

The Middle Grades Student Transitions Study

Navigating the Middle and Preparing Students for High School Graduation

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Overview

Educators have long asserted that the middle grade years (typically, sixth through eighth grades) are a time of both great importance and vulnerability in students' K-12 schooling. Anecdotal and empirical evidence suggest that students encounter new social and emotional challenges, increased academic demands, and major developmental transitions during the middle grade years.¹ Despite the academic and developmental challenges associated with the middle grades transition, we know very little about whether changes in students' achievement or attendance during this period can help us anticipate their progress toward graduation.

The Research Alliance for New York City Schools is currently investigating these topics in New York City through a collaboration with principal researcher Michael Kieffer (Teachers College, Columbia University). The study is motivated by an interest in learning more about whether and when students struggle during the transition between fourth and ninth grade, how early these vulnerable students can be identified, and which schools appear to be succeeding in supporting students' progress through these grades. In this first phase of this study, we investigate whether and how students' achievement and attendance change between fourth and eighth grade and identify moments during this period when students struggle in their progress towards high school and graduation.

While the study is ongoing, we have authored this research brief in order to stimulate conversation and critique of our work thus far and to generate ideas that might help shape our future analyses. Our preliminary findings are as follows:

- We can identify students who will struggle to graduate after four years of high school quite early in their schooling. Students' fourth grade attendance rates and their scores on New York's fourth grade math and English language arts (ELA) assessments all help predict the likelihood that students will graduate after four years of high school. Students' performance on the fourth grade ELA and math assessments are particularly strong predictors of the likelihood that they will graduate on time.
- Despite these early fourth grade warning signs, it is also important to monitor students' progress through the middle grades, as students whose attendance and achievement decline during this time period are less likely to graduate after four years of high school. In other words, the middle grades are not "too late to fail": Even students who are performing reasonably well at the beginning of the middle grades can fall off-track during the middle grades, and these declines have consequences for students' progress towards graduation.
- More specifically, students whose attendance falls during the middle grades are particularly at risk for not being able to graduate after four years of high school. While most students attend school regularly until the spring of sixth grade, their attendance begins to decline after this point, and falls quite rapidly between seventh and eighth grade. Many of the students whose attendance declines during this final middle grades year are on a similarly troubling trajectory at the end of ninth grade, one year later.

- While slightly less portentous than attendance, students' achievement during the middle grades also helps predict which students will graduate after four years of high school. In particular, students whose math scores decline during the middle grades (relative to the scores of their peers) are particularly less likely to graduate after four years of high schools.

These findings suggest that struggling students can be identified quite early in their schooling and that changes in students' achievement and attendance during the middle grades can help us anticipate which students will struggle during high school in their progress towards graduation. The findings also point to some evidence of students' resiliency in the middle grades, suggesting that interventions during the middle grades are not too late to prevent students from falling off-track in their progress towards graduation. In the remainder of this brief, we describe the analytic approach of our work thus far and the data sets that we use in these analyses. In addition, we describe our findings and the remaining components of our work in more detail.

Analytic Approach

Previous research has demonstrated the importance of students' performance in ninth grade in predicting the likelihood of their graduating after four years of high school, which we refer to throughout this brief as graduating "on time."² These findings have prompted urban schools systems, such as those in Chicago and NYC, to develop "on-track indicators," which identify vulnerable students in an attempt to help ensure that these students graduate on time and are prepared for post-secondary work or study. Following this precedent, our first set of analyses investigates the relationship between NYC students' performance in ninth grade and the likelihood of their graduating after four years of high school. Based on this analysis, we create a high school on-track indicator (i.e., a composite of student performance measures in ninth grade) that maximizes our ability to predict students' graduating on time. Subsequently, in our second set of analyses, we use this indicator as our new outcome, and we examine whether students' performance between fourth and eighth grade predicts their ninth grade indicator scores and, thus, their probability of graduating on time.

Data

These analyses draw on a number of student-level data files from the New York City Department of Education's (DOE) archive. We use the DOE's audited *J-Form Register* and *Longitudinal Cohort* files to identify first-time ninth grade students and to monitor their progress through their high school graduation. The *NY State ELA and Math Test Score* file is the source of information on students' English language arts and mathematics test scores in fourth and eighth grades, and the student-level *Regents* file contains information about whether students attempted and passed Regents exams in ninth grade. We obtain information about students' ninth grade course-taking, as well as the number of credits that they earned from these courses, from the *Course Detail Records* file.

For the first set of analyses, which predicts the probability of students graduating after four years of high school, we examine the progress of the cohort of students who were first-time ninth graders in the 2005-2006 school year. We begin with the 2005-2006 cohort because our data

span the cohort's progress from fourth grade through high school, including the cohort's graduation in the spring of 2009. To examine whether the on-track indicators that we create for this cohort are robust across a different group of students, we conduct a series of parallel analyses for students who were first-time ninth graders during the 2000-2001 school year.

For the second set of analyses, which examines students' achievement and attendance patterns as they transition into and through the middle grades, we examine the progress of four cohorts of students who were first-time fourth graders between the 2000-2001 and 2003-2004 school years. Our data cover the former cohort's progress through high school graduation and the latter cohort's progress through ninth grade. We conduct this second set of analyses with both the entire population of students who ever appear in these four cohorts ($N = 303,845$) and for the subset of students who meet the following criteria: they do not enter or exit the district at any point between fourth and ninth grade, they progress through each grade annually, and they have complete data for our variables of interest ($N = 169,953$). Results were largely the same for the entire population and the smaller subset.

Preliminary Findings

Who's on track to graduate and why?

The preliminary results from our first set of analyses suggest that indicators of students' performance in the ninth grade are strong predictors of the likelihood that students will graduate after four years of high school. These ninth-grade predictors include credits earned, courses failed, grade point average, attendance rate, whether a Regents exam was attempted, and whether a Regents exam was passed. These predictors remain strong when controlling for students' eighth-grade test scores in English language arts and mathematics and for "school effects" – in other words, the role that schools play in influencing students' performance. The single best predictor of students' graduating on time is the number of credits students earn in ninth grade. For both of cohorts that we studied, students who earned 11 or more credits in ninth grade (i.e., one-quarter of the 44 credits needed to graduate) had a predicted graduation rate of 83% or higher, whereas students earning eight or fewer credits had a predicted graduation rate of 20% or lower.

Using logistic regression to find the relative weights of each of the multiple predictors, we created a ninth-grade "on-track" indicator that summarizes these predictive relationships into a single predicted probability of graduation for each student. The median predicted student graduation rate was 67%. Students with on-track indicator values in the top quartile had an average predicted graduation rate of about 92%, whereas those in the bottom quartile had an average predicted graduation rate of 7%. Based on this analysis, we can also calculate the ninth-grade indicator score for students who have yet to graduate, as long as we have their ninth-grade performance, an approach that we use in the second set of analyses below.

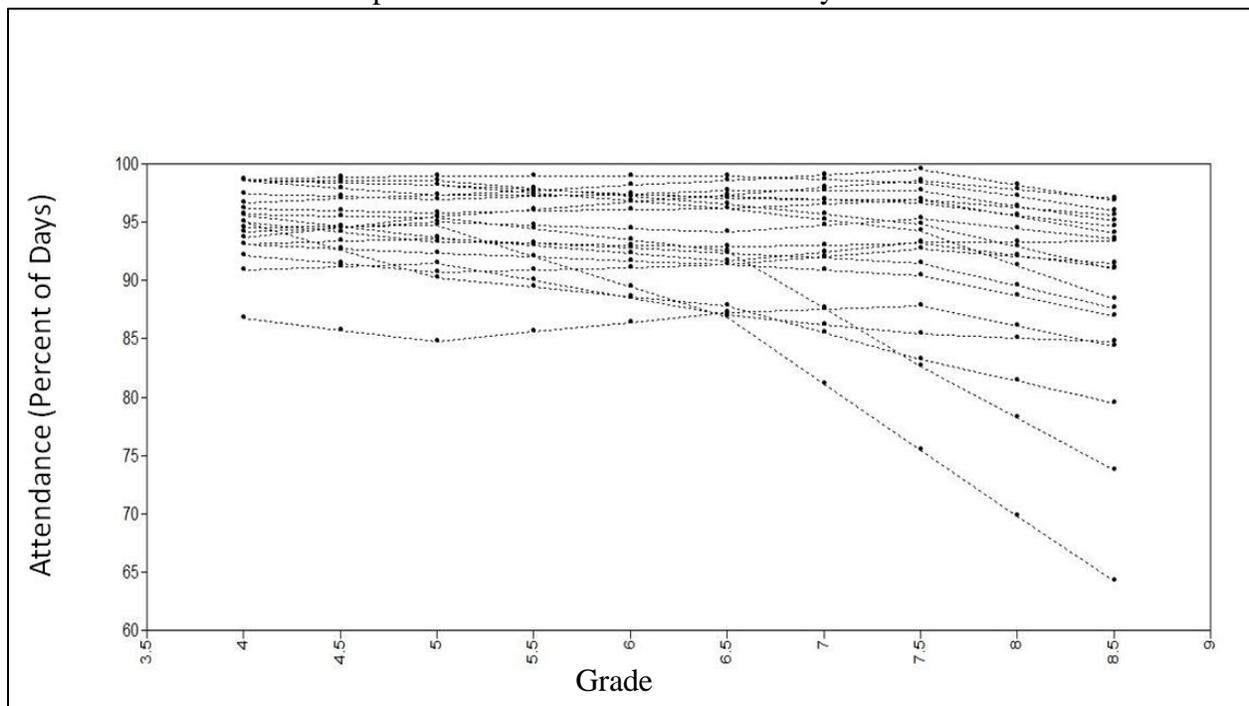
What do students' fourth-eighth grade achievement and attendance trajectories look like?

In the second set of analyses, we describe how students' achievement and attendance fluctuate between fourth and eighth grade. This description serves as the basis for our investigation of the extent to which students' performance during the middle grades predicts their ninth-grade indicator score. Our preliminary results suggest that there is wide variation in both the levels of

students' attendance and achievement and in the extent to which these levels change during the middle grades.

Attendance rates are generally high and stable across students from fourth through sixth grade and then drop off steeply between seventh and eighth grade. Figure 1 illustrates this overall pattern by displaying growth trajectories in students' attendance between fall of fourth grade and spring of eighth grade for 20 students that we chose at random from the dataset. As Figure 1 depicts, most of the students have high attendance rates (above 90% of the days enrolled) until the spring of sixth grade, when they begin to fall steeply. In addition, some students' attendance rates fall much more dramatically than others during seventh and eighth grade. Moreover, students' past attendance is not helpful in predicting which students will fall behind most in the later periods. Students' fourth grade attendance does not correlate with their change in attendance in eighth grade; in other words, the students who fell behind dramatically in seventh and eighth grade were equally likely to have high attendance as they were to have low attendance in earlier grades. The patterns that Figure 1 features also illustrate the general patterns across the entire dataset.

Figure 1. Patterns of change in attendance between fall semester of Grade 4 and spring semester of Grade 8 for a random sample of 20 students in New York City Schools.

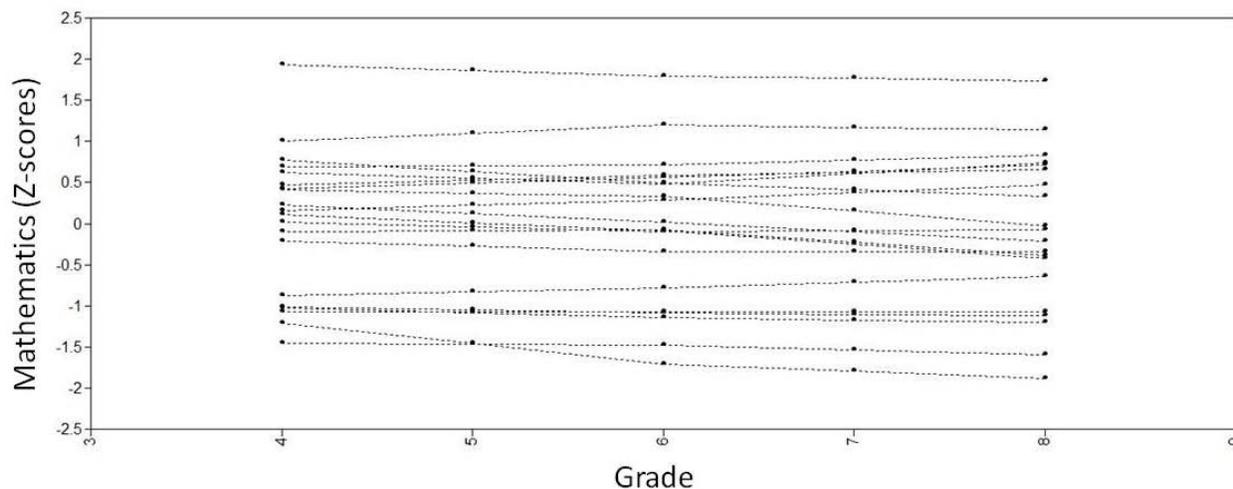


Note: Whole numbers indicate fall semester (e.g., 4 = fall of Grade 4) while .5 indicates spring semester (e.g., 8.5 = spring of Grade 8).

Students' achievement test scores are more stable than their attendance over time, with many students remaining at similar levels, relative to their peers, from fourth through eighth grades. Figure 2 illustrates this general pattern by displaying the patterns of change in mathematics

achievement for 20 students that we selected at random from the dataset. As shown, those students who have higher levels of achievement in fourth and sixth grades tend to be those who end up with higher achievement in eighth grade, while only a few students move from above-average to below-average (or vice versa) over time. It is worth noting that these figures – like the analyses on which our overall findings are based – use z-scores, which categorize students’ performance relative to other students in the same grade and have an average of zero in each grade. Thus, the flat nature of the overall trend is a result of our choice of measure and does not indicate that the average student’s mathematics performance is stagnant over time. Although the overall trend depicts stability across students’ relative performance, a minority of students fall substantially behind the bulk of New York City students, while others catch up with or surpass their peers. These patterns are largely similar for mathematics and for English language arts.

Figure 2. Patterns of change in students’ relative rank-order in mathematics achievement for a random sub-sample of 20 students in New York City Schools.



Does students’ fourth-eighth grade achievement predict who’s on track in ninth grade?

We find that students’ fourth grade achievement tells us a great deal about how they will perform in ninth grade (i.e., predicts their ninth-grade indicator score) and, thus, their likelihood of going on to graduate high school on time. However, changes in achievement during the middle grades also provide important information about how students will perform in ninth grade.

In particular, changes in students’ math scores between sixth and eighth grade are much more predictive of their ninth-grade indicator score than are changes between fourth and sixth grade—highlighting the importance of students’ performance in math during the middle grades for their eventual graduation. For reading scores, changes between sixth and eighth grade are equally as predictive of students’ ninth-grade indicator score as are changes in students’ reading scores between fourth and sixth grade.

To illustrate these findings, Figure 3 displays achievement patterns and the associated on-track indicator scores for four hypothetical students with prototypical performance. The left panel displays trends in students’ achievement between fourth and eighth grade. As shown, the student

trajectory displayed in blue starts at the NYC average in mathematics achievement in fourth grade and remains at the average level through eighth grade; the student trajectory in green starts at the NYC average but falls substantially behind in seventh and eighth grade;³ the student trajectory in red starts substantially below-average in fourth grade⁴ but maintains this level; and the student trajectory in purple starts substantially below-average in fourth grade but falls even further behind. Given the relationships we find above, these differences in achievement patterns predict major differences in students' ninth-grade on-track indicator score and thus their probability of graduating on time. The right panel of Figure 3 displays the percent chance of being on-track for graduation for these same four prototypical students. As shown, only the student trajectory in blue is associated with a greater than 50% chance of later graduation. Most notably, a student who starts at an average level but falls behind during the middle grades (i.e., the student represented in green) has a less than 50% of graduating on time, which is only marginally better than a student who starts behind in fourth grade (i.e., the student represented in red). We found similar patterns, though to a somewhat lesser degree, for reading achievement.

Does students' fourth-eighth grade attendance predict who's on track in ninth grade?

As with our analyses of students' achievement, students' fourth grade attendance is an important predictor of whether students are on-track to graduate by the end of ninth grade. Further, we find that students' attendance during the middle grades may be an even more important source of information about their later success than their test scores.

To illustrate these findings, Figure 4 displays attendance growth patterns and associated on-track indicator scores for four prototypical students. As the left panel shows, the blue and green trajectories both represent students who start with average attendance in fourth grade (i.e., attendance rates of roughly 94%); while the blue trajectory represents a student who maintains this level, the green trajectory represents a student who falls behind sharply in attendance in seventh and eighth grade (i.e., missing an additional 9% of days each year). Similarly, the red and purple trajectories represent students who start with below-average attendance (i.e., attendance rates of roughly 87%); while the red trajectory represents a student who maintains this (relatively low) level, the purple trajectory represents a student who falls even further below. Our findings indicate that these differences in attendance patterns predict differences in students' on-track indicator score and thus their chances of going on to graduate on time. As the right panel shows, a student who falls behind in the middle grades (i.e., the green trajectory) has only a 57% chance of going on to graduate, compared to the 75% chance for a student who maintains an average level of attendance. A student with a consistently low level of attendance (i.e., the red trajectory) has only a 43% chance of graduating, while a student who low attendance in fourth grade who falls even further in seventh and eighth grade has only a 25% chance of going on to graduate.

Figure 3. Fitted trajectories for four prototypical students with average or below-average levels and rates of growth in mathematics achievement (left panel) with their predicted ninth-grade on-track indicator score, i.e., percent chance of being on-track for later graduation (N = 303,845)

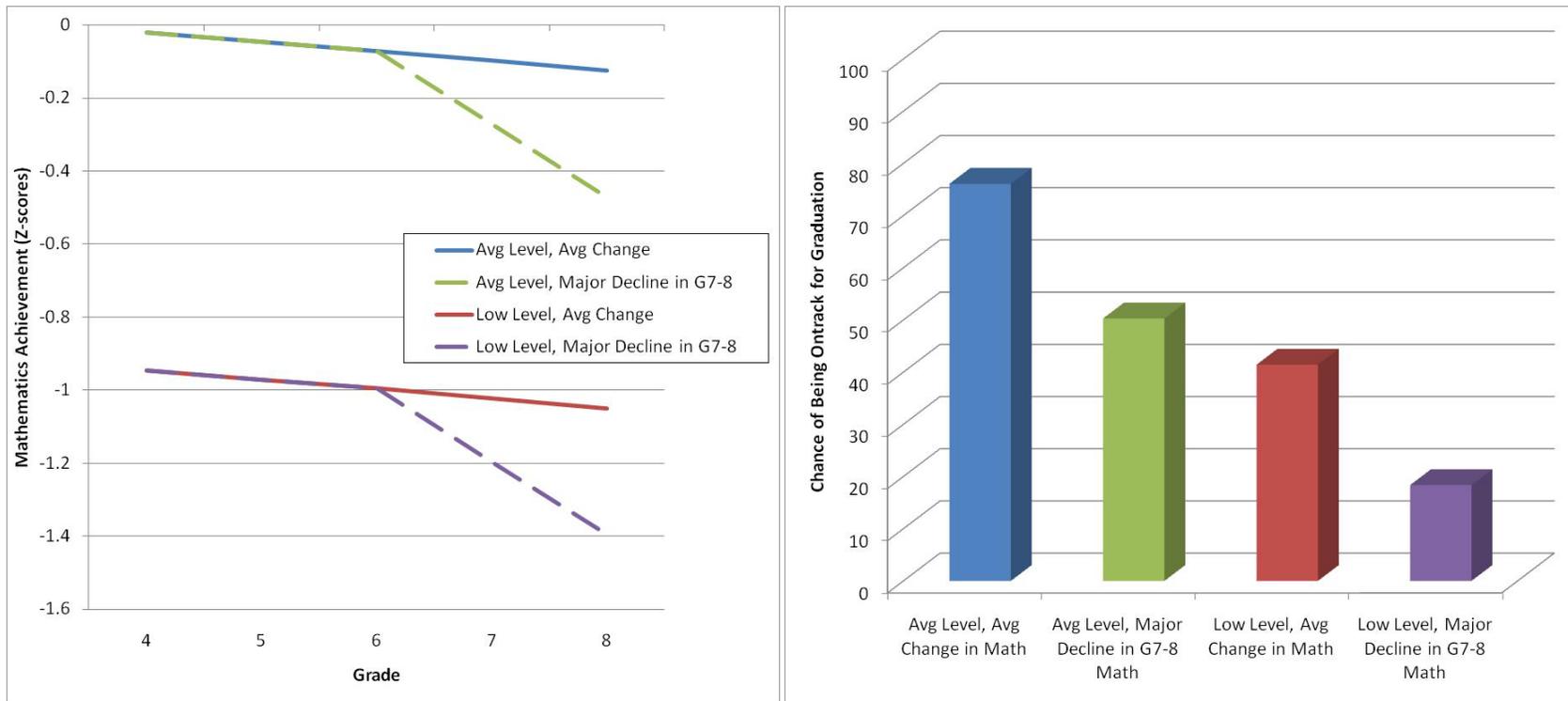
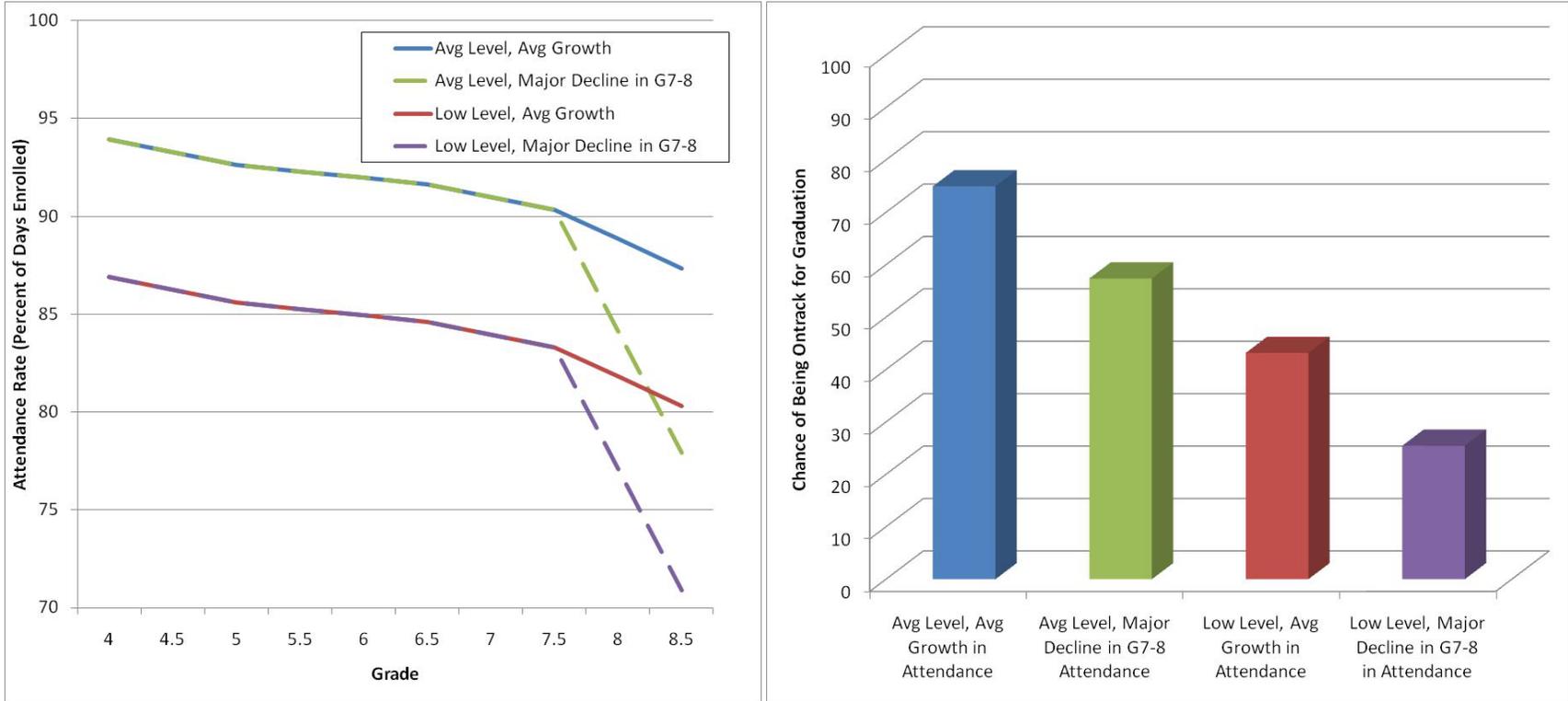


Figure 4. Fitted growth trajectories in attendance for four prototypical students between fourth and eighth grade (left panel) with their predicted ninth-grade on-track indicator score, i.e., percent chance of being on-track for later graduation (N = 303,845).



Preliminary Conclusions & Implications

Together, these results suggest several important discoveries. First, we have confirmed earlier research conducted in other contexts by finding that ninth grade performance provides strong information about whether students in NYC go on to graduate on time. Second, echoing research on the importance of early learning,⁵ we find that NYC students' attendance and achievement towards the end of the elementary grades tell us a lot about the likelihood that they will be on-track to graduate at the start of high school. Third, however, we find that the middle grades may not be too late to prevent declining attendance and stagnant achievement, given that changes during these years (not just prior levels in fourth grade) are predictive of students' later success. This suggests that initiatives to prevent declines in students' attendance and achievement in the middle grades may well help accomplish their intended objectives. Our preliminary findings also suggest that focusing on students' achievement alone may be misguided. While relative improvements or declines in students' test scores are predictive of students' progress towards graduation, changes in attendance during the middle grades are also equally, if not more, predictive of the likelihood that students will be on-track in ninth grade to graduate from high school within four years.

In the spring of 2011, we will extend this analysis by examining which students in which schools are most vulnerable to the negative changes in achievement and attendance that are associated with falling off-track by ninth grade. Specifically, we will continue to refine our on-track indicator by examining predictors of graduating on time across cohorts of first-time ninth-graders in additional school years. In addition, we will explore whether students' transitions through the middle grades explain some of the gaps in high school graduation found across different groups of students in NYC⁶ by investigating the relationship between students' performance and growth during the middle grades and the following student characteristics: students' English language learners status, disability status, gender, and ethnicity. We will also extend this analysis by examining which elementary, middle, and K-8 schools are more and less successful at supporting students' progress into, through, and out of the middle grades. To this end, we will use publically-available data about schools to investigate whether characteristics, such as schools' grade configuration, size, reported climate, and concentration of poverty, predict the proportion of students who demonstrate positive or negative changes in achievement and attendance during the middle grades.

We intend to use this working brief to solicit feedback on our work thus far and to inform our understanding of these preliminary findings. After discussing the work with practitioners, researchers, and policymakers, and upon completion of the remaining tasks described above, we will author a series of reports, articles, and technical documents that highlight the study's key findings, as well as our methodology and analytic approach.

Notes and References

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- ² Allensworth, E. M., & Easton, J. Q. (2007). What matters for staying on-track and graduating in Chicago Public High Schools: A close look at course grades, failures, and attendance in freshman year. Retrieved on February 17, 2011 from <http://ccsr.uchicago.edu/publications/07%20What%20Matters%20Final.pdf>
- ³ For all of these prototypical cases, a “major decline” is defined as one standard deviation below the sample mean for true rate of growth. For mathematics achievement during the sixth to eighth grade period, this is equivalent to approximately .2 z-score points.
- ⁴ By substantially below average, we mean one standard deviation below the sample mean in true scores for fourth grade status. For mathematics achievement, this standard deviation is equivalent to approximately .92 z-score points.
- ⁵ Balfanz, R. (2009). *Putting middle grades students on the graduation path: A policy and practice brief*. Retrieved on December 17, 2010 from: <http://www2.kapolei.k12.hi.us/campuslife/depts/electives/dance/Putting%20Middle%20Grades%20Students%20on%20the%20Graduation%20Path.%20%20A%20Policy%20and%20Practice%20Brief.%20%202009.pdf>
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- ⁶ We retrieved recent information regarding NYC students’ graduation rates (calculated by the NYC DOE) on February 17, 2011 from http://schools.nyc.gov/Accountability/Reports/Data/Graduation/GRAD_RATES_2009_HIGHLIGHTS.pdf