and

[2] Likelihood is not certainty, however. Furstenberg and his colleagues (1987) remind us that many low-income children do not develop serious social problems as commonly assumed. At the same time, most of us are aware of a few recent incidents in which children raised in affluent homes have committed horrifying crimes (Barber, 2000).

peers, and greater agreement between parents, peers, and children about educational expectations (Hao and Bonstead-Bruns, 1998; Fuligni, 1997, Kao and Tienda, 1995; Glick and White, 2003; Kao and Thompson, 2003).

Student-Level Characteristics

Three student-level characteristics have important associations with academic achievement: retention, special-education status, and mobility. The relationship between these characteristics and academic achievement is bi-directional and may be amenable to policy changes.

Retention.

There is probably no bigger disagreement between teachers and educational policymakers, on the one hand, and researchers on the other than the disagreement involving the use of retention to improve academic achievement among low-achieving students (Roderick, Nagaoka et al., 2005). Proponents argue that retention encourages students, parents, and teachers to change their behavior in ways that improve academic achievement, because students would be required to receive additional instruction unless their performance meets minimal standards. Researchers, by contrast, find no evidence that retention improves the academic achievement of low-achieving students. However, some recent studies find that low-achieving students who are retained may have fewer behavioral problems than their counterparts who are promoted. Other recent studies do not support the beneficial effects of retention on adjustment problems and counter still other studies finding that any such gains would be outweighed by the higher probability of retained students dropping out (Jimerson, 2001).

Special Education Status.

A longer standing controversy involves the overrepresentation of Black male students among students with special education classification. After decades of criticisms by studies, legal rulings, and commissions on several grounds, this practice continues. First, the practice is based upon discriminatory and unscientific standards and the failure of teachers to understand the meaning of behavior, language, and learning styles of Black males. Second, it unnecessarily stigmatizes Black males, increases their dropout rates, relegates them to watered down educational experiences, and diminishes their future economic prospects (Harry & Anderson, 1994; Metro Center, 2009; Oswald, Best et al., 2006).

Mobility.

While student mobility is often associated with changes in students' residence, research has also found that between 30% and 40% of school changes are associated with other factors such as school overcrowding, class size reduction policies, suspension and expulsions, and schools' academic and social climate (Kerbow, 1996; Rumberger et al., 1999). Studies also find that high mobility rates among elementary students are associated with negative academic achievement and academic outcomes such a dropouts (Rumberger & Parady, 2005; Ingersoll, Scamman & Eckerling, 1989).

However, the association between achievement and mobility may arise because both are associated with other factors that affect student achievement. Some of these other factors are observable in survey data, but some are not. For example, poorer families also tend to have the highest levels of mobility due to the difficulties their families may experience in finding affordable housing or stable employment. Both factors (poverty and mobility) are also correlated with lower academic performance (Nelson et al., 1996). On the other hand, personal and family problems (e.g., substance abuse), which is rarely available in survey data, can affect student's mobility and achievement.

Such spurious correlations have made it difficult for studies to determine if mobility was a symptom or cause of low achievement. For instance, Alexander, Entwisle, and Dauber (1996) demonstrated the association between mobility and academic achievement after accounting for other student variables including past academic performance, the relationships between student mobility and test scores, grades, retention, and referrals to special education. Similarly, Temple and Reynolds (1997) found that factors that pre-dated school changes accounted for half of the variation in achievement between mobile and non-mobile students.

This means that mobility may be more amenable to policy changes at several levels. For example, by improving the quality of a particular school, administrators may reduce parental incentives to move their children elsewhere. Or, by establishing common curriculum and standards throughout a district, policymakers may reduce the adverse effects of frequent mobility or the likelihood that parents move their children to better schools.

A third option policymakers have used to reduce the adverse effects of mobility is to change when students transition between schools as they move through grade levels. Alspaugh (1999) found that students who transitioned to high school in the 7th grade (e.g., students attending 7-12 schools) dropped out of high school at a significantly lower rate than students who transitioned to high school in the 9th or 10th grade. The developmental needs of student in the middle grades may account for these results (e.g., Jenkins & McEwin, 1992). Alspaugh (1999) posits that the high dropout rate attributed to students making later high-school transitions may be related to the achievement loss experienced by many students during a transitional year.

School-Level Characteristics

School-level characteristics in four domains (student enrollment, school resources, school climate, and school type) have important effects on academic achievement, which are often difficult to quantify in statistics because of collinearity and endogeneity[3].

[3] Endogeneity refers to a correlation between the variable of interest and the error term.

Student Enrollment.

Enrollment characteristics play an important role in shaping the educational outcomes of students in part because variables such as the racial and socioeconomic status of students are often highly inter-correlated and highly correlated with other educational opportunities. As a result, students who attend schools with high concentrations of poor, minority, and underachieving students may be at increased risk for academic failure (Wang & Gordon, 1994).

For example, findings from the Civil Rights Project show that the average Black student attends schools where close to half of the students are poor, while more than 60% of Black students attend schools with poverty rates of 50% or higher. As a result, Black students are three times more likely than White students to be in enrolled in high poverty schools (Orfield & Lee, 2006). Moreover, because of the high correlation between race and poverty, especially in large urban areas like New York City, many students attend schools where 90-100% of the students are Black and Latino students (Orfield & Lee, 2006). This makes high poverty concentration synonymous with race and ethnic segregation, both of which are adversely associated with academic achievement.

Research on the concentration of “high need” minority students has shown that schools often become overwhelmed by the broad array of needs that such students bring with them. Such schools are also more likely to have more remedial courses, high teacher turnover, inexperienced or unqualified teachers, and fewer demanding pre-collegiate courses (Lee, 2004). Moreover, schools with a high concentration of minority students tend to have crowded classroom space and inadequate supplies of textbooks and materials (Crosnoe, 2005; Fruchter, 2007; Moody, 2001). Schools with these characteristics often fail to provide adequate educational resources and a supportive school climate, including high academic expectations (Bryk, 2010; Griffith, 2000; Matute-Bianchi, 1991).

Further, Rumberger and Palardy (2005) found that the concentration of poverty in school was associated with lower student achievement through four school processes: 1) teachers' expectation about students' ability to learn; 2) the average hours of homework that students completed per week; 3) the average number of advanced (college prep) courses taken by students in the school; and 4) the percentage of students who reported feeling unsafe at school.

Nevertheless, even after controlling for school quality, classmate achievement, and classmate ability, attending schools with high concentration of low-income Black students is associated with lower achievement for individual Black students—particularly high-achieving Black students (Hanushek, Kain & Rivkin, 2009; Borman et al., 2004).

School Resources.

Greenwald and Hedges (1996) conclude through their meta-analysis of the effect of school resources on student achievement that school resources (e.g., counselors, social workers, and technology experts) have a positive effect on student achievement. Unfortunately, Black males are disproportionately enrolled in under-resourced, poorly performing schools (Rothstein, 2004). In New York City, high-need Black males—special education students and under-performing students generally—are also more likely to be concentrated in under-resourced schools in low-income neighborhoods ((Wilson, 1987); Metro Center, 2009). Two types of resources have been shown to be particularly effective in boosting student achievement—quality teachers and after-school programming.

Unqualified and inexperienced teachers.

Access to highly qualified and effective teachers is an issue of great concern, because many studies have shown that teachers have a significant impact on student achievement (e.g., Goldhaber, 2007; Gordon, Kane & Staiger, 2006; Rivkin, Hanushek & Kain, 2005; Rockoff, 2004; Sanders & Horn, 1994; Sanders & Rivers, 1996; Wright, Horn & Sanders, 1997). Teacher quality is also central in efforts to understand and reduce achievement gaps between students of color and their European-American and Asian-American peers (Ferguson, 1991, 1998).

Corcoran and Evans (2006) suggest that teacher quality comprises the following dimensions: education and content knowledge, professional licensure and certification, teaching experience as measured by years in the profession, and prior academic performance and college selectivity. Race and gender may also affect the quality of student-teacher interactions. Researchers and policy makers debate which of these dimensions of teacher quality are the most important and studies vary widely in the number of teacher-quality dimensions they include. This has made it difficult to reach consensus on the effects of teacher quality on academic achievement.

Findings on the effects of teacher certification are mixed. The teacher certification process is intended to require teachers to complete an accredited teacher-preparation program that will help them develop pedagogical knowledge and demonstrate subject-area knowledge. Proponents of teacher certification (e.g., Darling-Hammond, 2002) claim that these procedures ensure that teachers have both the pedagogical and content area knowledge necessary to increase their effectiveness in teaching at-risk students. In her analysis examining the relationship between state-level teacher quality indicators and student outcomes on state exams, Darling-Hammond (1999) also found a strong positive correlation between the percent of teachers with full certification and majors in their field and student test scores on 4^{th}-grade math and reading exams and 8^{th}-grade reading exams, even after controlling for student poverty and language background. At the same time, the percent of new, uncertified teachers was negatively correlated with student achievement on each of these tests. Similarly, school-district level analyses have shown that teacher certification accounts for a significant amount of variance in student achievement, even when accounting for district-level demographics and characteristics (Ferguson, 1991; Ferguson & Ladd, 1996; Goldhaber & Brewer, 2000).

Nevertheless, the variability in teacher certification programs and the lack of studies linking teacher certification to individual student outcomes makes it difficult to draw a direct correlation between teacher certification—along with other indicators of teacher quality—and student achievement (Goldhaber, 2008; Rivkin, Hanushek & Kain, 2005; Wayne & Youngs, 2003).

Among the more robust indicators of teacher quality, three or more years of teacher experience has been shown to correlate positively with student performance (Goldhaber, 2008). Experienced teachers, however, are not equally distributed across low- and high-poverty schools. Boyd, Lankford, Loeb, and Wyckoff (2005) demonstrate that experienced teachers are drawn to schools with low concentrations of poor and minority students and high levels of student achievement. There is also evidence that high teacher turnover inhibits low-performing schools from raising student achievement. The evidence suggests that building an experienced teaching core is essential to creating a more level playing field for students and expanding the opportunity to learn.

After-school programming.

Throughout the last two decades, there have been numerous studies documenting the benefits of participation in out of school time (OST) activities (Lauver, 2004). Participation has been associated with higher (more, or improved) school attendance, academic achievement , positive attitudes towards schoolwork (Anderson-Butcher, Newsome & Ferrari, 2003; Pettit et al., 1997; Pierce & Vandell, 1999; Posner & Vandell, 1994, 1999), homework completion, aspirations for college, work habits, and interpersonal skills (Hofferth & Jankuniene, 2001). Besides the demonstrated benefits, studies have shown that participation in OST activities are linked to decreases in negative behaviors such as juvenile arrests, drug activity, and teenage pregnancy (Mason-Dixon Pulling and Research, 2002; NIOST, 2004; Patten & Robertson, 2001).

Emerging evidence suggests at-risk students, especially boys, benefit most from OST activities (NIOST, 2008). One meta-analysis of 35 studies reported that standardized test scores of low-income, at-risk youth improved after participation in after-school programs (Lauer et al., 2006). Another study found that boys who participated in OST activities had more positive staff and student interactions. Classroom teachers also reported that boys had fewer behavior problems and better social skills with peers when they were allowed to make choices about their OST activities (Pierce, Hamm, & Vandell, 1999).

While much of the research focuses on academic performance, participation in OST activities has other benefits, including improved social and emotional development, health and wellness outcomes, and college enrollment (NIOST, 2008; Lauer et al., 2006; Hansen, Larson & Dworken, 2003; Roffman, Pagano & Hirsch 2001; Cooper et al., 1999; Peck et al., 2008; Gardner, Roth & Brooks-Gunn, 2008).

School Climate.

School climate is the social atmosphere of a setting or learning environment that affects the behavior and attitudes of teachers and students (Moos, 1979). Positive school climates are correlated with positive student educational outcomes, whereas "negative" school climates are associated with obstacles that can inhibit students' learning (Brand, 2003; Freiberg, 1998; Kuperminc et al., 1997, 2001). Few studies have developed measures of school climate, but many have used disciplinary and attendance records as proxies (Freiberg, 1998). Several such studies have found that academic achievement is highly associated with attendance, classroom behavior, and perceptions of safety and order (Brand, 2003; Duncan & Brooks-Gunn, 1997;

Lamdin, 1996; Roby 2004; Felner et al., 1985; Moos, 1979).

School Type: Small Schools.

There has been considerable research on the effects of school type, especially school size, on academic (and related) outcomes. Most such studies find that small schools produce better academic outcomes compared to large comprehensive schools, particularly for disadvantaged students (Leithwood & Jantzi, 2009; Huang & Howley, 1993; Friedkin & Necochea, 1988; Howley, 1996). Other studies show that when compared with large schools, small schools have lower dropouts rates (Rumber, 1995; Lee & Burkam, 2003; Gardner, Ritblatt, and Beatty, 2000), higher student engagement (Lee & Smith, 2005; McNeely, Nonnemaker & Blum, 2002; Silins & Mulford, 2004; Crosnoe, Johnson & Elder, 2004), higher attendance rates (Kuziemko, 2006), and lower levels of violence and discipline problems (Darling-Hammond et al., 2002; Kimweli & Anderman, 1997).

Many of the benefits that have been attributed to small schools and small learning communities appear to be related to the ability of teachers to exert greater influence upon students when they work within lower teacher-student ratios. The lower the case load the greater the ability of the teacher to provide meaningful feedback and support to students (Wasley et al., 2000). Based on their analysis of over 11,000 students in 820 high schools, Lee and Smith (1996) also found that small learning communities increased teacher collaboration and provided more personalized student instruction (rather than tracking). Finally, Hemphill et al. (2009) found that students attending smaller high schools in New York City had higher graduation rates and higher passing rates on state assessments.

However, the evidence on small schools is not universally favorable. For instance, Noguera (2002) found that several of the new small schools in Boston lacked a clear academic focus and failed to develop strategies to provide support for students. Conchas and Rodriguez

(2007) found that many small schools offered a limited curriculum compared to larger comprehensive schools and were unable to provide the support services that students with learning disabilities and English language learners required.

Description of the Student Sample

Student Selection

Our data was comprised of two merged data sources: 1) family background and student-level data; and 2) school-level data. We obtained the family background and student-level data from the New York City Department of Education's Department of Assessment and Accountability (DAA). We linked these data to publicly available school-level data, which we originally obtained from the New York City Department of Education, New York State Education Department, and US Department of Education Common Core Data. The result was a large, rich, and rare longitudinal sample of a cohort of Black male students and the schools they attended. This sample included all the Black male students in the city who began high school in 2003-2004, and on whom DOE based their high school graduation reports for the cohort of 2007.

The initial sample consisted of 11,803 Black males who were in the system between the fall 1998 and fall 2003, or entered the system during that time period. Because we sought to track the students from elementary school through high school, we decided to narrow our sample to those students who were present in the system beginning in 1998 (expected 4^{th} grade) and for whom we had performance data over the entire period of interest. We decided to focus on math performance because some of the students in our sample were English Language Learners and, during this sample period, they were not required to take the same state or city ELA exam as native speakers of English.

To study the relationship between individual students and the school they attended over time, we also had to ensure that we included students whom we could link to the schools they attended over time. Finally, outliers in terms of age and grade in the first year of the study were removed. Our specific criteria for inclusion in our study were: 1) scores for at least four state/district math exams between 1998 and 2003 (expected grades 4 through 8); 2) identified schooling settings that each student attended for all years between 1998 and 2003; and 3) within two standard deviations of the expected age for a 4th grader in 1998 (roughly 8-10 years). Based on these criteria, a total of 7,039 students were used in our trajectory analyses.

Student Performance

Outcome variable: math scale scores.

Our outcome variable is the math scale score for each student in each year of 1998-2003. Between 4th and 8th grade, when students are usually between the ages of 8-14, students in New York City Schools take standardized exams in math and English Language Arts. While NCLB now requires states to conduct annual testing for grades 3-8, during our period, the state only required standardized testing in grades 4 and 8. During the interim years, New York City Schools administered annual district exams with the same underlying design as the state exams. These exams formed the basis of our assessment of performance for our sample from 1998-2003.

During these years, raw scores were converted to *scale scores* to allow for cross-grade comparisons and to assess growth in performance over time. However, these scales scores were not benchmarks of what is considered to represent *math proficiency*. For that purpose, scale scores were further converted into a Likert scale with a range of 1-4 levels, where 3 represents proficiency. To see how students performed over time, we examined their growth both in terms of performance and proficiency over time.

Figure 1 shows the math scale scores of our sample in 4th and 8th grade, compared to the minimum scale score needed in each year to be considered a Level 3 or proficient. In 1999, the sample performed, on average, just below proficiency; however, in spite of their mean increase in the scale score in 2003, the sample, in terms of proficiency, fell behind.

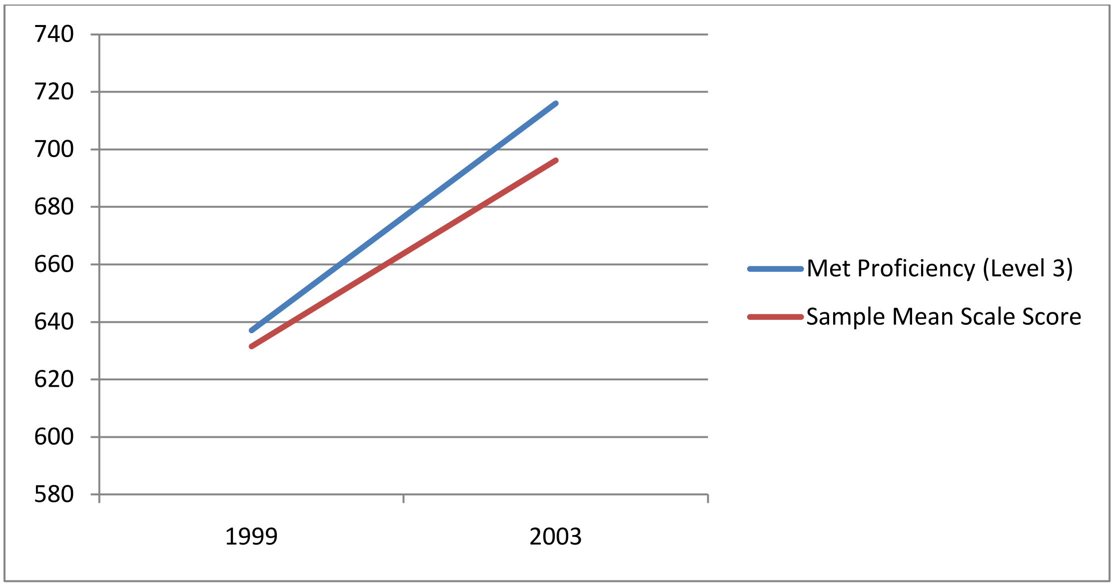

Figure 1. Mean Math scale scores and Level-3 Proficient lower limit in 1999 and 2003

In *Figure 2*, we add the minimum scale scores needed to perform at Level 2, or the "almost proficient" level. Here we see that, over time, our sample's mean scale score moves from being just under proficient towards the lower limit for Level 2.

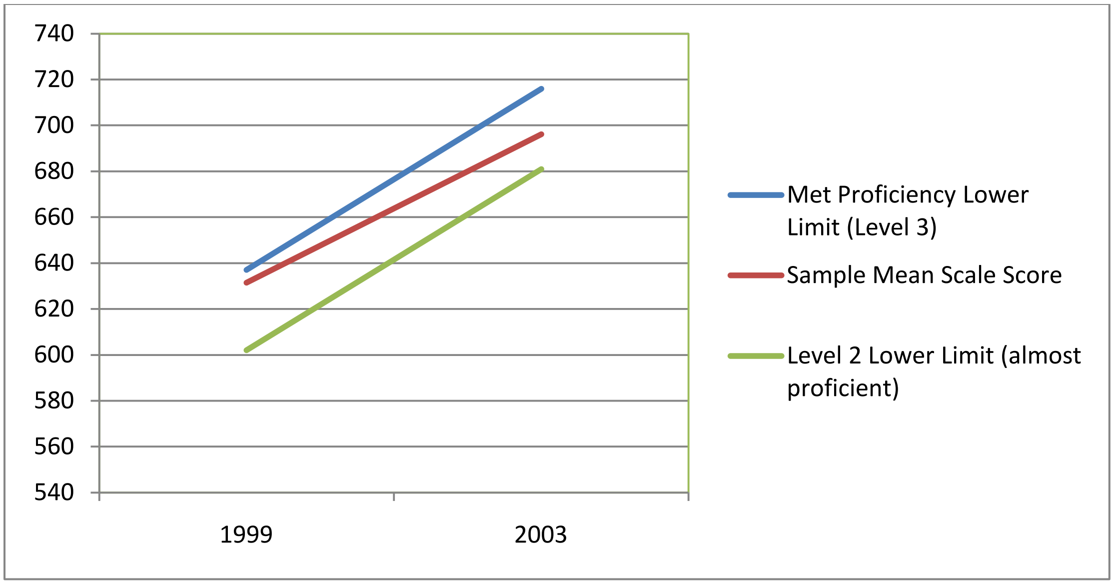

Figure 2 Mean Math scale scores and Level-3 Proficient & Level 2 almost proficient lower limits in 1999 and 2003

Math proficiency levels.

Looking more closely at students' proficiency levels on the math exam, we see a rather acute downward shift in proficiency levels between 1999 and 2003 (see *Figure 3*). Overall, in 1999, only 43% of the sample obtained a score that was within the proficiency of high-proficiency level (Level 3 or 4). More disturbing, this percentage in 2003 decreased by 17%, with only 26% obtaining proficiency or above. Most notable was the change in performance for the students in the sample that were the highest performers in 1999. While only 7.7% obtained advanced proficiency (Level 4) on the math exam in 1999, by 2003 this small percentage had decreased dramatically to 1.9% of the total sample that obtained advanced proficiency.

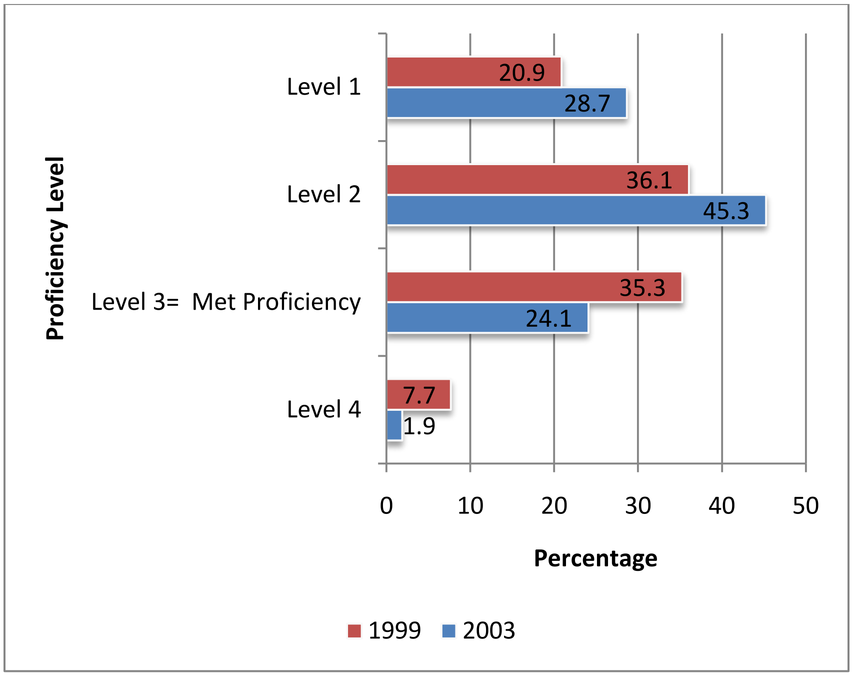

Figure 3. Math proficiency levels of sample in 1999 and 2003

While the numbers of students in our sample who made up particular categories of proficiency changed quite a bit between 1999 and 2003, an interesting phenomenon occurred in terms of the average scale scores obtained within each proficiency grouping. Within each grouping, the average scores remained flat between 1999 and 2003. In other words, it appears that when a student moves from one group to another, his score, on average, stays about the same as his peers within the same level.

Figures 4 and *5* show the average scale score within proficiency level for our sample in 1999 and 2003 bounded by the lower and upper scale score limits that define the grouping. While the students in our sample whose proficiency levels were determined to be proficient or just below proficient fell in the middle of the range for each level, those at the lowest end of the proficiency level were very close to meeting Level 2 levels. On the other hand, the mean of the highest performing grouping, Level 4, tended to obtain scores placing them towards the lower end of the range. Remarkably, five years later, average scale scores within each level group remain virtually the same. This finding suggests that there may be a strong peer effect or lack of contextual effect in performance on the math exam.

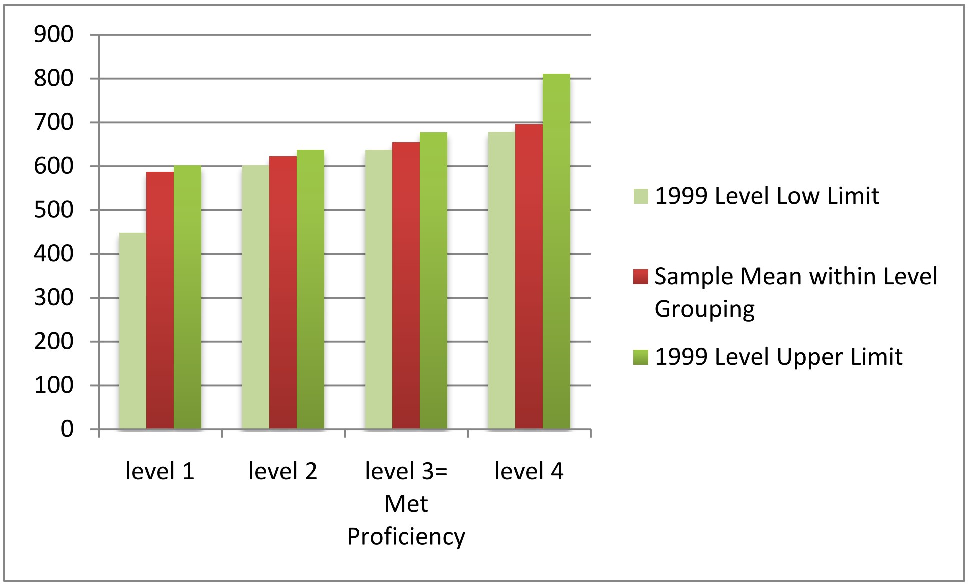

Figure 4. Mean Math scale scores for sample within level groupings 1999

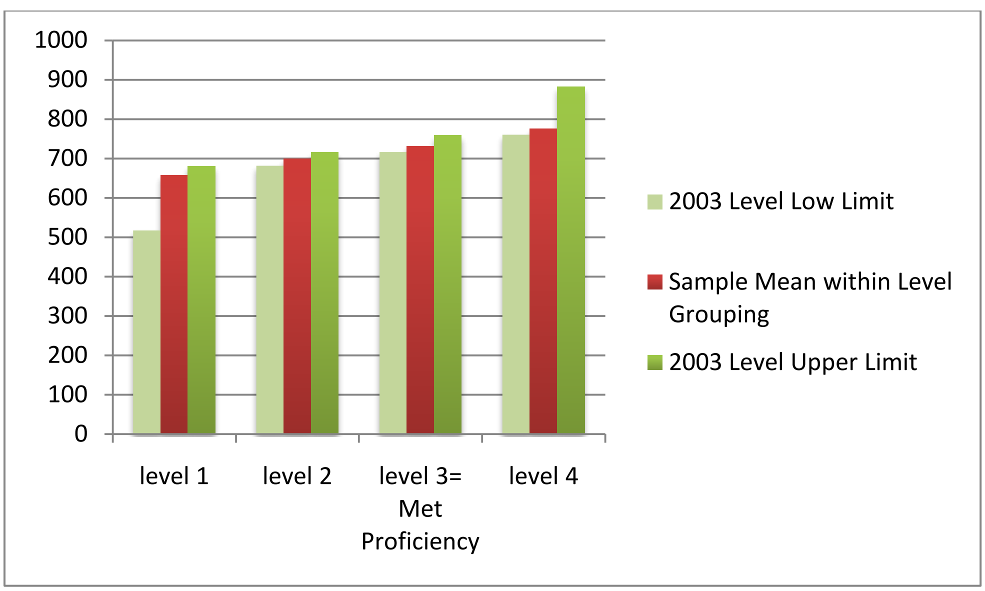

Figure 5. Mean Math scale scores for sample within level groupings 2003

Remember that DOE converts exam scores to a common scale in order to compare achievement across grades. Using this conversion, the mean math score for a 4^{th}-grade student assessed to be well below proficiency is 586.9, while the mean math score for a 4^{th}-grade student assessed to be below proficiency is 621.9, and the mean math score for a 4^{th}-grade student assessed to have just met proficiency is 653.9. This demonstrates the average Black male student is performing below proficiency in the 4^{th}-grade.

With a sample as large as ours, the distribution of math scale scores should be symmetrical, so that the mean of the standardized scores should be near zero and the standardized scores should have a unit standard deviation.[4] Standardizing the math scale scores of Black male students, therefore, using the mean of Black male math scores each year—which also remain below proficiency—will provide an interesting lens with which to view the trajectory of math proficiency. Using this method, we can also express associations between included variables and math performance in terms of standard deviations. These associations will be utilized in our primary measure of the outcome variable in most of our analyses.

Characteristics of the Sample

Family Background.

Our data include only two measures of family background characteristics: nativity and SES. The vast majority of students in our sample were born in the United States (91.0%), with 86.4% being born in New York City (see Table 1). The remaining 9% were foreign born, of whom 81.7% were born in the Caribbean (7.4% of the total sample.) Following most education research, we use qualification for the federal subsidized school lunch program (either free or at a

[4] A normal distribution, which is symmetrical, is a very important distribution in statistics and is a good approximation for large samples in which half of the observations are above the mean and half below. Standardized scores represent a conversion in which the mean of the raw variable is subtracted from each observation and the result is divided by the standard distribution of the raw variable. The result is a standardized variable with a mean of zero and a standard deviation of 1.

reduced rate) to measure SES, because this measure is linked to reported income and qualification for other social subsidies. The vast majority of the students in our sample (89.2%) qualified for the federal subsidized lunch program, suggesting that an overwhelming number of the students in our sample were from low-income homes.

Table 1: Family Background and Student-Level Characteristics

	N	%
Family Background		
Foreign Born	661	9.1
Free/reduced Lunch	6486	89.2
Student-Level Characteristics		
Retention in the 5th Grade	41	0.6
Special Education Classification	1397	19.8
Mobility (between 5th – 8th grade)	6450	88.7

Student-Level Characteristics.

A large number of students in our sample (N=1, 397 or 19.8%) were referred for special education services at some point during their academic career. Of those referred, 11.6% spent at least one year in integrated settings between 1998 and 2003, while almost half (48.9%) were assigned at least one school year during the same time period to settings where they were isolated from the general school population, either in special classrooms or programs within schools or in specialized school settings (see Table 1). By contrast, retention by the 5th grade, which could have occurred in the 3rd or 4th grade, was rare, involving only 41 students (0.6%) in our sample.

There was much mobility in our sample, but some mobility was to be expected as students transitioned from elementary to middle school. Most (89%) of our sample changed schools between the 5th and 8th grades. If a student had attended a traditional elementary school (grades k-5) and middle school (grades 6-8), we would expect them to move once; almost three-quarters of our sample (74.4%) followed this expected pattern, but many transferred more than one would expect.

Selected Characteristics of Attended Schools

School-Level Characteristics

This section describes the characteristics, summarized in Table 2, of the students and schools in the elementary and middle schools attended by our sample during their expected 4th-grade year (1998-1999) and expected 8th-grade year (2002-2003).

During both the sample's elementary and middle-school years, students attended predominantly minority schools, where Black students made up the largest enrollment grouping (62.8% and 59.3%, respectively). As students transitioned from their elementary to middle-school years, fewer qualified for subsidized lunch (81.6% and 74.8%, respectively). As we mentioned in the literature review, minority status and SES are highly correlated, such that including minority status and SES in the model increases the standard errors of both. Since there were four race-ethnic groups and ethnicity has different implications for performance, we included those on SES (qualified for free or subsidized lunch) in our model. The resulting coefficients reflect the association between math scale scores on the one hand and both SES and race/ethnicity.

On average, our sample attended schools in which administrators allocated very little of their budgets to afterschool programming in 1999 and 2003 (1.2% and 1.3%, respectively). Further, as students in our sample progressed into their middle-school years, they were taught by a greater number of teachers with less than three years of experience (16.6% in 1999 and 23% in 2003, respectively).

Table 2: Student and School-Level Characteristics

	1999-2000 Elementary		2002-2003 Middle-School Years	
	Mean	**SD**	**Mean**	**SD**
Student-Level Characteristics				
School Enrollment	2116.3	1202.0	1101.9	475.0
% Black	62.8	28.8	59.3	28.3
% Latino	27.0	23.1	27.9	22.2
% White	5.5	12.6	6.7	12.5
% Asian	4.2	8.7	5.7	9.6
% Qualify for Subsidized lunch	81.6	16.0	74.8	17.9
Mean Math Scale Score	639.7	15.7	695.2	16.4
School-Level Characteristics				
Resources				
% Budget to afterschool programming	1.2	0.7	1.3	0.7
% Teachers with < 3 years experience	16.6	9.2	23.0	8.8
Climate				
Student Attendance Rate	91.0	2.2	90.3	2.8
% Teachers returning from last 2 years	75.9	21.2	73.8	17.4
School Type				
% Enrolled in small schools (<440)	295	4.2	663	9.5

Following previous studies, we use attendance rates as a proxy for school climate. Student attendance rates were generally low throughout the elementary school years (84.3%) to middle-school years (83.7%). In other words, for every one hundred students, at least 15 students were absent on any given school day. Our data also include a proxy for school climate not usually available in other studies: the proportion of teachers who returned to the same school from the previous year. The schools our sample attended retained just under one-quarter of their teachers in their elementary (75.9%) and middle-school (73.8%) years. These findings suggest a lack of a stable environment in many of the schools Black males attended, which we expect to reduce math scale scores. While few of the sample attended small schools in the elementary years, the number of students attending small schools (<440) more than tripled between in their elementary (4.2%) and middle-school years (15%).

Step 1: HLM Growth Modeling to Examine School-Related Factors to Math Performance Over Time

The relations between the selected school-level characteristics and patterns of math exam performance were explored by estimating individual patterns of math performance over time and identifying factors that differentiated students who displayed different patterns. We explored associations between math scale scores and family background and student-level and school-level characteristics by estimating individual patterns of math scores over time and identifying factors that differentiated students who displayed different patterns.

We fit two models to the longitudinal data to test the association between student math exam scores and substantive predictors. The first model uses time to predict math exam scores over time; the second model adds all other predictors. We fit these models to the data using growth curve analysis.

Growth curve methods permit the examination of individual performance patterns and the identification of factors related to those patterns by distinguishing between *within-individual* performance patterns and *between-individual* differences in those patterns. Hierarchical linear models (HLM) or multi-level models (MLM) estimate individual growth curves and identify school-level characteristics related to patterns of development. Individual and population growth curves are estimated simultaneously to describe the change we expect each member of the population to experience between the 4th and 8th grades (individual) and to identify characteristics that vary across individuals that are associated with those patterns of change over time (population). Specifically, HLM analyses estimates individual and population growth curves from the fixed- and random-effect variables specified in the models. The iterative estimation process is divided into the estimation of the individual (within-subject) growth curves and the population (between-subjects) growth curves.

Model 1 (See Table A in the Appendix), presents the results of fitting Model (1) to our data, using the raw math scale score as our outcome variable. *Year* indicates the grade level at time *j* for student *i*. Since time is centered at grade 4, when time equals 0, we estimate that the average student has a math score of 629 in the 4th grade; over time this level increases linearly at a rate of 15 points per grade level. The variance components for both initial status and rates of change are statistically significant, suggesting the wisdom of exploring the effects of person-specific predictors.

In *Figure* 6 we can see a collection of individual growth trajectories for a sample of four students (dotted lines) against the estimated model (population average in solid line). There is evidence of heterogeneity in observed change across students—for some, math scores increase with grade levels, for others scores decrease before finally increasing, and for still others math scores increase before decreasing by 8th grade. Despite the differences, these plots show a general, linear average trend in the growth of math scores.

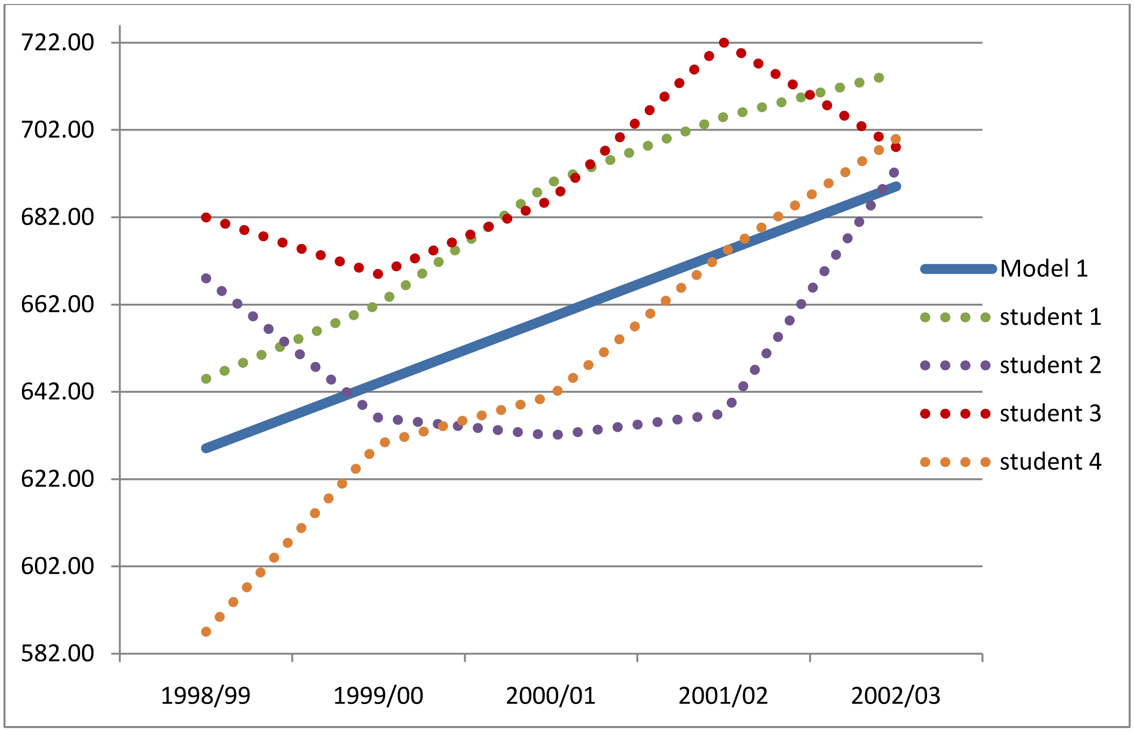

Figure 6. Math exam scores for four sample students and the average trajectory for all students

Model 2 shows the results of re-estimating the model using standardized scale scores as the outcome variable. The estimate of the sample mean of our 4th-grade standardized score is in fact near zero (.05). But more importantly, our estimate of the coefficient of time (grade) is not statistically different from zero, which means that, on average, there is no growth in the standardized math scores over time. However, as we saw earlier, the average math scores of Black male students in the 8th grade were closer to the lower limit of Level 2 (below proficiency) than in 4th-grade. Therefore, no growth in the standardized math scores suggests that, on average, the math proficiency is declining over time.

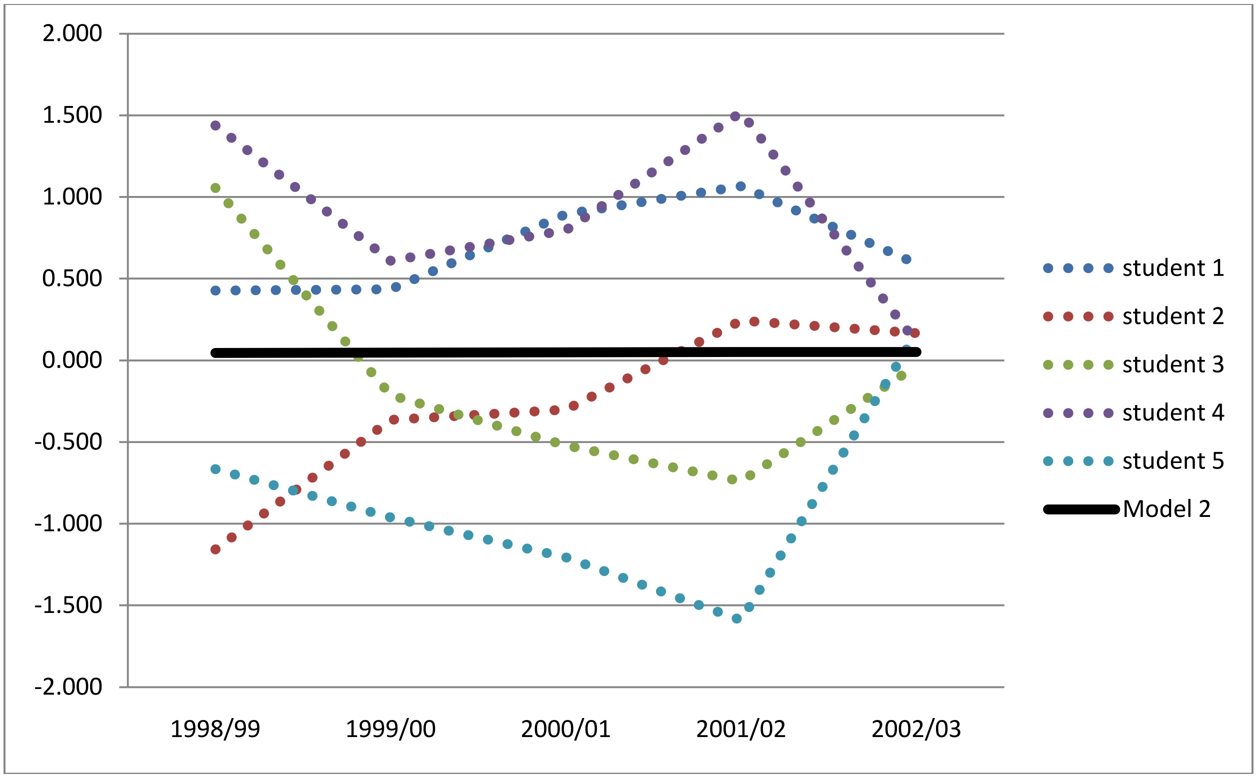

Figure 7. Standardized math exam scores for four sample students and the average trajectory for all students

Model 3 presents the results of adding our measures of family background, individual student characteristics, student-level characteristics, and school-level characteristics to our model, using students' standardized math scores as the outcome variable. The standardized average 4th-grade math score is higher than our estimate in model 2, but on average, we still see no trend in standardized math scores over time. There was no statistically significant difference between the standardized math scores of foreign-born and native-born Black male students; however, subsidized-lunch students had standardized math scores one-tenth of a standard deviation lower than non-subsidized students in the 4th grade. Like the standardized math scores of the average Black Male student, the scores of foreign-born and subsidized-lunch students displayed no trend over time.

As compared with the average Black male student, the 4th-grade standardized math scores of special education students were .6 of a standard deviation lower. Students who were retained in the expected 5th-grade year, by being held back one or two years, had standardized math scores nearly three-quarters of a standard deviation lower than the average Black male student. However, we remain cautious about interpreting our results for retained students and after-school programming. Only 41 students were retained in the 5th-grade year, and our research takes place before New York's retention policy was instituted—and would not have impacted our sample. Again, there was no trend in standardized math scores for the average Black male student (nor for retained students), but special education students saw their standardized math scores grow by less than tenth of a standard deviation (.03) per year. Mobile students saw their standardized math scores drop by a larger but still negligible amount: (.06) standard deviations per year.

With one exception, student- and school-level characteristics minimally explain the math scores of Black male students. The proportion of students receiving subsidized lunch was associated with an even smaller reduction in standardized math scores, but a 1 standard deviation increase in the average standardized math scores of the cohort increases a student's standardized math scores by a quarter of a standard deviation. Teacher retention also has a negligible association with standardized math scores, while none of the other student- or school-level variables has a statistically significant association with standardized math scores.

Discussion

The goal of this analysis was to understand what characteristics of students, schoolmates, and schools attended by Black male students, especially those amenable to policy change, were associated with growth in math proficiency during the elementary and middle-school years. We found that the average Black male performed below proficiency in math in the 4th grade, and so we decided to focus on standardized, rather than actual, math scores to examine the trend in proficiency. The standardized math scores of Black male students showed no trend, so that, on average, math proficiency was declining over time. After including all the theoretically relevant variables, we found that the 4th-grade standardized math scores of subsidized-lunch students were somewhat lower than those of non-subsidized students and those of subsidized-lunch and retained students were substantially lower. However, we still found no trend in the standardized math scores of Black male students, although the standardized scores of special education students showed a modest upward trend and the standardized math scores of mobile students show a somewhat larger, but still negligible, downward trend.

Finally, the average math score of a Black male student's classmates appear to be the only variable amenable to policy manipulation that has a sizeable association with the growth of Black male students' standardized math scores. This finding suggests that putting Black male students in more challenging learning environments may be the best way to increase math proficiency over time. By themselves, other policy decisions (e.g., reducing student mobility, teacher turnover, or special education classification, increasing attendance or spending on after-school programming, or hiring more qualified or experienced teachers) all appear to have no or negligible associations with growth in math scale scores. In terms of after-school programming, there is little variation in spending across schools. However, Black male students attend schools that expend, on average, about 1 percent of their budgets on after-school programming. We could not detect any improvements in math proficiency in our sample that would be the result of substantial increases in spending on after-school programming.

Overall, the trend in actual and standardized math scores is revealing, but educational decision makers collapse these measures into proficiency levels and use the levels to make decisions that influence students' educational opportunities. For this reason, it is important to examine the trajectory of math proficiency using proficiency levels as well.

Step 2: Identifying Grouping Trajectories in the Early Years

In the second part of our analysis, we sought to determine if the academic achievement of the Black male students in our sample clustered into common performance trajectories in the five years prior to their entry into high school (expected 4th through 8th grade.) Here, we asked, "**Do the educational trajectories of Black males in New York City Schools cluster?"** To address this question we utilized a semi-parametric group-modeling statistical procedure called Latent Class Growth Modeling (LCGM) to estimate clusters of individuals with similar trajectories (See Nagin & Tremblay, 1999, for details about the method). Once we estimated the model that "best fit" our data, we calculated individuals' posterior probabilities of group membership as a collective measure to specify an individual's likelihood of belonging to each of the model's trajectory groupings.

It is important to note that every individual follows a unique developmental course. Therefore, the estimated model presented, while a useful heuristic tool for analyzing patterns, must be interpreted with caution. First, individuals in reality do not in actuality belong to a trajectory group. Second, the number of trajectory groups is mutable—they can change depending on what is entered into the data. Finally, the trajectories of group members are not lock step—they are based on probability averages and only approximate population differences in developmental trajectories (see Nagin, 2005). As such, when interpreting the results presented below, performance groupings should not be taken to describe individual or groups of students, but rather membership to the trajectory grouping that best fits their math proficiency scores over time, or the high probability (>70% chance) of following a performance pattern of a trajectory grouping.

Results.

In this analysis we used math-exam proficiency levels over the five years prior to entering high school (1999-2003). The results of our analysis revealed that math proficiency over time clustered into six general patterns, which are depicted in *Figure 8* below. Initially, only two of the six trajectory groups obtained a mean average of *proficiency* (Level 3). The groupings that fell initially below the proficiency threshold are divided into four distinct trajectory groupings. Taken together, these four below-proficiency groupings make up just under three-quarters (73.2%) of our total sample.

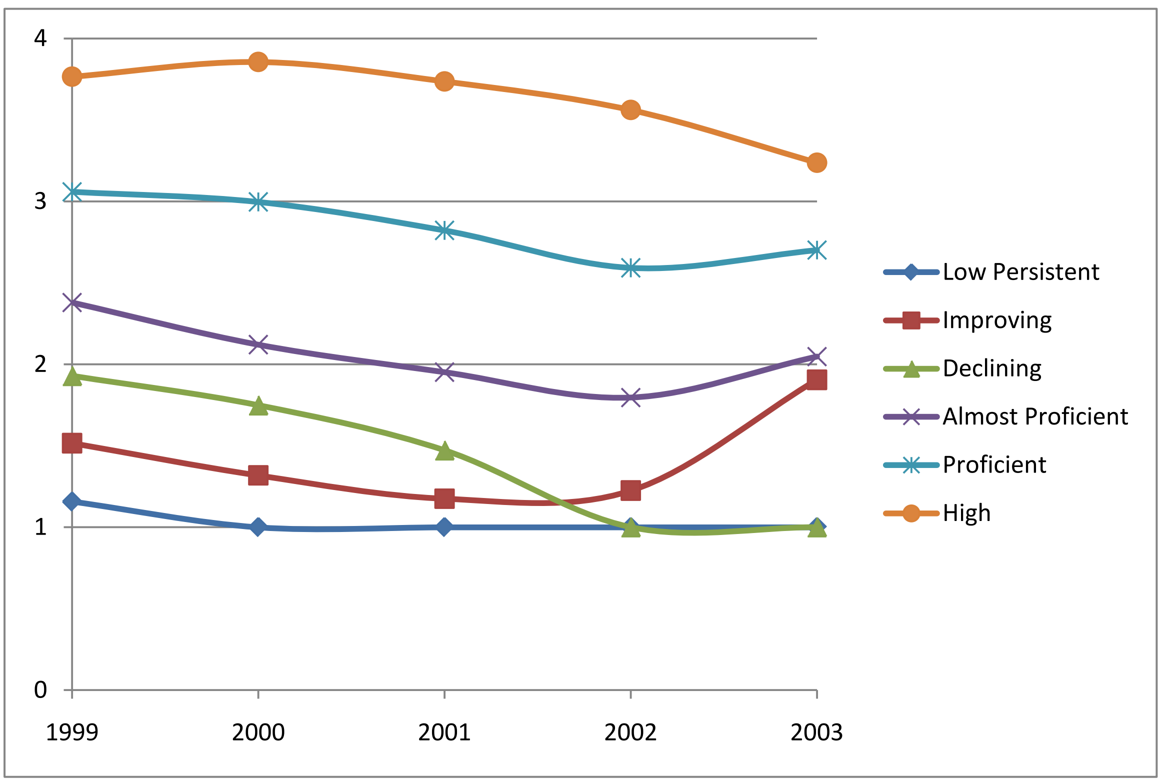

Figure 8. Six-Group CNORM Trajectory Model of Math Performance Over Time

The *persistently low math performer trajectory***,** at 14.2% of the total sample as assigned, consistently performed at the lowest levels on the math exams, maintaining a generally flat pattern of performance over time. The next group, the *improving math performer trajectory* consisted of 13.9% of the sample. This trajectory started low but showed a marked improvement in the expected middle-school years, increasing almost a full point by their 8th-grade year. While initially performing at a higher level than the *persistently low math performer trajectory* and *improving math performer trajectory***,** a third group—the *declining math performer trajectory* (10.4% of the sample)—made steady declines at first, then precipitously bottomed out in 7th grade and never recovered, remaining at the lowest level on the 8th-grade math exam.

Almost proficient math performer trajectory was in the largest cluster, with an assignment of over one-third (36%) of the sample. This trajectory performed consistently just below the proficiency level, declining slightly over the first four years but maintaining numbers just around slightly below proficiency (Level 2). A fifth group, the *proficient math performer trajectory*, began at the proficiency level in elementary school and then slipped, on average, just below proficiency during their expected middle-school years. *Proficient math performer trajectory* were the second largest group, consisting of just over one-fifth (20.4%) of the sample. The smallest assigned cluster was made up of the *high math performer trajectory*, which represented 6% of the sample. This trajectory consistently scored at proficiency or above over the five years they were tested. Although their scores declined beginning in middle school, *high math performer trajectory* scores remained in the proficient to highly proficient math trajectories.

Discussion.

Findings from other research are consistent with the general decline in math proficiency levels in middle school for the *high math performer trajectory*, *proficient math performer trajectory*, and *almost proficient math performer trajectory*. It is similarly not surprising that the lowest group persistently performed at the lowest level over time. These four, relatively flat trajectories are also consistent with research showing that performance gaps tend to be rigid and remain persistent over time (Jencks & Phillips, 1998).

At the same time, almost one-quarter of our sample were predicted into trajectories that "changed tracks" during the middle-school years, suggesting that middle school can be a place where significant growth or decline in math proficiency can take place. The *declining math performer trajectory* took a particularly steep fall in the middle-school years and, alternatively and most surprisingly, the *improving math performer trajectory*, which started between the *persistently low* and *declining performer trajectories*, made strong gains in middle school. Given the declines (slight and steep) and improvements that occurred during the middle-school years, we decided to look deeper into the individual and schooling characteristics that may be associated with these years. Table 3 provides the student characteristics by performance groups.

Characteristics of membership assignment to persistent performance trajectories.

When looking at the four trajectory groupings with the most similar trends in math performance over the five years they took the exam, the following patterns emerged (see Table 3 on the next page). While the vast majority of students across performance groupings predicted into persistent trajectories lived in poverty, as indicated by the high percentage that qualify for free lunch, the percentage that qualified decreased from the low- to the high-proficiency groupings. This finding supports the vast literature that relates poverty to poor academic performance. Furthermore, a similar pattern emerged in terms of special education.

The percentage of students predicted into persistent trajectories and who were referred for special education services decreased from 44.5% percent in the lowest-performing group, declining steadily across performance groupings to only 2.1% in the highest-performing trajectory group. This finding is also consistent with the broad research literature on the relationship between special education classification and academic performance; however, the disproportionate overrepresentation of special education in the lowest-performance trajectory may represent other confounding school practice factors. In addition, for students who were in our sample from 4th grade, the percentage of foreign-born students in each predicted performance trajectory increased from the low-performer to the high-performer trajectories. This may suggest an immigrant advantage in math performance.

Finally, mobility of students predicted into persistent trajectories appears to be highly related to performance trajectories. Predicted members into the persistently low math performer trajectory were almost twice as likely to have transferred schools at least three times between expected 5th-grade and high-school entry than those predicted into proficient and highly proficient performer trajectories (19.1% to 10.7% and 8.3%, respectively), and were almost three times as likely to have attended at least two failing schools (schools closed or slated to close after they left) than the highly proficient performer trajectory (30.2% to 11.8%, respectively).

Table 3. Selected Student Characteristics – Four Persistent Trajectories

	Below Math Proficiency				At or Above Math Proficiency			
	Persistently Low Math Performers		**Almost Proficient Math Performers**		**Proficient Math Performers**		**High Math Performers**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Total in Trajectory Grouping	998	15.5	2468	35.1	1437	20.4	424	6.0
Foreign Born**	64	6.4	231	9.4	143	10.0	55	13.0
Qualified for Free Lunch***	928	93.0	2197	89.0	1239	86.2	344	81.1
Referred for Special Ed. Svcs. ***	444	44.5	363	14.7	106	7.4	9	2.1
% students transferred >2 btw Y1-first year of HS***	191	19.1	316	12.8	153	10.7	35	8.3
Middle School and High School of entry are the same	19	1.9	41	1.7	37	2.6	8	1.9
# of failing schools attended[5]	341	39.2	615	24.9	225	15.7	50	11.8

Characteristics of membership assignment to middle-school decliner and improver trajectories.

With these four fairly consistent trajectory groups described, we next turn to two unusual performance trajectories that emerged in our grouping analysis: the *declining math performer* and the *improving math performer* trajectories. While both trajectories never reached proficiency during their five years of taking math exams, each trajectory took on sudden and distinguishing changes during the expected middle-school years (see Table 5).

At first glance, the students predicted into the *declining math performer* trajectory had few distinguishing features compared to the other low-performing groups. Like the other low-performing trajectories, the vast majority of its predicted members qualified for subsidized lunch (92.1%). Further, the *declining math performer* trajectory has much in common with the *low persister* trajectory, including high mobility (18.3%) and attendance in a failing school (39.2%). While over one-quarter of predicted members of the declining trajectory were referred to special

[5] # of failing schools attended is measured by calculating the total number of schools between expected 4th & 8th grade that closed (or are slated to close) after student attended >=1.

education services (26.7%), the percentage was a full 17.8% lower than those found in the lowest grouping.

Similarly, students predicted into the *improving math performer trajectory* had many of the characteristics that would seemingly place them at a similarly higher risk as members of the *low persister* and the *declining math performer* trajectories for poor outcomes, including a high percentage of free-lunch qualification (91.9%), special education, and referral (28.5%).

Table 4. Selected Student Characteristics – Improving and Declining Math Performance Trajectories

	Improving Math Performers		**Declining Math Performers**	
	N	**%**	**N**	**%**
Total in Trajectory Grouping	979	13.9	733	10.4
Foreign Born**	87	8.9	54	7.4
Qualified for Free Lunch***	900	91.9	668	91.1
Referred for Special Ed. Svcs. ***	279	28.5	196	26.7
% students transferred >2 btw Y1-first year of HS***	166	16.9	134	18.3
Middle School and High School of entry are the same	15	1.5	8	1.1
# of failing schools attended[6]	284	29.0	232	32.7

Linking performance trajectory groupings to high school outcomes.

To gain a sense of whether or not these early year trajectory pathways may be related to later outcomes, we examined high-school completion outcomes by trajectory groupings. Overall, we found that graduation patterns were distinctly different for some of our groupings compared to others.

In terms of outcomes, persistent math performance trajectory clusters were also highly related to future graduation (see Table 5). First, only 2.6% of those predicted into the *low persister trajectory* graduated high school with a Regents diploma, and over one-quarter (26.4%) had dropped out of school by fall, 2007. Second, while over one-quarter (27.7%) of those

[6] # of failing schools attended is measured by calculating the total number of schools between expected 4th & 8th grade that closed (or are slated to close) after student attended >=1

predicted into the *almost proficient performer trajectory* completed high school with a Regents diploma, even more dropped out of school (29.2%). This rate was even higher than the dropout rate for the *low persister trajectory*. Finally, as one would expect, graduation outcomes were dramatically different for those predicted into the two highest-performing trajectories. Fifty-five percent of those assigned to the proficient performers and 80.9% of the highly proficient performers graduated with Regents degrees, and very few had dropped out of school as of fall, 2007 (5.8% and 1.2%, respectively).

For the *declining math performer trajectory*, the steep decline in middle school had ramifications later on. As of fall, 2007 the group were less likely to dropout than the low- or almost-proficient math performers (20.7%); however, similar to the lowest cluster, half of the students assigned to the trajectory were still attending high school (50.5%) as of fall, 2007, while only 6.7% had completed high school with a Regents diploma.

Students predicted into the *improving math performer trajectory,* while completing high school at a higher rate than the *declining* and *low persistent math performer* trajectories, had high-school completion outcomes as of fall, 2007 that were disturbingly low—given the upward gains in middle school. Only 14.9% of assigned students graduated with a Regents diploma.

The *improving math performer trajectory* represented the largest cluster graduating with a local diploma and, in light of new Regents requirements for graduation, would be the most impacted by the new Regents-only diploma policy. Thus, gains in middle school may not be sustained through high school, and this cluster remains in need of vital supports in school. On the other hand, as of fall 2007, the percentage who had dropped out of school was lowest among the 4 lowest performing groups, with only 15.9 percent dropping out—lower than in the *declining math performer* group (18.6%) and well over one-third (38.1%) still attending school.

Therefore, while vulnerable, there is evidence that this group lingers on in its pursuit of graduation.

In sum, as noted in the Metro Center's study on high-school dropout patterns (Metro Center, 2009), 9th-grade credit completion was determined to be a key indicator to predicting eventual dropout for Black and Latino males. As a result of our Step 1 and Step 2 analyses, we could now examine the extent to which student performance trajectory patterns predict performance in this critical first year of high school. In addition, our trajectory analyses suggest that middle school is a unique period where we found that 25% of our sample "shifted off" from the more persistent growth of our other groupings, indicating that middle school was a key period in their academic development. As such, for our final analyses the research team decided to conduct regression analysis to examine the extent to which middle-school characteristics (8th grade year) predicted 9th grade credit completion.

Table 5. Selected Student Descriptive Outcomes by Trajectory Clusters

	Persistently Low Math Performers		Almost Proficient Math Performers		Proficient Math Performers		High Math Performers		Improving Math Performers		Declining Math Performers	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Final Disposition Fall, 2007***												
Graduated with Regents/HR Diploma	26	2.6	685	27.7	802	55.8	343	80.9	137	14	49	6.7
Graduated with Local Diploma	183	18.3	616	25	297	14.5	23	5.4	284	29	141	19.2
Graduated with IEP Diploma	46	4.1	4	0.2	0	0	0	0	8	0.8	5	0.7
GED	15	1.5	92	3.7	53	3.7	14	3.3	21	2.1	16	2.2
Still Attending in Fall 2007	497	49.8	810	32.8	291	20.3	39	9.2	373	38.1	370	50.5
Dropped Out of School	236	26.4	261	29.2	83	5.8	5	1.2	156	15.9	152	20.7

Step 3: Predicting Course Credit Completion in the First Year of High School

In our final analysis, we examined the extent to which student trajectory groupings and middle-school characteristics (where the twists and turns happened) predicted how well students performed in their first year of high school. In a previous analysis conducted by the Metro Center (Metro Center, 2009), we found that 9^{th}-grade credit completion was a primary predictor of student drop out. As such, by identifying key aspects of their education background, the goal of this final analysis is to identify key factors or vulnerabilities young Black males may enter high school with, so that high schools can intervene before students underperform in their first year.

9^{th}-Grade Credit Completion.

In general, the students in our sample underperformed in their first year in high school, where students who are on-track for graduation will earn 10 or more credits in their freshman year. In contrast, Table 6 shows that, on average, the students in our sample earned only 8.4 credits with a wide standard deviation of 4.8, suggesting variability among the sample. As such, an average credit completer in our sample, based on first-year high-school performance, was already at risk for dropout. As one would expect, students whose math proficiency levels placed them in the proficient or highly proficient trajectory clusters were more or less on track, with highly proficient performers apparently doing very well. Also as expected, groupings that performed below proficiency were struggling, in particular those in the *low persistent* and *declining* groups. The *improver* trajectory fell between the low/declining groups and the *almost proficient* trajectories, which suggests that while math test scores improved in high school, they may not have translated to higher credit completion in high school.

Table 6. Total Credit Completion in First Year of High School by Trajectory Grouping

	Mean	SD
Overall Sample Mean	8.4	4.8
Low Persistent	5.3	4.2
Persistently Below Proficient	8.3	4.2
Proficient Persistent	11.1	4.3
High Persistent	14	4.1
Middle School Improvers	7.4	4.1
Steep Decliners	5.6	4.2

Results.

We employed multiple regression modeling to predict credit completion in the 9th grade using two models. The first model examines the extent to which performance trajectory assignment predicted 9th-grade credit completion. In the second model, we test whether or not middle-school characteristics predict 9th-grade credit completion (See Table B in Appendix). For each model, we control for individual characteristics to serve as control variables, including background characteristics (foreign born, subsidized lunch, and referral to special education service).

In our first analysis, we tested the extent to which assignment to a particular performance trajectory predicted 9th-grade credit completion, controlling for the individual characteristics mentioned above. We used the *almost proficient performer trajectory* as our comparison group because it was the most commonly assigned trajectory grouping.

The tested model was fairly robust, with 28% of the total variance explained and all variables found to be significantly associated with 9th-grade credit completion. Dummy variables were used for trajectory assignment with the *almost proficient math performer trajectory* (the largest grouping) serving as the comparison group. All of the five trajectory predictors demonstrated significantly different levels of credit completion in their first year of high school compared to the *almost proficient math performers*, in expected directions, with the three lower-performing clusters completing a significantly lower number of credits while the two higher-performing clusters completed a significantly higher number of credits in their first year. This finding suggests that trajectory trends of academic achievement (as indicated by performance on the math exam) in elementary and middle-school years continue into the students' first year of high school (See Table B in Appendix).

In our second analysis, we tested the extent to which characteristics of the middle school in which a student was enrolled predicted 9th-grade credit completion. Given the results in our Step 1 analysis, that found that scale math scores remain flat over time. In the second model, where we test middle school characteristics, we entered the 4th-grade math exam to consider prior individual math performance. Middle-school characteristics entered included middle-school variables related to school characteristics (e.g., small school, combined middle and high school), student body characteristics (percent in special education, attendance rate, and mean math scale score in 2003), and school resources such as percentage budget expended to after-school programming and mean years of teacher experience, student attendance rate, and percent of teachers who were in the student's middle school for at least two years in a role (teacher retained).

The overall model was less robust than the trajectory group model, with 20% of the total variance explained. Of the middle-school predictors entered into the model, findings were similar to what we discovered in the Step 1 HLM analysis, where the students' mean math score from the school attended before the students entered high school proved to be the strongest predictor of 9th-grade credit completion. Attending the same high school where the student was enrolled in middle school was also a significant predictor, but the contribution was quite small. Similarly, attending middle schools where teachers were, on average, less experienced had a slight but significant association with 9^{th}-grade credit completion.

Similarly, a student's math scale score in elementary school proved to be the strongest individual factor that predicted 9^{th}-grade completion. This finding is in line with our prior analyses and suggests that the pattern of "no growth" revealed in Step 1 and "persistence" in Step 2 carry through to high-school performance; however, as noted in other analyses (see Metro Center, 2009), while this stagnation in performance may have been sustainable from elementary through middle school, in high school the tides turn and students can quickly become drop outs. Taken together, these findings suggest even more profoundly the importance of early intervention on impacting the performance trajectories of Black male students.

Conclusion

As we noted earlier, the absence of a more nuanced analysis of the performance of Black males and the prevalence of an analytical perspective that reifies existing stereotypes related to the failure of Black males invariably contributes to the notion that Black males have monolithic experiences and outcomes. Our research was carried out with the recognition that we need to know more about the complex pathways and educational experiences that shape outcomes for Black male students in the public school system. This understanding is critical if we are going to "race to the top" and make targeted decisions on how and where to intervene, or design appropriate programs that can ameliorate the obstacles confronting Black male students in New York City and elsewhere.

Innovation, interventions, policy, and practice must be informed by how Black male students are learning and experiencing opportunities to learn—not just whether they are learning.

Overall, our analyses demonstrate not only a great deal of variation existing within Black males, but also how the varying patterns of performance elucidate a possible effect of school climate and instructional practice in elementary and middle school.

The goal of this analysis was to understand what school-level characteristics are influential in affecting student growth rate in math proficiency during the elementary and middle-school years. The analyses reported here show that the average Black male performs below proficiency in math in the 4th grade. In addition, the fact that Black males show no performance trend means that, on average, math proficiency is declining over time. Even after including all the theoretically relevant variables, we still find no trend in the standardized math scores of Black male students over time, although the standardized scores of special education and subsidized-lunch students show some downward trend.

Finally, the average math score of a Black male student's classmates appears to be the only variable amenable to policy manipulation that has a sizeable association with the growth of their standardized math scores, suggesting that Black male students need to be in rigorous instructional environments that know how to elicit high performance for the students they serve.

In exploring further the limited trend between 1999 and 2003, we identified six clear performance patterns among our sample: the *high math performer*, *proficient math performer*, *almost proficient math performer, improving math performer, declining math performer, and persistently low performer* groups. Initially, only two of the six trajectory groups obtained a mean average of *proficiency* (Level 3), these being *high math performers* and *proficient math performers*.

The groupings that fell initially below the proficiency threshold are divided into four distinct trajectory groupings: *almost proficient math performer*, *improving math performer,* *declining math performer, and persistently low performer*. Taken together, these four below-proficiency groupings make up just under three-quarters (73.2%) of our total sample. It is similarly not surprising that the lowest group persistently performed at the lowest level over time. These four, relatively flat trajectories are also consistent with research showing that performance gaps tend to be rigid and remain persistent over time (Jencks & Phillips, 1998)

At the same time, almost one-quarter of our sample were predicted to be members of performance trajectories that "changed tracks" during the middle-school years, suggesting that middle school can be a place where significant growth or decline in math proficiency can take place. The *declining math performer* trajectory took a particularly steep fall in the middle-school years. Alternatively and most surprisingly, the *improving math performer* trajectory, which started between the *persistently low* and *declining* trajectories, made strong gains in middle school. However, while the third and final analyses found that membership to performance trajectories significantly predicted 9th-grade credit completion, the upward swing in the *improving math performer* trajectory may have been short lived. Finally, while aspects of middle-school characteristics were significantly associated with 9th-grade credit completion (mean math scale score, schools with teachers who, on average, have fewer years experience, and combined middle and high schools), the strongest individual predictors were individual student characteristics and performance on a child's very first standardized math exam. This final finding reinforces the importance of early intervention.

Recommendations

Based on these findings, the research team strongly recommends the following:

Target early and on-going intensive interventions over time:

- Provide intensive academic support to 2nd- to 5th-grade students who are not performing at a grade level;
- Provide intensive case management for 6th, 8th, and 9th graders at as many schools as possible, using the following indicators: irregular attendance, disruptive behavior, non-submission of homework, and academic difficulties in the classroom as a trigger for deliberate intervention;

Increase school quality and opportunities to learn:

- Increase access to high-quality diverse schools to reduce racial and socio-economic isolation of the most academically vulnerable students;
- Provide guidance to schools on how to use and interpret the ARIS data system to carefully monitor progress of Black male students;
- Develop strategies to recruit and retain cohorts of teachers with a record of effectiveness in high-need schools (focus on middle schools); and
- Finally, as noted earlier in this report, Black male students attend schools that expended an average of about 1 percent of their budgets on after-school programming and there is little variation in spending across schools. As such, substantial increases in spending on after-school programming would take after-school programs to the next level. Target high-poverty communities for the development of academically oriented after-school programs that provide both social and academic supports and enrichment opportunities.

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Appendix

Table A Results of fitting MLM models for change to Math exam scores (n=7039)

		Model 1	Model 2	Model 3
Fixed Effects				
Composite Model	Intercept	629.06**	0.0462**	0.473**
	(initial status)	(0.4320)	(0.0111)	(0.0665)
	Year	15.0*	0.00142	-0.0176
	(rate of change)	(0.0850)	(0.00233)	(0.0138)
Family Background Variables	Foreign Born			0.0789
				(0.0579)
	Ever free/red lunch			-0.105*
				(0.0521)
	Foreignborn x year			0.0146
				(0.0156)
	Lunch status x year			0.0144
				(0.0140)
Student Level variables				
	Special Ed Status			-0.628**
				(0.0458)
	Retention in the 5th			-.749*
				(.310)
	School mobility			-0.0593**
				(0.0137)
	Special ed x Year			0.0286*
				(0.0125)
	Retention x year			0.0705
				(.0871)

*Notes: **p<.01, *p<.05; [a]These models use math scores in continuous (not z-score)*

Table A (Cont'd) Results of fitting MLM models for change to Math exam scores (n=7039)

		Model 1	Model 2	Model 3
School Level: Enrollment Characteristics				
	Percent of free lunch status students			-0.000494*
				(0.00023)
	Cohort Average Math			0.251**
				(0.0081)
School Level: Resources				
	% Total Budget to After school programming			0.012
				(0.0077)
	% Teachers teaching outside area of			0.00047
				(0.00062)
	% Teachers with less than 3 years of			-0.00075
				(0.00062)
School Level: Climate				
	Teacher Retention (in percent over two			-0.00096**
				(0.00034)
	Attendance Rate			-0.00038
				(0.00035)
School Level: School Type				
	Small School			-.0063
				(0.0281)
Variance components				
Level 1	Within-person	0.243	0.243	0.200
		(0.0024)	(.0024)	(.0038)
Level 2	In initial status	0.7154	0.7154	0.633
		(0.0148)	(.0148)	(.0362)
	In rate of change	0.0128	0.0128	0.013
		(0.0007)	(.0007)	(.0030)
	Covariance	-0.024	-0.024	-0.040
		(.0024)	(.0024)	(.0096)
Model Fit				
AIC			70776.67	34532.55
BIC			70827.35	34710.82

*Notes: **p<.01, *p<.05 [a]These models use math scores in continuous (not z-score)*

Table B. Multiple Regression Analysis of Predictors of 9th-Grade Credit Completion

Variable	9th-Grade Credit Completion: Performance Trajectory Group Predictors			9th-Grade Credit Completion: Middle-School Predictors		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Student Characteristics						
Foreign Born	.84	.17	.05***	1.1	.21	.06***
Subsidized Lunch	-.49	.16	-.032**	-.26	.18	-.02
Special Education	-1.7	.13	-.14***	-2.07	.16	-.17***
Trajectory Grouping						
Lowest Persistent Math Performers	-2.38	.17	-.16***			
Proficient Math Performer	3.12	.16	.23***			
High Proficient Math Performer	5.9	.24	.27***			
Middle School Declining Math Performer	-2.4	.19	-.14***			
Middle School Improving Math Performer	-.62	.18	-.038**			
1999 Math Scale Score				.04	.00	.29***
Middle School Characteristics						
Small School (<= 440 students)				-.30	.23	-.07
Combined Middle and High School				1.5	.52	.04***
Student body Characteristics						
% students in special education				.021	.02	.02
Math mean math scale score				.04	.01	.15***
School attendance rate				.03	.04	.02
School Resources						
% expended on after-school programming				-.001	-.001	
Mean years teacher experience				-.22	.06	-.05**
R^2			.28			.20
F			329.5***			128.40***

*$p < .05$. **$p < .01$. ***$p < .001$