The Research Alliance for New York City Schools

The Middle School Teacher Turnover Project

A Descriptive Analysis of Teacher Turnover in New York City's Middle Schools

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This paper reflects interpretations of the author. Readers should not infer any endorsement of the findings or interpretations on the part of the New York City Department of Education or on the part of those who reviewed earlier drafts and provided guidance to the author.

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Executive Summary

Several recent studies and a high profile report have underscored the importance of learning more about the causes and consequences of teacher turnover in New York City's middle schools. One recent investigation found that rates of turnover were higher among first-year New York City middle school math teachers than among elementary teachers and that the most effective middle school math teachers who left their schools after one year tended to leave the lowest-performing schools.[1] Further, a panel of experts recently noted that many of New York City's middle schools possess characteristics associated with high rates of turnover, such as large percentages of underperforming students and high rates of principal turnover.[2] Given the role that students' performance in middle school can have on their progress towards post-secondary work and study,[3] it seems critical to learn more about middle school teacher turnover in order to help schools develop strategies for recruiting, developing and retaining effective teachers, while simultaneously limiting turnover's damaging consequences.

To date, however, there has not been a comprehensive resource that addresses central questions related to New York City middle school teacher turnover and identifies important avenues for future research. The Research Alliance for New York City Schools aims to fill this gap through a three-year, mixed-methods study of New York City middle school teacher turnover. The goals of this project are to describe the rates and patterns of turnover over the past decade, identify middle school teachers' career plans and their impressions of their schools, and examine the causes and consequences of turnover in middle schools that serve high-need student populations. This project is a collaboration among researchers at Baruch College (City University of New York), Teachers College (Columbia), and New York University. The study is organized into three components, each of which investigates questions related to turnover using one of the following sources of data: the New York City Department of Education's human resources administrative records, an original survey of middle school teachers, and case studies of four middle schools.

This report presents findings from the first of the study's three components. Using human resources data from 2001 to 2010, this study identifies the characteristics of New York City middle school teachers, describes the rates and patterns of turnover over the past decade, and investigates the relationship between turnover and the characteristics of middle school teachers and middle schools. In doing so, the report aims to address foundational questions related to turnover and to identify some key questions that future studies – including the survey and case study components of this larger project – should explore in order to gain a nuanced understanding of middle school teacher turnover.

Background

Teacher turnover is one of the more widely studied topics in K-12 education, and with good reason. Research indicates that high rates of teacher turnover can leave schools facing instructional, financial, and organizational costs, which can be difficult to surmount.[4] While some degree of turnover can be constructive for organizations, a perpetual churning of teachers through schools requires that administrators devote scarce resources to recruiting and orienting new teachers. Further, turnover can compromise a school's long-term objectives, such as its

efforts to promote a professional culture or strengthen its instructional core through sequential professional development.[5]

Evidence suggests that rates of teacher turnover may be particularly high in urban middle schools, especially those serving disadvantaged students. A recent study found that 60% of novice math teachers in low-performing middle schools left their schools within two years.[6] This same study revealed a potentially vicious cycle, wherein the least effective middle school teachers rotate through the schools that serve the largest percentages of underperforming students and students from minority backgrounds.[7] Outside of New York City, research has shown that middle schools have relatively high rates of out-of-field teaching, a factor that is associated with turnover, and that some middle school teachers view their assignments as stepping-stones to positions in elementary or high schools.

Methodology

This investigation employs a discrete-time survival analysis methodology to estimate the length of time that teachers remain in their schools. From these estimates, we generate statistics of the percentage of teachers who left their schools within various lengths of time (e.g., after their first year, within three years, etc.). The primary sample for this analysis is the 15,628 teachers who were new to one of New York City's 196 Grade 6-8 middle schools between 2002 and 2009.[8] The analysis follows these teachers' careers from the time they enter their school until they either depart these schools or are censored by the data set in 2010.

Findings

These findings shed light on a number of the issues raised above and, more importantly, provide a context for future investigations of factors that influence, and are influenced by, teacher turnover within New York City's middle schools.

How long do middle school teachers remain in their schools?

This question addresses a topic of central importance to school principals, school system administrators and organizations invested in preparing teachers for their work and developing their capabilities on the job: after teachers enter New York City middle schools, how long do they remain in their schools? On average, middle school teachers who entered their schools between 2002 and 2009 remained in these schools for roughly three years. More specifically, 27% of middle school teachers left their schools within one year, 55% within three years and 66% within five years. To situate these rates of turnover within the larger context of the New York City public school system, we estimated comparable rates of turnover among the elementary and high school teachers who were new to New York City schools during the same time period. Exhibit 1 illustrates the cumulative percentage of teachers who left New York City's middle, elementary and high schools after various lengths of time. As the exhibit depicts, the rates of middle school turnover are either comparable or slightly higher than rates of turnover in elementary and high schools. For example, 55% of middle school teachers left their schools within three years, as compared with 46% of elementary school teachers and 51% of high school teachers. Exhibit 1 also demonstrates that, across all of these school levels, the steepest increases

in turnover occurred during teachers' first few years in schools, after which turnover rates gradually leveled off.

Exhibit 1
The percentage of new-to-school middle, high and elementary school teachers who left their schools between 2002 and 2009
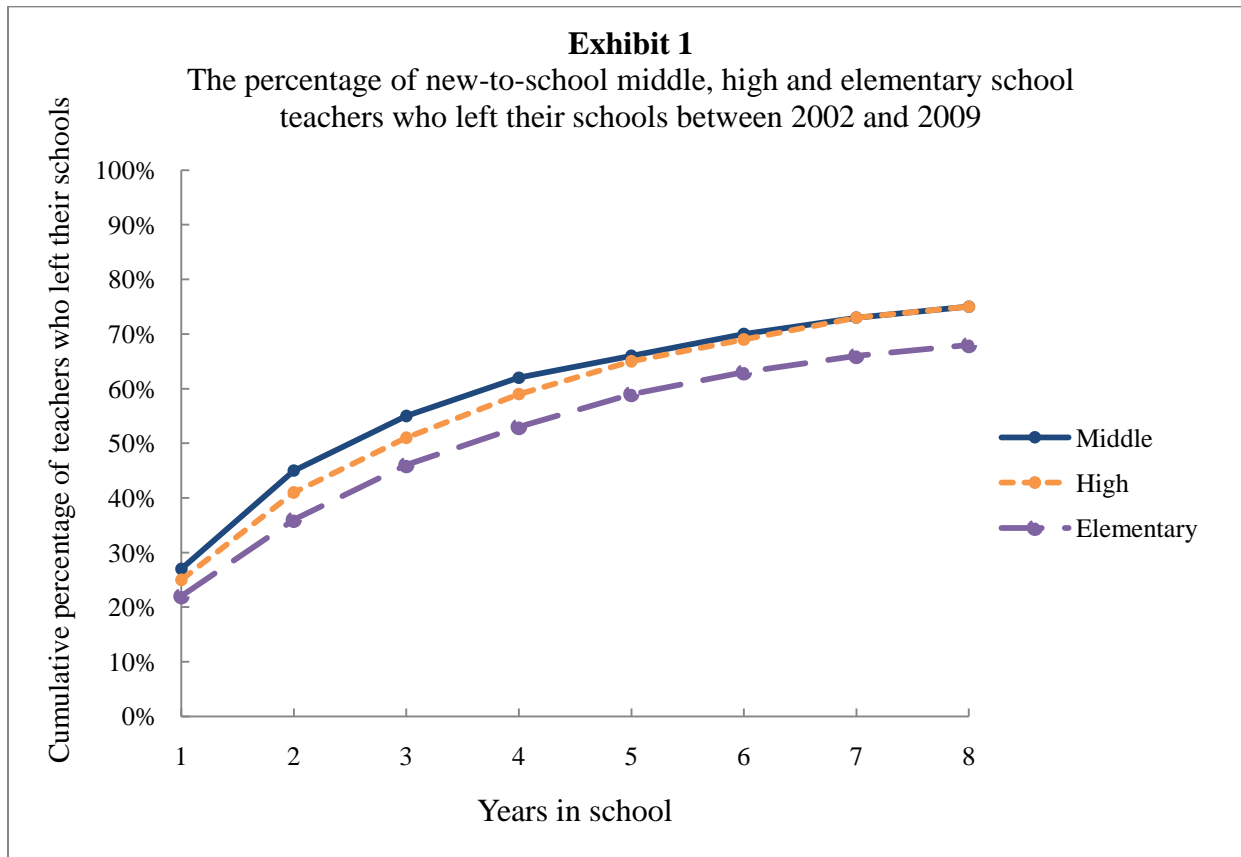
How have rates of middle school teacher turnover changed over the past decade?

To inform preliminary hypotheses about whether and how turnover may have been influenced by a number of factors – such as New York City's movement towards an open-market hiring system – we examined whether rates of turnover changed between 2002 and 2007. These exploratory analyses revealed that rates of middle school teacher turnover declined slightly over this time period. More specifically, 57% of teachers who entered middle schools during the 2001-2002 school year left those schools within three years. Rates of turnover declined slightly among teachers who entered their schools over the subsequent five years. Among teachers who entered middle schools during the 2006-2007 school year, 52% left these schools within three years. This five percentage-point decrease in turnover rates between 2002 and 2007 represented a statistically significant negative linear trend; however, the small magnitude of this difference seemed less notable than the discovery that there was not a year during this time period when more than 50% of middle school teachers remained in their schools for longer than three years.

To what extent is turnover characterized by mobility between schools or attrition from the New York City public school system?

Future studies of middle school teachers' career plans and of the factors that influence whether they remain in their schools, in the New York City public school system, or in teaching should be grounded in a descriptive analysis of teachers' patterns of mobility and attrition. Data from the past decade reveal that both mobility (transferring between New York City schools) and attrition (leaving the New York City public schools altogether) have contributed to New York City middle school teacher turnover. Exhibit 2 illustrates the patterns of mobility and attrition among teachers who left their middle schools between 2002 and 2009. As the exhibit reveals, 59% of departing middle school teachers were not employed in the New York City public school system in the year after their departure (referred to as *Leavers*). By comparison, 41% of departing middle school teachers transitioned to another New York City public school (referred to as *Movers*). Further, as the exhibit indicates, 19% of all of the departing middle school teachers secured assignments in New York City public schools that did not include the middle grades (Grades 6-8). Twelve percent of all departing middle school teachers transitioned to middle schools with traditional Grade 6-8 configurations.

Which teacher characteristics are associated with turnover?

Historically, research on turnover has investigated the relationship between turnover and the characteristics of teachers and schools in an effort to help practitioners and policymakers identify which teachers leave schools and which types of schools they leave behind.[9] Exhibit 3 depicts the percentage of teachers with various background characteristics who left their middle schools within three years. As this exhibit indicates, while these teacher characteristics are all statistically significant predictors of turnover, turnover rates are similar among teachers within many of the larger categories, such as race, gender, and subject area. For instance, roughly 50% of middle school teachers left their schools within three years, regardless of whether they were male or female, or from Black, Hispanic, or White racial/ethnic backgrounds. Similarly, the percentage of math and science middle school teachers who left their schools within three years did not differ notably from rates of turnover among their colleagues who teach other subjects.

There a few notable exceptions to this general pattern of similarity between teachers' characteristics and rates of turnover. More specifically, turnover rates varied across teachers of different ages, levels of experience, and degree credentials. For instance, among the teachers who entered their schools between 2002 and 2009, the teachers with the most experience in New York City schools were associated with the lowest rates of turnover (44% left their schools within three years). By contrast, 55% of teachers who had worked in New York City schools for three years or less left their schools within the same period of time. In addition, older and younger teachers were associated with higher rates of turnover than middle-aged teachers. More specifically, 61% of teachers aged 55-or-older and 54% of teachers aged 30-or-younger left their schools within three years. By comparison, 49% of teachers aged 30-55 left their schools within the same length of time.

Exhibit 2
Patterns of mobility and attrition among teachers who entered NYC middle schools between 2002 and 2009

NYC middle school teachers who entered their schools between 2002-09
(*N* = 18,019)

Departed schools during the period of observation
(*N* = 10,405)

"The Stayers": Remained in schools for the period of observation
(*N* = 7,614)

"The Leavers": Left the NYC public school system
59%

"The Movers": Transferred to other NYC schools
41%

Remained teachers
37%

Assumed non-teaching roles
4%

Transitioned to schools that *did not include* grades 6-8
19%

Transitioned to schools that included grades 6-8
18%

High schools
8%

Grade 6-8 middle schools
12%

Elementary schools
5%

Grade 6-12 schools
3%

Schools with other grade configurations and ungraded schools
6%

Grade K-8 schools
3%

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Exhibit 3
Estimated percentage of middle school teachers who left their schools within three years
By selected teacher characteristics

	Left within 3 years (%)	Statistical significance
Gender		
Female	51	
Male	53	***
Ethnicity		
White	53	
Black	52	
Hispanic	48	**
Other	54	
Years of experience in NYC schools		
3 years or less	55	
Between 3 and 6 years	50	
Between 6 and 9 years	47	***
More than 9 years	44	
Degree level		
B.A.	51	
M.A. or credit equivalent	50	
M.A. and 30 additional credits	55	***
Other	64	
Age		
30-years-old or younger	54	
Between 30-55 years-old	49	***
Older than 55	61	
Subject area		
Math or science teacher	54	
Non-math or science teacher	52	**

SOURCE: Discrete time survival analyses that model the probability of turnover for the various teacher characteristics, while simultaneously controlling for other teacher characteristics and contextual factors, such as a school's NYC borough location and its annual change in student enrollment. Please see the full report and Technical Documentation for detailed information about modeling procedures.
NOTES: Statistical significance key: ~ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Which school characteristics are associated with teacher turnover?

Using a variety of publicly-available data, and controlling for various characteristics of teachers and larger, system-wide contextual factors[10], we examined whether turnover rates differed across various types of middle schools. Exhibit 4 depicts the percentage of middle school teachers who left their schools within three years across middle schools with different characteristics. As with the previous exhibit, the statistics presented in Exhibit 4 suggest that rates of turnover are similar across many different types of middle schools, with a few notable exceptions. For instance, smaller middle schools were associated with higher levels of turnover,

on average. Fifty-five percent of the teachers who entered smaller middle schools (i.e., schools with roughly 700 students) between 2002 and 2009 left these schools within three years. By comparison, schools that enrolled approximately twice as many students lost about 48% of similar teachers within the same time period.

Exhibit 4
Estimated percentage of middle school teachers who left their schools with within three years
By selected school characteristics

	Left within 3 years (%)	Statistical significance
School size[a]		
692 (25th percentile)	55	
1,122 (50th percentile)	51	***
1,383 (75th percentile)	48	
Quality Review score		
Underdeveloped	51	
Underdeveloped with proficient features	53	0.3544
Proficient	52	
Well	51	
Percentage of students in poverty[b]		
59 (25th percentile)	52	
71 (50th percentile)	51	**
83 (75th percentile)	50	
Percent Proficient or higher on NY math assessment[a]		
30 (25th percentile)	54	
49 (50th percentile)	51	***
69 (75th percentile)	49	
Weighted school environment score from School Survey[b]		
8.1 (25th percentile)	51	
9.4 (50th percentile)	49	***
11 (75th percentile)	47	
Teachers' race and whether school had a relatively high proportion of White students[a]		
White teacher, high proportion of White students	47	
White teacher, not a high proportion of White students	55	
Black teacher, high proportion of White students	53	***
Black teacher, not a high proportion of White students	47	
Hispanic teacher, high proportion of White students	53	
Hispanic teacher, not a high proportion of White students	46	

Motivated by the work of Thomas Dee and others[11], we examined the relationship between turnover and the match between teachers' and students' racial/ethnic backgrounds. These analyses revealed that middle school teachers remained in their schools longer when their racial and ethnic characteristics matched those of a substantial proportion of the students in their schools. In the typical New York City middle school, roughly 16% of students are White and 84% are non-White. Thus, schools where more than 16% of students are White could be considered schools with a relatively high proportion of White students even though White students do not represent the predominant racial/ethnic category in the school.

As Exhibit 4 depicts, controlling for other factors, White teachers who were working in schools with a relatively large proportion of White students were associated with *lower* rates of turnover than were White teachers working in schools where White students did not comprise an uncharacteristically large proportion of the student body. Similarly, Black and Hispanic teachers who were working in schools that had a relatively large proportion of non-White students were associated with *lower* rates of turnover than were Black and Hispanic teachers who were working in schools that did not have an uncharacteristically large proportion of non-White students.

While not the focus of this portion of the study, the relationship between turnover and the contextual factors for which our analyses controlled, such as the borough in which a middle school was located, yielded patterns of turnover that future studies should investigate further. For instance, there were wide discrepancies in the percentage of middle school teachers who left schools across the five boroughs. Rates of turnover were highest in Manhattan, where 66% of the teachers who entered middle schools between 2002 and 2009 left within three years. By contrast, within the same period of time, 63% of similar teachers left middle schools in the Bronx, 54% left schools in Brooklyn, 49% left schools in Queens, and 35% left schools in Staten Island.

Discussion and Next Steps

The main objectives of this first component of our larger study of turnover are to address foundational questions related to New York City middle school teacher turnover and establish the context for the subsequent components of our larger study. Despite the study's design being more suitable for raising, rather than answering, questions, several key findings stand out in their own right. First, more than half of the middle school teachers who entered their schools between 2002 and 2009 left these schools within three years. Among those who left, nearly 60% left the New York City public school system altogether; less than 30% of those who moved to other schools within the system transferred to Grade 6-8 middle schools. The relatively small percentage of teachers who secured assignments in other Grade 6-8 schools suggests that few of

the vacancies created by departing teachers were filled by incoming teachers with recent experience in similar schools.

These rates of turnover are likely to make it challenging for middle school principals, and for the teachers who remain in their schools, to establish organizational norms and a shared vision for their schools' teaching and learning environment. Turnover of this nature may require schools administrators to divert resources away from professional development in order to orient and support teachers who are new to their buildings, new to the New York City schools, or new to teaching. In addition, turnover may compromise the continuity of the relationships between middle school teachers and administrators, students, parents, and the staff at organizations that partner with middle schools. If middle schools are unstable and impersonal, students may find it even more challenging to manage the transitions into, through, and out of the middle grades – a time period characterized by numerous social and emotional developments.[12] While descriptive analyses of this nature do not support causal inferences, we find associations between turnover and measurable and malleable characteristics of middle schools, such as school size and the aspects of schools environment measured by the *School Survey* (e.g., school safety). These findings suggest the possibility that practitioners and policymakers may be able to influence turnover by influencing these characteristics of middle schools.

The remaining components of this study will extend the findings presented here and address other important questions related to middle school teacher turnover. The study's second component – a survey of teachers in 125 New York City middle schools – is being led by Dr. Aaron Pallas (Teachers College). The survey will identify middle school teachers' career intentions and examine their impressions of various aspects of their work and worksite. When linked with our analyses of the rates and patterns of turnover, the survey data will help us understand the extent to which turnover reflects, for instance, teachers' discontent, a desire to pursue teaching as a short-term career, or factors beyond teachers' control. In addition, the data will allow us to conduct a more fine-grained investigation of the relationship between turnover and additional, malleable aspects of schools' environments.

Dr. Jennifer Goldstein (Baruch College) is leading the study's third and final component, which consists of case studies of four middle schools – two schools where rates of turnover have been historically high, and two where rates have been low – that serve similar, high-need student populations. These case studies will help us gain a better understanding of the extent to which teachers and school administrators perceive turnover as a cause or consequence of their schools' operational functioning. Further the case studies will examine schools' strategies for recruiting, developing and retaining effective teachers and for limiting turnover's damaging consequences.

The Research Alliance also intends to extend the analyses presented here in order to offer further insight into the potential causes and consequences of the rates and patterns of turnover. In particular, we hope to examine the extent to which patterns of turnover are the result of teachers' voluntary decisions, as opposed to involuntarily transactions initiated by administrators. Utilizing various sources of data about teachers' effectiveness, we also intend to explore why effective middle school teachers leave their schools and whether particular incentives or changes to their working conditions appear to keep them in their schools.

To inform our broader research on the middle grades, we plan on gathering more and better evidence about whether middle school teachers are prepared, and whether their schools are organized, to support students' academic, social and emotional development during this critical

phase of students' schooling. This effort will entail conducting rigorous investigations on topics that have not been adequately explored, such as whether particular school grade configurations (e.g. 6-8, K-8, or 6-12 schools) are more suitable for sustaining and stimulating students' growth during the middle grades. Collectively, the findings from the three components of this study of teacher turnover and from our future investigations will provide policymakers, practitioners, and researchers with evidence that can inform their efforts to improve middle schools and middle grades education – two features of the New York City public school system that many agree are vital but imperiled.

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[6] Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2007, September 18). *Who leaves? Teacher attrition and student achievement*. Paper presented at the Inaugural Conference of the Research Alliance for New York City Schools.

[7] Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2007, September 18). *Who leaves? Teacher attrition and student achievement*. Paper presented at the Inaugural Conference of the Research Alliance for New York City Schools.

Goldhaber, D., Gross, B., & Player, D. (2009). "Teacher career paths, teacher quality, and persistence in the classroom: Are schools keeping their best?" National Center for Analysis of Longitudinal Data in Education Research Working Paper, Working Paper 29. August, 2009.

[8] It should be noted these teachers were not necessarily first-year teachers, nor new to the New York City public school system.

[9] Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal, 38*(3), 499-534.

[10] Our analyses of the relationship between turnover and the characteristics of teachers and schools control for four factors that we hypothesized might affect turnover: 1) the school year during which teachers first entered their NYC middle school; 2) whether a school experienced one or several episodes of principal turnover during the period of observation; 3) a time-varying measure of the annual change in a school's student enrollment; and 4) a school's NYC borough location. In the full report, we refer to these variables as our *baseline covariates.* Our methodology controls for their effects in order to examine the relationships between turnover and the relevant teacher and school characteristics in our datasets.

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Introduction

In March 2007, New York City's (NYC) City Council Speaker, Christine C. Quinn, convened a diverse group of educational advocates to address a pressing issue: the state of NYC's middle schools. After visiting numerous middle schools, reviewing surveys of parents, students, and middle school professionals, and soliciting testimony from academic experts, Quinn's Middle School Task Force concluded: "Without a unified and long-term effort, the middle grades will continue to become a greater burden not only on the school system, but also on the social service and public safety infrastructure of the City" (p. 18, New York City Council, 2007). Central to the Task Force's concern was NYC's middle school teaching corps, which lacked the diversity of the students it served, was potentially underprepared to address middle grades students' developmental needs, and appeared prone to high levels of turnover. These concerns were echoed by subsequent research related to NYC middle schools and teacher turnover (e.g., Boyd, Grossman, Lankford, Loeb & Wyckoff, 2007).

Given the consensus that NYC middle schools were both important and ailing, the Research Alliance for New York City Schools (RANYCS) identified the middle grades as a topic of critical importance and launched studies aimed at addressing issues raised by researchers and practitioners. The first of these studies is a three-year, mixed-methods investigation of teacher turnover within NYC's traditional Grade 6-8 middle schools, which is funded by the Ford Foundation.

This study brings together researchers from RANYCS, New York University, Teachers College (Columbia University), and Baruch College (City University of New York) to identify the descriptive patterns of middle school teacher turnover, examine the relationship between teachers' impressions of their schools and their short- and long-term career plans, and investigate the causes and consequences of turnover in NYC middle schools that serve high-need student populations. We believe that each individual component of the study, as well as the larger project overall, will help practitioners, policymakers, and researchers assess the current state of middle school turnover and identify strategies for promoting stability and retaining effective teachers.

The study's first component—the subject of this report—presents a descriptive profile of traditional Grade 6-8 NYC middle schools, the teachers in these schools, and the patterns of teacher turnover across these schools over the past decade. In constructing this profile, we aim to provide the educational community with an informed understanding of the middle school context. The second and third components of the larger study, which are still ongoing, will expand our understanding of the potential causes and effects of teacher turnover. In the second component of the study, we survey over 4,500 teachers in approximately 125 middle schools about their impressions of aspects of their schools that research has identified as being related to turnover. In the third and final component of the study, we will conduct in-depth case studies of four NYC middle schools in order to gain additional insights into the possible causes and consequences of teacher turnover.

In this report, we address the following foundational questions related to middle school teachers, middle schools, and rates of middle school teacher turnover:

1. *What are the characteristics of NYC middle school teachers and how have they changed over the past decade?*
2. *How long do middle school teachers remain in their schools?*

3. *How, if at all, have rates of middle school teacher turnover changed over the past decade?*
4. *To what extent is turnover characterized by mobility between schools or attrition from the NYC public school system?*
5. *Which teacher and school characteristics are associated with turnover?*

Within these overarching questions, we also address a number of related sub-questions. For example, in addition to examining whether turnover appears to be the result of mobility or attrition, we investigate whether teachers who move between schools tend to transition to other middle schools or schools with elementary or high school grade configurations. In the coming year, as we conclude our analyses of the survey and case study data, we will author additional reports that document our new findings and summarize the evolution of our understanding of NYC middle school teacher turnover.

We find that, over the past decade, the percentage of middle school teachers that are female has increased, as has the percentage that are in the second stage of their careers as NYC teachers (i.e., they have between three and nine years of experience in NYC schools). Rates of NYC middle school teacher turnover are on-par or slightly higher than rates in some other urban school systems and in NYC elementary and high schools. We find that more than half (55%) of the middle school teachers who were new to their schools between 2002 and 2009 left their schools within three years. Middle school teacher turnover decreased slightly between the 2001-02 and 2006-07 school years, though across every year within that timeframe, middle school teachers' median length of stay in schools was still less than three years. Further, our analyses reveal that the majority of departing middle school teachers left the NYC public school system altogether. Among those who transitioned to other NYC schools, roughly half transferred to schools that did not include the middle grades (grades 6-8).

We find that both teachers' background characteristics and the characteristics of their schools help predict the probability that middle school teachers will leave their schools. Some of the relationships between turnover and schools' organizational characteristics warrant further research. For instance, a greater percentage of teachers left small middle schools than large ones; of the five NYC Boroughs, Manhattan lost the greatest percentage of middle school teachers.

This report illuminates each of the findings described above in greater detail. First, we present a brief overview of the literature related to teacher turnover to explain the motivation for the study. In addition, we present information about the teachers and schools in the study. Next, we present our findings in the body of the report, which is divided into two parts. In Part I, we address the first four foundational questions and present a descriptive profile of NYC middle school teachers, the schools in which they work, and how both have changed over time. In Part II, we examine the relationship between turnover and the characteristics of middle school teachers and of the schools where they work (the fifth question above). In the report's concluding section, Part III, we discuss the implications of our findings. References, technical information—such as sources of data and methodologies, and additional figures and tables—appear at the end of the report and in the accompanying Technical Documentation.

Prior Research

Researchers have studied teacher turnover extensively over the past 30 years, though less so in New York City or at the middle school level. The broad term "turnover" typically refers to both teacher mobility and attrition (Johnson, Berg, & Donaldson, 2005, paraphrasing the literature). Mobility is usually defined as the movement of teachers between schools, which can occur within the same district or school system, as well as across separate districts/systems. Attrition, by contrast, typically refers to exits from schools, and/or from the profession, including retirements and both voluntary and involuntary departures.

Recent analyses have estimated that approximately 16% of the nation's teachers leave schools annually for reasons other than retirement. Of those, roughly half move to other schools and half leave teaching altogether (Marvel, Lyter, Peltola, Strizek, & Morton, 2007). These rates are higher among inexperienced teachers. Ingersoll (2003a) has estimated that approximately half of new entrants to teaching leave the field within five years.

Rates of teacher turnover may be particularly high in large urban districts. In Philadelphia, 70% of new teachers who began teaching in 1999 were no longer teaching in the district in 2005 (Useem, Offenberg, & Farley, 2007). In NYC, the United Federation of Teachers (UFT) has estimated that 16% of new teachers leave their schools within the first year of teaching (United Federation of Teachers [UFT], 2007). A recent study of turnover within Chicago elementary and high schools found that a typical school in their study lost roughly half of its teaching staff every five years (Consortium on Chicago School Research [CCSR], 2009).

Why does turnover matter? Most agree that some amount of turnover is constructive in that it enables schools to counsel out ineffective teachers and helps bring new ideas to organizations that might otherwise grow stagnant (Johnson, Berg, & Donaldson, 2005). CCSR estimates that about 10% of teachers leave even the most highly functioning schools every year. However, when rates of turnover are too high, schools face considerable instructional, financial, and organizational costs associated with losing and replacing staff (Johnson, Berg, & Donaldson, 2005; Milanowski & Odden, 2007; National Commission on Teaching and America's Future [NCTAF], 2007). A constant churning of teachers through schools requires administrators to direct already scarce resources to hiring and supporting new teachers, and it makes establishing a consistent, constructive school culture more challenging (Neild, Useem, Travers, & Lesnick, 2003). Perhaps the greatest challenge that turnover presents to districts, regions, and to the nation's public schools in general, pertains to teacher supply. Most often, exiting teachers are replaced by inexperienced beginning teachers, who are relatively ineffective in their early years on the job (Hanushek, Kain, & Rivkin, 2004; Kane, Rockoff, & Staiger, 2006; Murnane & Phillips, 1981; Rockoff, 2004).

The consequences of teacher turnover may be particularly damaging to disadvantaged, underperforming schools within urban school systems. Some studies have found that rates of turnover are highest in schools that serve large percentages of minority students and students who perform poorly on standardized assessments (e.g., Boyd, Lankford, Loeb, & Wyckoff, 2005; Goldhaber, Gross, & Player, 2009; Hanushek et al., 2004)—the very same schools that struggle mightily to fill vacancies and attract qualified applicants (Guin, 2004; Lankford, Loeb, & Wyckoff, 2002). And while there is some evidence that the least effective teachers are the ones most likely to leave underperforming schools (Hanushek, Kain, & Rivkin, 2005), there is also evidence that the less effective teachers who re-enter schools largely transfer to other

similar, low-performing schools (Boyd et al., 2007; Goldhaber, Gross, & Player, 2009). This trend suggests a potentially vicious cycle, wherein the least effective teachers perpetually rotate through the schools where the strongest teachers are most needed.

Studies have found associations, sometimes to varying degrees, between teacher turnover and a number of factors pertaining to teachers' background characteristics and the characteristics of their schools. To name just a few, teachers' age, years of teaching experience, gender, and teaching assignment (i.e., special education vs. general education), level of degree, and compensation have all been found to be related to turnover (summarized in Johnson, Berg, & Donaldson, 2005). Recent evidence, including evidence from NYC, suggests that teachers' routes of entry into the profession may also affect their length of stay in schools (e.g., Boyd et al., 2009a; Donaldson & Johnson, 2010). Schools' working conditions also influence teachers' career decisions (Marvel et al., 2007). One recent study in NYC found a relationship between turnover and the caliber and content of mentoring programs for new teachers (Grossman et al., 2009). In addition, there is evidence that teachers who are dissatisfied with their social and professional relationships in schools—with parents, colleagues, the principal, or students—are more likely to leave teaching or to anticipate leaving teaching in the future (Boyd et al., 2009b; Metropolitan Life Insurance Company, 2006).

There are few studies focused specifically on middle school teacher turnover, much less on middle school turnover within one urban school system. The minimal evidence suggests that rates of middle school teacher turnover may be particularly high (NCTAF, 2007). There are a number of compelling reasons why we might expect this to be so. First, middle school teaching assignments are often considered stepping-stone positions to more competitive elementary positions or to high school positions (Neild, Useem, & Farley, 2005). As a result, middle school teachers have historically accepted, and been assigned to, teaching assignments for which they are only partially qualified. Rates of turnover are higher among teachers with such out-of-field assignments (Donaldson & Johnson, 2010; Ingersoll, 2003b; Neild, Farley-Ripple, & Byrnes, 2009; Young, 2002).

Complicating matters further, middle school teaching may be particularly challenging given the social, physical, and emotional developments that occur during the middle grade years (Eccles, Midgley, & Adler, 1984; National Middle School Association, 1995). Improving the organizational functioning of middle schools seems of particular urgency, as students' development and performance during the middle grades plays a critical role in their subsequent success in and after high school (Balfanz, 2009; Balfanz, Herzog, & Mac Iver, 2007; Murdock, Anderman, & Hodge, 2000; Neild and Balfazn, 2006; Roderick, 1994). Specifically in NYC, there is evidence that a troubling number of middle schools possess characteristics that have historically been associated with high levels of turnover, such as large percentages of underperforming students and substantial turnover among school leaders (New York City Council, 2007).

The teachers and schools in the study

This study investigates patterns of teacher turnover in 196 Grade 6-8 NYC middle schools. Given the sheer size of the NYC public school system, there is substantial variation in the grade configurations of schools that serve students in the middle grades. Figure 1 presents the selection criteria that we used to identify the 196 schools in this study. As depicted, in 2009, 519

city schools served students in at least one of the middle grades (grades 6-8). These schools possessed a variety of grade configurations, from K-12 schools to Grade 6-8 schools to schools with less typical grade configurations (i.e., grade 6-10 or grade 7-9 schools). In the NYC public school system, it is not uncommon for schools to change grade configurations over time due to shifting enrollment trends and reform movements. For example, 6-12 schools sometimes break into two schools, one serving students in the middle grades (6-8) and another serving students in the upper grades (9-12). Occasionally schools choose to add one or several grades, only to stop serving students in those grades several years later.

Figure 1
Identifying the potential sample of NYC middle schools

Total number of **schools serving students in grades 6 – 8 in 2009** (N=424)

- Grades 6-8 (224)
- Grades Pre K-8 (86)
- Grades 6-12 (44)
- Grades K-8 (32)
- Other (38)

Included: Schools with grades 6-8 in 2009. Sum = 424.

- Grade 6 only (9)
- Grade 8 only (10)
- Grades 6 & 7 only (14)
- Grades 7 & 8 only (4)
- Other (58)

Not Included: schools with 1 or several middle grades, as well as other grades

Schools serving students in **ONLY grades 6 – 8** in 2009 (N=224)

- Of these 224 schools, 19 were created in 2007 or later and, thus, are removed from the sample because they were not in existence long enough to study teachers' career patterns.

Schools serving students in **ONLY grades 6-8 and created BEFORE 2007** (N=205)

- Of these 205 schools, 4 had distinct pre-k or k programs during years prior to 2009 and 5 had at least one of the 6-8 grades disappear and then reappear between 2000-09. These 9 schools present atypical cases that might affect a study of turnover and retention and are, thus, removed.

Schools in the Sample (N=196)

- Of these 196 schools, 10 have irregular data: 8 have test scores in years when no other data exist; 2 have changing DBNs and atypical organizational characteristics (e.g. different names in different years). We investigated the histories of these schools and determined that they could all be included in the study for some portion of their existence. **The final sample includes 196 schools.**

We chose to examine turnover in the Grade 6-8 middle schools—the most common of the middle grades school configurations and the one at which much of the criticism (outlined at the beginning of this report) has been directed.[1] For the purposes of this study, we selected schools that existed in 2009, served students in the traditional middle grades (6, 7, and 8) and *did not* serve students in any other grades in that same year, and had opened and begun enrolling students by the 2005-06 school year.[2] Schools that opened after 2005-06 were not included in this analysis because they would not have been in existence for a long enough period of time to produce reliable information about how long teachers remain in these schools. Therefore, with a few exceptions, our sample of schools ends up being the population of traditional NYC Grade 6-8 middle schools, excluding those that were opened in recent years or schools that were atypical in some notable way (see Figure 1). For the remainder of this report, rather than repeatedly

referring to these schools as "sample middle schools" or "the schools in this study," we often refer to them simply as NYC middle schools.

The middle schools in this study are located throughout the city, possess a range of organizational characteristics, and serve diverse populations of students. Figure 2 depicts the distribution of these middle schools across the New York City boroughs in 2009. As displayed, over one-third of the schools in the study (67 of 196, or 34%) are located in Brooklyn. Schools in the Bronx account for one-quarter of the schools in our study (48 of 196, or 25%), and Manhattan and Queens contribute 35 and 36 middle schools, respectively—roughly 18% of schools in the study each. Ten of our schools (5%) are in Staten Island.

Figure 2
The number and percentage of Grade 6-8 middle schools by NYC borough, School Year 2008-2009 (n=196)
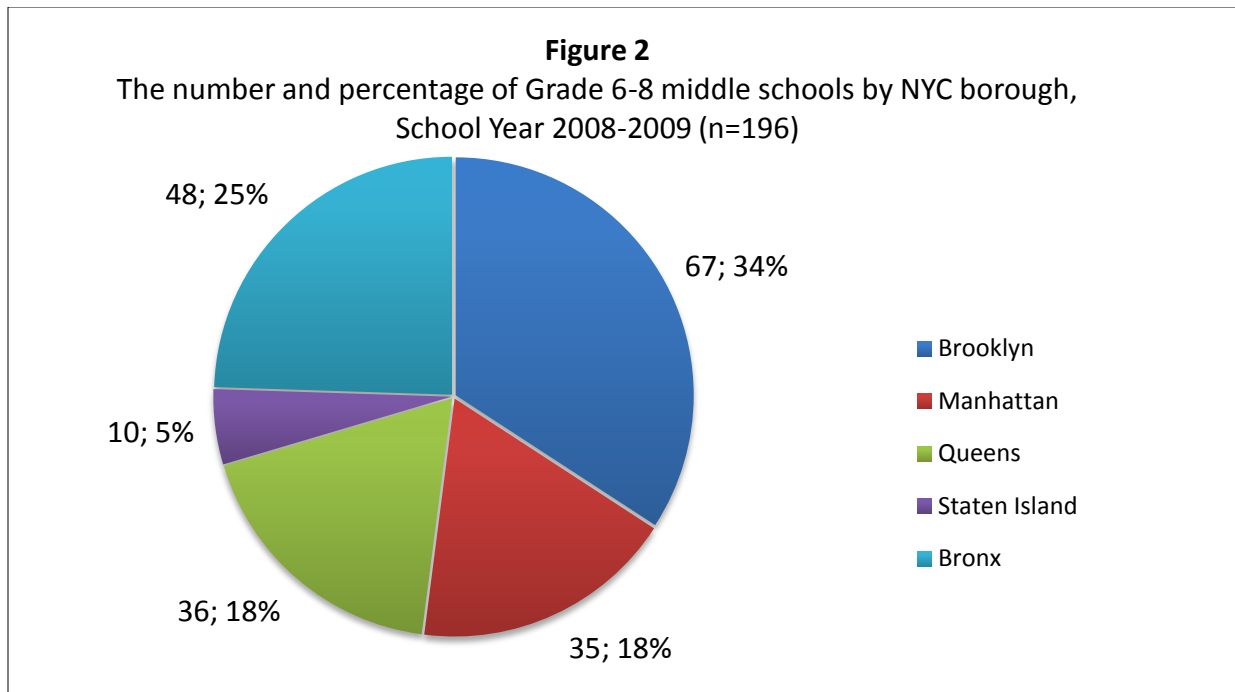
The majority of the schools in this study were open prior to the beginning of the period of observation for this study, 2000-01. As Figure 3 reveals, 131 middle schools were already in existence in 2001. From 2001-04, between four and seven new middle schools opened each year. After 2005, the number of new middle schools increased substantially. In 2005, 31 additional Grade 6-8 middle schools were opened, and 17 additional schools were opened in the following year. Because this study does not include schools that were opened after 2006, the total number of schools in our study remains 196 from 2007 through 2010.

The newer middle schools are more heavily concentrated in certain NYC boroughs. Of the 71 schools that opened between 2001-06, the greatest number (27) were created in the Bronx, followed by 22 in Brooklyn and 20 in Manhattan. Only two schools were opened in Queens, and none were opened on Staten Island during this time period. Appendix B presents additional information about the schools in our study, such as the variation across the five NYC boroughs in the average size of the schools.

Figure 3

The number of existing and newly-opened Grade 6-8 NYC middle schools, from 2001 to 2010
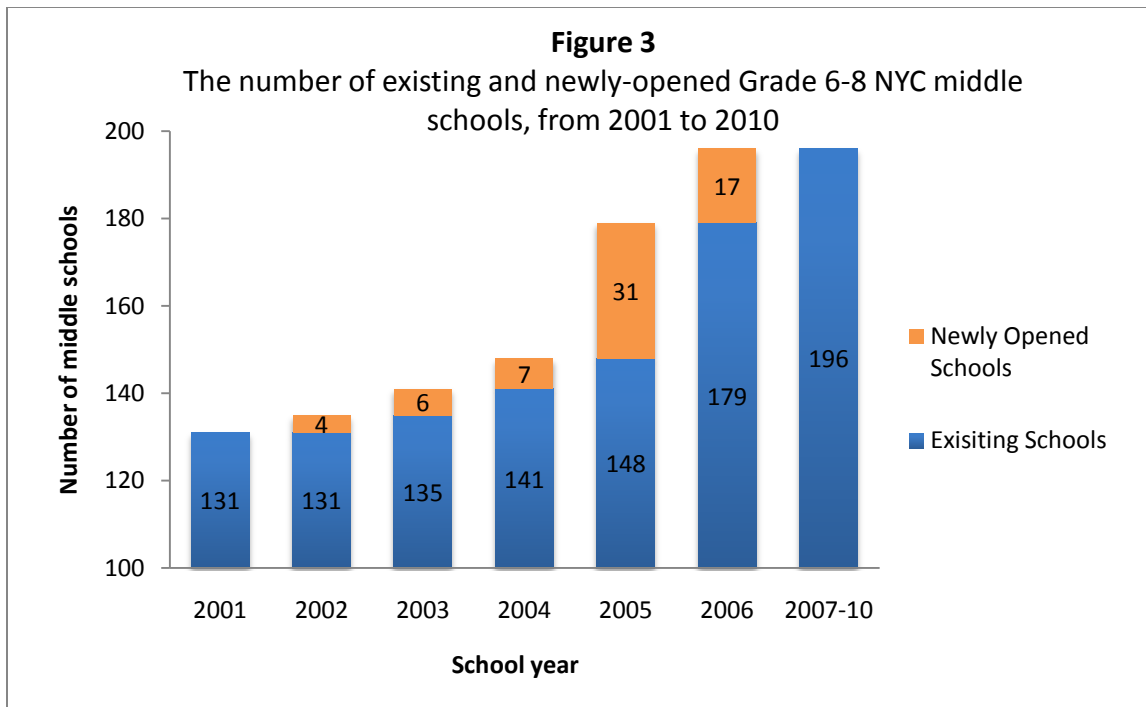
Between 2001 and 2010, 24,598 full-time teachers[3] were employed in at least one traditional grade 6-8 NYC middle school for at least one school year. Of these, 15,628 entered their schools between 2002 and 2009. We conduct analyses of turnover using both the larger, inclusive set of teachers and the smaller sample of teachers who were new to their schools between 2002 and 2009; we refer to this latter group as "new-to-school teachers." New-to-school teachers constitute roughly 65% of all the teachers who were employed in traditional Grade 6-8 middle schools between 2001 and 2010.[4] The bulk of our report focuses on the rates of turnover among the 15,628 new-to-school teachers, as we can only generate accurate estimates of how long middle school teachers remain in their schools if we know when they began teaching in their schools. Since our dataset does not contain information that would allow us to identify how long teachers had been in their schools at the outset of the period of observation (2000-01), we must focus our analysis on the subset of new-to-school teachers. *Please note, unless specified otherwise, the turnover statistics in this report refer to those among new-to-school teachers.* For ease of reporting, we sometimes refer to these teachers simply as "middle school teachers," rather than as "new-to-school teachers," the latter of which is both more accurate and cumbersome. We clearly specify when analyses and statistics refer to the larger, inclusive population of all middle school teachers.

Findings Part I: Middle School Teachers and Their Rates of Turnover

In this section, we use data from the most recently available school year, 2008-09,[5] to construct a brief descriptive profile of NYC middle school teachers and to identify how their characteristics differ from NYC elementary and high school teachers. Subsequently, we examine how the characteristics of new-to-school middle school teachers differ from middle school teachers overall, how long middle school teachers remain in their schools, where they go when

they leave, and whether and how rates of turnover have changed since the early years of the past decade. We illustrate some of the notable findings with specific tables and figures referred to in the text. Appendix C contains additional tables and figures that are related to the statistics presented below.

Who are NYC middle school teachers?

In 2009, the average NYC middle school teacher was a White female in her early 40s with a Master's degree (or the credit equivalent) and nine years of experience in the NYC public school system. In that same year, NYC elementary, middle, and high school teachers shared many of the same characteristics. Approximately the same percentage of teachers were White regardless of the level of school in which they taught (roughly 60% across elementary, middle and high schools); however, a greater percentage of middle school teachers were Black (23%, as compared with 18% for both elementary and high school teachers) and a greater percentage of elementary school teachers were from Hispanic backgrounds (16%, as compared with 13% of middle school teachers and 12% of high school teachers). As is the case in elementary schools in general, the vast majority of NYC elementary school teachers were women (90%). By comparison, women comprised 69% and 55% of NYC's middle school and high school teachers, respectively.

In 2009, teachers across all of three common school levels were, on average, about 40-years-old and had taught in NYC schools for approximately 10 years. Middle school teachers were slightly less experienced than their elementary and high school counterparts. In 2009, 41% of elementary school teachers and 38% of high school teachers had more than nine years of experience in NYC schools; by comparison, 33% of middle school teachers had the same level of experience. Middle schools also had the highest percentage of inexperienced teachers: 21% of middle school teachers had been in NYC schools for three years or less. By comparison, 16% of elementary teachers and 18% of high school teachers had the same level of experience. Not surprisingly given their age and experience, middle school teachers were less likely than their elementary and high school teacher counterparts to have obtained credentials that entailed a Master's degree or higher. The percentages of elementary, middle, and high school teachers with the highest level of credentials recognized in the NYC salary step schedule were 43%, 40%, and 47%, respectively.

Any rigorous study of patterns of teacher turnover necessarily examines teachers' patterns of entry into, and exit from, schools over a period of time. Therefore, identifying teachers' characteristics in any one year can obscure important changes that occur over the larger period of time. We briefly identify some of the notable differences between middle school teachers in 2001 and 2009 as a way of illuminating some of the broad changes that occurred during the years covered by this study. Tables depicting similar changes in elementary and high school teachers can be found in Appendix C.

Compared to the middle school teachers in 2009, those in 2001 were a couple of years years older (42, as compared with 40) and more likely to be veterans with more than nine years of experience teaching in NYC schools (41%, as compared with 33% in 2009). A smaller percentage of middle school teachers were women in 2001 than in 2009 (62% and 69% respectively), while a greater percentage were from Black racial/ethnic backgrounds in 2001 than in 2009 (26%, as compared with 23%). These changes, especially those related to age and

experience, are important to keep in mind when interpreting findings regarding middle school teachers' length of stay in schools, which, as we discuss later, differs depending on teachers' gender and experience.[6] In general, it appears that there were similar changes among NYC's elementary and high school teachers during the same years.

How do the characteristics of new-to-school middle school teachers differ from those of NYC middle school teachers overall?

Given the nature of our data, we are compelled to focus our analysis on the subset of teachers who were new to their schools during the study period in order to generate an accurate estimate of how long teachers remain in their schools. In doing so, we necessarily identify a sample of teachers that is, on average, younger and less experienced than the larger population of NYC middle school teachers. In 2009, new-to-school middle school teachers were, on average, 35-years-old and had taught in NYC schools for five years. The majority (55%) had three years or less of experience in NYC schools, while 32% had between 3 and 9 years of experience, and 13% had more than 9 years of experience. As one might expect given these differences, a smaller percentage of new-to-school teachers (18%) had obtained the highest level of degree credentials. Importantly, given subsequent analyses of the relationship between turnover and teachers' personal characteristics (such as their race and gender), new-to-school teachers' racial and gender characteristics did not differ notably from those of middle school teachers overall.

It is difficult to say with certainty how differences in the characteristics of the new-to-school middle school teachers might affect the findings shared in this report. Typically, teacher turnover is highest among the youngest and oldest strata of teachers (Ingersoll, 2001; Luekens, Lyter, Fox, & Chandler, 2004; Murnane, Singer, & Willett, 1988). The new-to-school sample of middle school teachers certainly contains a larger percentage of younger, less experienced teachers than are present in the entire pool of middle school teachers. This could result in higher estimates of teacher turnover than would be obtained from an analysis of mobility among all middle school teachers. However, the new-to-school sample is far from a subset of first-year novices, for whom rates of turnover are often the highest (Luekens et al., 2004). On the contrary, with an average age in the mid-30s and five years of experience in NYC schools already under their belts, a substantial proportion of new-to-school teachers are in the period of teaching that tends to be relatively stable. Furthermore, with fewer aging veterans among their ranks, new-to-school teachers would seem far less likely to leave their schools due to retirement. We conduct several analyses in an attempt to discern how the characteristics of the new-to-school teachers in our sample might affect our estimates of teacher turnover; the results of these analyses follow.

How long do middle school teachers remain in their schools?

To address this research question, we investigate the length of time that middle school teachers remained in their schools after having first entered those schools. One of the primary objectives of the larger study of turnover—including the survey and case study components that we describe in the introduction to this report—is to gain a better understanding of the extent to which turnover is disruptive or, alternatively, potentially constructive to schools. Thus, we employ an expansive definition of turnover, identifying teachers as having left their schools if they either: a) physically leave their schools (i.e., teachers transfer to another NYC public school

or leave the system altogether), or b) assume roles other than teaching (i.e., teachers chose to become principals, librarians, or school nurses), regardless of whether they remain in their schools.[7] Our rationale for considering this latter category of role-changers as having "turned over" is that their changing roles leaves building administrators in the same ultimate scenario: needing to fill a vacant teaching position.[8] Employing an expansive definition of turnover in this type of descriptive, foundational study also allows us to examine the prevalence of different types of turnover—a possibility that would have been precluded by using a more constrictive strategy.

So, how long do NYC middle school teachers remain in their schools? The short answer to this important question is: not particularly long. We find that, 27% of middle school teachers who entered their schools between 2002-09 were no longer teaching in the same schools within one year of having begun in those schools. Within three years, over half (55%) of middle school teachers had left their schools. Five years out, two-thirds (66%) of middle school teachers had either changed schools, left teaching and/or left the NYC public schools, or assumed roles other than teaching.

Our analysis suggests that rates of teacher turnover, while similar and relatively high across all schools types in NYC, are highest in middle schools. As Table 1 reveals, over the period of observation, the percentage of elementary school teachers who left their schools within one, three, and five years were the lowest across the major NYC school levels. High school teachers left their schools in similar, but slightly higher percentages. As noted, middle school teachers left their schools in the highest percentages.

Table 1

The percentage elementary, middle, and high school teachers who left their schools within 1, 3, and 5 years, among teachers who were new to their schools between 2002 and 2009

	Elementary (n=39,083)	Middle (n=18,019)	High (n=25,533)
Percentage Left Within 1 YR	22%	27%	25%
Percentage Left Within 3 YRS	46%	55%	51%
Percentage Left Within 5 YRS	59%	66%	65%

The rates of middle school turnover that we report here do not appear to be the byproduct of an analytical sample comprised of new-to-school middle teachers. We investigated this possibility by conducting a similar discrete-time survival analysis for *all of the middle school teachers* who were teaching in sample schools during 2000-01 school year. Middle school teachers in this more inclusive sample remained in their school for slightly longer than did the new-to-school teachers alone; however, in practical terms, the margin of difference seems negligible.[9] Among all middle school teachers working in Grade 6-8 middle schools in 2000-01, 22% were no longer teaching in the same school one year later, 48% had left their schools within three years, and 64% had left within five years. In both cases, nearly half of middle school teachers (slightly more for new-to-school teachers, slightly less for the middle school teachers who were already in their schools in the 2000-01 school year) had left their school within three years.

How has middle school teacher turnover changed over the past decade?

Over the past decade, local and state policymakers have enacted numerous reforms aimed at improving the quality of classroom instruction in NYC public schools by influencing how teachers are prepared, recruited, supported, and evaluated once in schools (for a summary of these reforms, see Goertz, Loeb, & Wyckoff, 2010). Consider an abbreviated list of these reforms: in 2005, the DOE and the UFT initiated an open-market human resources policy that was intended to provide principals with more discretion over hiring in their schools; roughly a year prior, NY state, and subsequently NYC, enacted various measures to support new teachers with mentors; through a number of Chancellor Klein's *Children First* reforms, policymakers attempted to strengthen principal training and recruitment strategies, with the hopes that stronger school leaders would be better able to help foster and extend strong classroom instruction; in recent years, and in partnership with external researchers, the DOE has embarked on effort to construct and validate measures of teachers' instructional effectiveness and to use such evaluations in decisions regarding teachers' tenure and salary. During this same time, there were also broad changes in state and national educational policy—most notably, the movement towards holding schools accountable for standardized test results—as well as changes in the local and national labor market, such as the recent economic collapse, that may have affected teacher turnover.

While many of these reforms are intended to influence the mix of teachers in NYC schools and how they perform their work, the relationship between these policies and teacher turnover is not clear. For instance, the transition to an open-market hiring system might increase or decrease turnover, or have no net effect on turnover at all. The open-market policy may have granted inexperienced teachers—who previously had a limited ability to compete with more experienced teachers for open teaching assignments—greater flexibility to transfer between schools, thus increasing turnover by prompting more inexperienced teachers to move between schools.[10] However, if principals gained greater authority to reject the transfer requests of more senior teachers', this may have reduced turnover. Granting more discretion over hiring to schools might result in principals, or school hiring committees, hiring teachers who were well suited for their schools, which in turn might decrease turnover down the road.

Similar hypothetical scenarios can be crafted for how each of the aforementioned reforms over the past decade might increase or reduce turnover. Thus, it is difficult to draw clear conclusions about the extent to which average levels of turnover, or short- or long-term increases or decreases in rates of turnover, are ultimately constructive or destructive for schools or for school systems overall. Nonetheless, in an effort to describe broad patterns of NYC middle school teacher turnover over the past decade, we examine how average rates of turnover among new-to-school teachers fluctuated between 2002-07.

Our preliminary analyses suggest that rates of turnover have declined slightly over the past decade. As Figure 4 demonstrates, the percentage of new-to-school middle school teachers who left their schools within three years increased from 2002-2003 (from 57% to 59%) but then decreased slightly in subsequent years, reaching a six-year low of 52% during the 2006-07 school year.[11] The appropriate way to interpret this figure is as follows: The "school year" indicated on the x-axis is the year in which a new-to-school teacher first began teaching in her school. The percentage associated with that same year is the percentage of teachers in that entering school-year cohort who left within three years. In other words, of the middle school teachers who were new to their schools during the 2001-02 school year (identified in the figure

as 2002), 57% left these schools within three years. By comparison, of the teachers who were new to their schools in the subsequent year, 2003, 59% left these schools within three years.

Figure 4
The percentage of NYC middle school teachers who left their schools within three years, among teachers who were new to their schools between 2002 and 2007
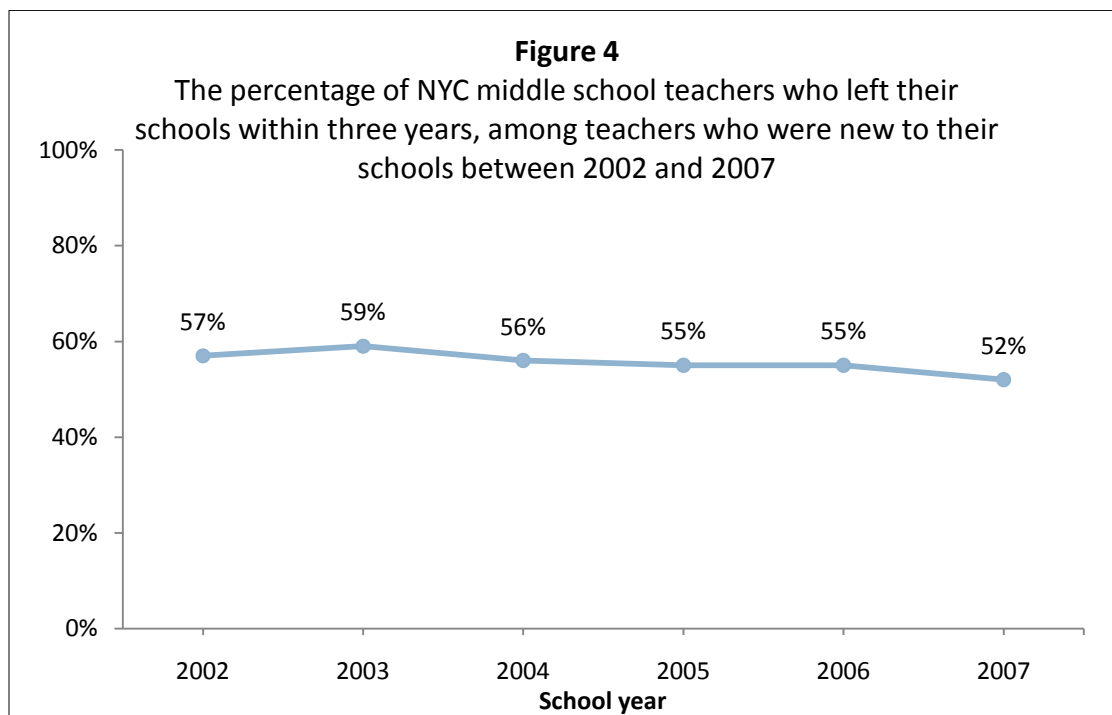
Future research should examine whether this downward trend persists in the future, as well as whether it appears to be the result of changes in the characteristics of middle school teachers; improvements in the operational functioning of middle schools; a system-wide contextual change, such as the introduction of the DOE's *Children First* reforms; or some larger regional change, such as the attractiveness of teaching positions relative to jobs in other sectors.

Is middle school teacher turnover the result of mobility or attrition?

Middle school teacher turnover is the result of both mobility (changing between NYC schools) and attrition (leaving the NYC public schools altogether), though the latter plays a larger role than the former. To principals and teachers, it may make little difference whether a teacher transitions to another school or pursues a career outside of teaching. However, to the NYC public school system as a whole, attrition may represent greater net losses than those due to mobility. This calculus certainly depends on the effectiveness of the outgoing teachers relative to those entering the system; however, training novice, new-to-school, and new-to-system teachers requires a substantial amount of resources and support. Any system that loses a sizable percentage of teachers, even if some of those teachers have yet to demonstrate their effectiveness, loses the investment it made in providing those teachers with a foundation on which success could be built.

When new-to-school middle school teachers leave their schools, they are more likely to leave the NYC public schools than to transfer to other schools within the system. As Table 2 depicts, 59% of the departing new-to-school middle school teachers were not employed in the

NYC public school system in any capacity in the year following their departure; consistent with previous research on teacher turnover (e.g., National Center for Education Statistics, 1997), we identify these teachers as the *Leavers*. By comparison, 41% of new-to-school middle school teachers who left their schools could be characterized as *Movers*, those who transitioned to another NYC school, middle school or otherwise.

Table 2
The number and percentage of *Leavers* and *Movers,* among NYC middle school teachers who were new to their schools between 2002 and 2009 (n=10,405)

	Leavers	*Movers*			
		Moved to different 6-8 middle school		Moved to non-6-8 middle school	
		Teaching	Not teaching	Teaching	Not teaching
N	6,089	1,068	204	2,842	202
Percent	59%	10%	2%	27%	2%
Total %	**59%**	**41%**			

The *Movers* can be further characterized in the following ways: 1) those who moved to a different Grade 6-8 middle school within our sample, 2) those who moved to some other type of NYC school, 3) those who remained teachers, and 4) those who assumed non-teaching roles (e.g., principals, assistant principals, librarians, guidance counselors, etc.).

Our analysis of middle school teachers' mobility patterns renders some sobering news for NYC's traditional Grade 6-8 middle schools: Among the *Movers*, 25% transitioned to another Grade 6-8 middle school.[12] An additional 5% of *Movers* transferred to another sample school but assumed non-teaching roles. By comparison, 66% of *Movers* transitioned to teaching assignments in a non-Grade 6-8 school (e.g., schools with typical elementary or high school grade configurations), and an additional 4% assumed non-teaching roles in non-Grade 6-8 schools. This finding lends some support to the common notion that middle school teachers may view their assignments as stepping-stones to positions in elementary or high schools.

We explore this hypothesis further by examining the types of schools that *Movers* entered when they transitioned to schools other than Grade 6-8 sample middle schools. A straightforward summary of *Movers'* transitions is complicated by the extraordinary diversity of grade configurations across the NYC public schools. Nonetheless, we attempt to identify the major mobility patterns across these various types of schools. As Table 3 depicts, the largest percentage of *Movers* (36%) transitioned to teaching assignments in high schools with typical grade 9-12 configurations. A similar percentage (34%) transferred to positions in schools with grade configurations that span the K-12 years, which cannot be easily characterized as elementary, middle, or high schools. However, the most prevalent school grade configurations within this heterogeneous grouping were K-8 and 6-12 schools, suggesting that a proportion of *Movers* may remain interested in teaching in schools that serve students in the middle grades. Twenty-seven percent of *Movers* transitioned to teaching assignments in elementary schools, and 4% to schools that served some, but not all, of the grades in the sixth-eighth range (e.g., Grade 7-8 schools, Grade 6-7 schools, or schools that enroll students in only one of the middle grades).

Table 3

The grade configurations of *Movers'* subsequent schools, among *Movers* who did not transition to other Grade 6-8 middle schools

School Type	Percentage	N
Elementary	27%	588
High	36%	800
Schools with alternative Grade 6-8 configurations	4%	82
Schools with grade configurations that span the K-12 Grades	34%	740
• K-8 schools	(14%)	(302)
• 6-12 schools	(16%)	(343)

Note: K-8 and 6-12 schools are subsets of the larger category of schools with grade configurations that span the K-12 range. Thus, together, these two subsets represent 645 of the 740 *Movers* in the larger category, or 30% of the 34% of *Movers* in the larger K-12 category.

Regardless of the configurations of *Movers'* subsequent schools, the majority of *Movers* remained within the same NYC borough. Among *Movers* who transitioned to schools other than Grade 6-8 middle schools, those leaving Staten Island middle schools were the most likely to transfer to schools within the same borough (69%), which does not seem particularly surprising given Staten Island's geographic isolation from the rest of the City. There were only slight differences in the within-borough retention rates among the other four boroughs: 63% for the Bronx, 62% for Queens, 61% for Manhattan, and 59% for Brooklyn. We explore the relationship between teacher turnover and NYC borough further in Part II when we examine the factors that predict middle school turnover.

Do Movers who transfer between Grade 6-8 middle schools find a better match in their second school?

Concern over the magnitude of turnover among middle school teachers might be mitigated if there were evidence that *Movers* who transfer within NYC middle schools find a better match in their second school. By securing a second assignment in a traditional Grade 6-8 middle school, these teachers are arguably the subgroup of *Movers* most committed to educating students in the middle grades. Were they to find in their second school an organization conducive to their preferences, it is conceivable that they would remain in this school for a substantial length of time.

We find that *Movers* between sample schools did remain in their second school for a longer period of time, but the difference between the lengths of their first and second "spells" in school was slight. In their initial spell in schools, more than half (55%) of middle school teachers left their schools within three years. By comparison, during their second spell, roughly half of middle school teachers (49%) left within the same length of time. Thus, while middle school teachers' median length of stay in their second school was marginally longer than in their first school (slightly over three years in their second school, as opposed to about two and one-half years in their first), this small difference, alone, does not seem to offer compelling evidence that *Movers* discover a better match in their second schools.

Do the characteristics of Stayers, Movers, and Leavers differ in any notable ways?

There were not many notable differences between the characteristics of *Stayers*, *Movers*, and *Leavers*. Greater percentages of middle school *Leavers* and *Stayers* were White, while *Movers* were more likely to be from minority racial/ethnic backgrounds. More specifically, middle school teachers from White backgrounds constituted 58% of the *Stayers*, 52% of the *Movers*, and 60% of the *Leavers*. The average age of teachers across the three categories did not differ much, either; however, a greater percentage of *Leavers* (54%) fell within the youngest age bracket—30-years-old or younger. *Movers* comprised roughly 46% of the same age category and *Stayers*, 37%. Consistent with other research on turnover (e.g., Luekens et al., 2004), we find that teachers in the middle age bracket, 30-55-year-olds, were the most likely to remain in schools. Teachers in the 30-55-year-old age range comprised 56% of the *Stayers*, 49% of the *Movers*, and 37% of the *Leavers*. Table C-4 in Appendix C presents a summary of the descriptive characteristics of *Stayers, Movers,* and *Leavers*.

Findings Part II: The Teachers Who Leave, the Schools They Leave Behind

As noted in the introduction of this report, much of the research on teacher turnover has investigated the relationship between turnover and teachers' background characteristics, such as their age, race, and gender. In addition, some investigations have examined the relationship between turnover and schools' organizational characteristics, such as school size and principal turnover. Both types of studies have added to our understanding of which types of teachers tend to leave schools, when in their careers they usually leave, and what types of schools they leave.

Research on the relationship between teacher characteristics and turnover can help identify particularly vulnerable subgroups of teachers—such as novice teachers or those entering the profession with emergency credentials—to whom additional supports can be targeted. Similarly, investigations of the relationship between turnover and schools' organizational characteristics can identify both struggling schools and schools that may serve as exemplars of strategies for retaining teachers. To the extent that either of these veins of research yields evidence that turnover is associated with malleable organizational factors—such as school size or the strength of school induction programs—findings can help policymakers and practitioners prioritize how and where to allocate resources in order to influence turnover.

To address the questions in this section of the report, we examine the relationship between middle school teacher turnover and the characteristics of teachers and schools, after controlling for four factors that might also influence turnover: 1) the school year during which a teacher first entered her NYC middle school; 2) whether a school experienced one or several episodes of principal turnover during the period of observation; 3) a time-varying measure of whether a school's student population was increasing or decreasing from one year to the next; and 4) a school's NYC borough location. We hypothesize that all of these factors, which we refer to as our *baseline covariates,* could play a substantial role in influencing turnover, and so our methodology controls for their effects in order to examine the relationships between turnover and the relevant teacher and school characteristics in our datasets.[13]

We subsequently investigate the relationships between turnover and both teacher and school characteristics. Because the primary objective of our larger study (which includes the survey and case study components) is to gain a better understanding of the causes and

consequences of turnover *at the school level*, we see the second half of Part II of this report—where we examine the relationships between turnover and school characteristics—as the more critical for forming theories that we expand and deepen with the subsequent survey and case study components of our larger study. However, because teachers' individual characteristics affect their decisions regarding mobility and attrition, it is critical that we examine these relationships first so that we can isolate the additional role that middle schools' organizational characteristics play in influencing turnover.

Analytic approach

We conduct three stages of statistical analyses to examine the relationship between NYC middle school teacher turnover and the characteristics of teachers and schools. In the first stage, we examine the relationship between turnover and the baseline covariates described above. In the second stage, we examine the relationship between turnover and the characteristics of teachers, controlling for the baseline covariates. In the third and final stage, we examine the relationship between turnover and the characteristics of schools, controlling for both the baseline covariates and the characteristics of teachers.

Each stage is further subdivided into two separate analytical steps. In the first analytical step, we examine the relationship between turnover and *each of the individual baseline, teacher or school characteristics*—such as a school's NYC borough location, a teacher's age or race, or the demographic characteristics of a school's student population. More specifically, we fit a series of "individual models" where we add and remove each individual characteristic separately to a model that contains the measures from the previous stage.[14] For instance, in the first analytical step in stage one, we fit a series of separate models that predicts the likelihood of teacher turnover for each of the baseline covariates described above.

In the second analytical step within each stage, we fit one "full model" that contains all of the characteristics from the relevant stage (i.e., all of the baseline covariates in the first stage; all of the teacher characteristics in the second stage; all of the school characteristics in the third stage), as well as all of the characteristics from the previous stage(s), and we examine the nature and strength of the relationship between turnover and each of the main effects for that stage. The accompanying Technical Documentation contains a more detailed explanation of our modeling procedures, measures, and statistical findings.

We generate turnover statistics from individual and full models for a variety of reasons. Examining the relationships between turnover and individual characteristics is useful for identifying observed patterns of turnover; in other words, patterns that describe how the actual percentage of teachers leaving their schools varies across different types of teachers, schools, or across other factors that might influence turnover (i.e., those that we identify as our baseline covariates).[15] The results from the individual models are useful for providing practitioners and policymakers with foundational descriptive information. For instance, school system administrators might want to know what percentage of math and science teachers leave their schools within three years. To get basic descriptive information about how the percentage teachers who leave their schools within three years varies across teachers of different subjects, the administrator could examine the individual relationship between turnover and teachers' subject area, controlling for other factors (i.e., the baseline covariates) that might influence turnover. For the sake of argument, this preliminary analytical step might yield evidence that a

much larger percentage of math and science teachers leave their schools within three years than do teachers of other subjects. This information may be useful, as it may help the system administrator identify a topic of potential concern.

However, there are many other factors beyond teachers' subject area that influence their decision about whether, and for how long, to remain in their schools. When characteristics—in this case, subject area, age, gender, and experience—are correlated with one-another, examining the relationship between turnover and any one measure will mask the role that the other measures play in influencing rates of turnover. Thus, if the system administrator wants to form additional hypotheses about why math and science teachers leave their schools at higher rates than their non math/science colleagues, the administrator must consult the results of a "full model" that attempts to control for these other factors. Upon doing so, the administrator may discover for instance, that much of the observed turnover among math and science teachers appears to be due to a large percentage of math/science teachers being young, inexperienced male teachers who do not posses formal licensing credentials. When these related factors are controlled for in the analysis, math and science teachers do not appear more likely to leave their schools than teachers of other subjects.

Readers will inevitably want to know whether the size of the differences that we identify are of some practical importance to NYC middle schools or to the city's public school system overall. To a certain extent, this decision is subjective; what strikes one reader as a sizable difference may strike another reader as inconsequential. Because there is so much we do not know about the teachers who are entering, transferring between, and exiting NYC middle schools—and the extent to which, if at all, their mobility and attrition is detrimental to schools—we refrain from offering definitive judgments about the practical significance of the differences we identify in this report. However, to help readers form their own opinions in this regard, Table 4 presents information about the distribution and standard deviations of our turnover statistics.

Table 4
Rates of turnover in prototypical low (25th percentile), median (50th percentile), and high (75th percentile) turnover NYC Grade 6-8 middle schools
(including means and standard deviations of outcome metrics)

Turnover statistic	Mean	Standard deviation	Prototypical low turnover school (25th Percentile)	Prototypical median turnover school (50th Percentile)	Prototypical high turnover school (75th Percentile)
% left within 1 year	27%	9%	20%	26%	32%
% left within 3 years	55%	14%	43%	55%	66%
% left within 5 years	67%	15%	56%	68%	78%

SOURCE: To generate univariate information about our turnover statistics, we fit separate discrete-time survival analyses for each NYC middle school. These analyses predicted the likelihood of turnover using a time-only model. We then examined the means and standard deviations across schools of the percentages of teachers who left their schools within one, three, and five years.

The narrow range of the distributions in the turnover statistics reported in Table 4 suggests that seemingly small differences in turnover rates (e.g., five percentage points, which is approximately one-third of the standard deviation, across schools, in the percentage of new-to-school teachers who leave their schools within three years) between types of teachers or schools represent somewhat notable differences, especially when abstracted to the school, district, or

system-wide level. In other words, since there is little variation across schools in the average percentage of teachers who leave after one, three, and five years, small differences between types of teachers may be notable.

Given the number of the middle schools and middle school teachers in NYC, the majority of the differences that we identify in this section of the report are likely to be statistically significant. For this reason, we do not conduct or report extensive statistical tests of difference of the various categories within each teacher or school measure. Rather, we examine whether the relationship between turnover and a particular characteristic—teachers' age, for example—is statistically significant; we do not investigate whether differences in the rates of turnover across teachers in each of the age categories (30-years-old or younger; between age 30 and 55; older than 55) are statistically different from one another. Readers should be mindful of these decisions when interpreting tables and figures that report differences between the categories within individual teacher or school characteristics. The companion Technical Documentation contains additional information about our statistical analyses.[16]

Lastly, we should acknowledge that, while this analysis reveals some interesting descriptive relationships between turnover and a number of teacher and school characteristics, it is a foundational study. There are many additional teacher and school characteristics, such as measures of teachers' instructional effectiveness or teachers' assessments of various aspects of their schools' operational functioning, that are likely to be related to turnover but which we did not have in our datasets. We discuss how we intend to extend this analysis in the concluding implications section of the report.

Stage 1: Examining the relationship between NYC middle school teacher turnover and baseline covariates

There are a number of other factors that we hypothesized might influence NYC middle school teacher turnover. In this first analytical stage, we examine the relationship between turnover and our four baseline covariates: teachers' new-to-school cohort year, principal turnover, the annual change in a school's student enrollment, and schools' NYC borough locations. We first fit a series of models that examines the individual relationship between turnover and each of these characteristics separately. Subsequently, we fit one full model and examine the relationship between turnover and each covariate while controlling for all of the other baseline covariates.

Individual models

Table 5 presents the findings from our analyses of the individual models that include only the baseline covariates. As the table illustrates, there was a statistically significant relationship between turnover and each of the baseline covariates.[17]As we hypothesized, schools with declining student enrollment patterns were associated with higher levels of turnover than schools where enrollment was stable. For instance, schools that shrank by approximately 100 students per year lost roughly 58% of their new-to-school teachers within three years of those teachers having first entered the schools.[18] By comparison, schools with no average change in student enrollment lost 54% of their new-to-school teachers during the same length of time.[19] The directionality of the relationship between teacher and principal turnover also confirmed our preliminary hypothesis, though the magnitude of the relationship was smaller than we expected.

In schools where principals left, approximately 58% of teachers left their schools within three years of having first begun in those schools. Schools with stable leadership lost, on average, 54% of new-to-school teachers over the same period of time.

Table 5
The results of individual models that examine the relationship between
NYC middle school teacher turnover and the individual baseline covariates,
among teachers who were new to their schools between 2002 and 2009

		% leaving within			Statistical
		1 YR	**3 YRS**	**5 YRS**	**Significance**
Teachers' entering cohort year[20]	2002	29.2	58.0	68.9	
	2003	30.0	59.1	70.0	
	2004	28.2	56.4	67.2	
	2005	27.5	55.2	66.1	***
	2006	27.2	54.8	.	
	2007	25.6	52.3	.	
	2008	22.0	.	.	
	2009	23.7	.	.	
Annual change in schools' enrollment	-99	29.3	57.9	69.0	
	-45	28.0	56.0	67.0	***
	0	27.0	54.3	65.4	
Schools' NYC borough	Manhattan	33.0	64.4	76.1	
	Brooklyn	25.5	53.0	64.7	
	Bronx	31.3	62.0	73.7	***
	Queens	23.4	49.4	60.8	
	Staten Island	15.5	34.8	44.3	
Principal turnover	Yes	29.1	58.3	69.8	***
	No	26.6	54.4	65.7	

Source: Discrete time survival analyses that model the probability of teacher turnover for each of the individual baseline covariates separately.
Notes: Statistical significance key: ~ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
Prototypical schools with annual changes in enrollment of -99, -45, and 0 represent schools at the 10th, 25th, and 50th percentiles, respectively, of the distribution of this measure.

In addition to these somewhat predictable findings, our preliminary analyses also yielded findings that warrant further exploration, such as the rates of turnover across the NYC boroughs. Quite likely, schools' borough location indicator is a proxy for some unmeasured characteristic of schools or teachers, such as the proximity of teachers' residence to their schools, so we must be cautious about interpreting these descriptive patterns. The average decline in turnover across the teacher cohort years—which represents a statistically significant, negative linear trend—compels us to want to learn more about whether this trend reflects changes in the characteristics of the teacher cohorts, changes in teachers' impression of their schools or of teaching in the NYC school system; some factor that is external to schools, such as the strength of the local job market; or some combination of all of these possibilities.

Full model

In this second analytical step, we examined the relationship between turnover and each of the baseline covariates, while simultaneously controlling for all of the other covariates. Table 6 combines the results from our first analytical step (where we fit a series of individual models) with the results from our analysis of a full model. As the table reveals, all of the covariates remained statistically significant predictors of turnover in the full model, suggesting that, in general, they are unique measures that each contributes information that helps predict the likelihood of teacher turnover. Readers who compare the results from the individual and full models will notice few noticeable differences. The one exception to this overall observation is principal turnover. While this measure remains a statistically significant predictor of turnover in the full model, the smaller difference in teacher turnover between schools that did and did not experience principal turnover suggests that this measure may not remain a critical baseline covariate as additional measures of schools' organizational characteristics are added to the model in the third stage of the analysis.

Stage 2: Examining the relationship between NYC middle school teacher turnover and teachers' characteristics

Consistent with previous research, we examine the extent to which middle school teachers' age, race, level of experience, degree credentials, and subject area (specifically, whether teachers taught math or science subjects) are associated with turnover. While a number of these characteristics, namely age and experience, have been studied extensively in the past (e.g., Grissmer & Kirby, 1993, 1997; Murnane, Singer, Willett, Kemple, & Olsen, 1991), the limited research on turnover among middle school teachers warrants their inclusion here. Less is known about how some of the other teacher characteristics that we investigate, such as subject area, affect turnover *at the middle school level*. With this particular example, many middle school teachers are, like elementary school teachers, "common branch" teachers (i.e., teach multiple subject areas) and, thus, it may be less common to examine the relationship between middle school teachers' subject area and any particular outcome of interest.

Individual models

We first examine the relationship between turnover and each of the teacher characteristics and find that there is a statistically significant relationship between each of the teacher characteristics and turnover, controlling for the aforementioned baseline covariates. Table 7 depicts our findings. In general, these findings highlight typical patterns identified in the literature (e.g., summarized in Johnson, Berg, & Donaldson, 2005). For instance, the youngest and oldest teachers tend to leave their schools at the highest rates—a pattern that we see in our data on NYC middle school teachers. Middle school teachers who are either over the age of 55 or who are 30-years-old or younger are more likely to leave their schools within one year than are teachers between the ages of 30 and 55 (29%, 28% and 23%, respectively). Similarly, within three years, the percentages of teachers leaving their schools among the oldest and youngest subgroups of teachers (59% and 57% respectively) are higher than for the teachers aged 30 to 55, 49% of whom leave their schools within three years.

Table 6

The results of individual and full models that examine the relationship between
NYC middle school teacher turnover and baseline covariates
among teachers who were new to their schools between 2002 and 2009

| | | Individual Models | | | | Full Model | | | |
| | | % leaving within | | | Statistical | % leaving within | | | Statistical |
		1 YR	3 YRS	5 YRS	Significance	1 YR	3 YRS	5 YRS	Significance
Teachers'	2002	29.2	58.0	68.9		29.3	57.8	68.7	
entering cohort	2003	30.0	59.1	70.0		30.0	58.8	69.8	
year	2004	28.2	56.4	67.2		28.2	56.2	67.1	
	2005	27.5	55.2	66.1	***	27.0	54.3	65.1	***
	2006	27.2	54.8	.		26.5	53.4	.	
	2007	25.6	52.3	.		24.3	49.9	.	
	2008	22.0	.	.		21.3	.	.	
	2009	23.7	.	.		22.9	.	.	
Annual change	-99	29.3	57.9	69.0		29.0	57.4	68.3	
in schools'	-45	28.0	56.0	67.0	***	27.8	55.5	66.3	***
enrollment	0	27.0	54.3	65.4		26.8	53.9	64.7	
	Manhattan	33.0	64.4	76.1		34.9	65.8	76.6	
Schools' NYC	Brooklyn	25.5	53.0	64.7		26.6	53.6	64.4	
borough	Bronx	31.3	62.0	73.7	***	32.6	62.6	73.5	***
	Queens	23.4	49.4	60.8		24.0	49.4	59.9	
	Staten Island	15.5	34.8	44.3		16.2	35.2	44.0	
Principal	Yes	29.1	58.3	69.8	***	28.6	56.7	67.6	*
turnover	No	26.6	54.4	65.7		27.1	54.3	65.1	

Source: Discrete time survival analyses that model the probability of teacher turnover for each of the individual baseline covariates separately, as well as a full model that controls for all of the covariates simultaneously.

Notes: Statistical significance key: ~ p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001
Prototypical schools with annual changes in enrollment of -99, -45, and 0 represent schools at the 10th, 25th, and 50th percentiles, respectively, of the distribution of this measure. The distribution of this measure is not normal, so we do not report turnover statistics for prototypical schools at the 75th and 90th percentile of the distribution.

Table 7
The results of individual models that examine the relationship between
NYC middle school teacher turnover and teachers' characteristics
among teachers who were new to their schools between 2002 and 2009

		% leaving within			Statistical
		1 YR	**3 YRS**	**5 YRS**	**Significance**
Gender	Female	26.3	53.5	64.7	***
	Male	27.8	55.9	67.1	
Ethnicity	White	27.6	55.4	66.4	***
	Black	26.4	53.4	64.4	
	Hispanic	24.6	50.5	61.3	
	Other	28.6	57.0	68.1	
Years experience in NYC schools	< 3 years	28.8	57.5	69.0	***
	> 3-6 years	24.7	51.1	62.2	
	> 6-9 years	22.9	47.9	58.8	
	> 9 years	22.8	47.8	58.7	
Degree	B.A.	26.7	54.9	66.7	***
	M.A. or credit equiv.	23.4	50.2	61.7	
	M.A. and 30 additional credits	24.8	51.8	63.5	
	Other	36.3	68.9	80.2	
Age	< 30	27.8	57.1	69.5	***
	>30-55	22.7	48.7	60.7	
	>55	28.7	58.5	71.0	
Subject area	Math or science teacher	29.7	58.5	69.4	***
	Non-math/science teacher	26.6	53.6	64.5	

Source: Discrete time survival analyses that model the probability of teacher turnover for each of the individual
teacher characteristics separately, controlling for baseline covariates.
Notes: Statistical significance key: ~ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

To investigate the relationship between turnover and teachers' degree credentials, we employed the measure of degree attainment that the DOE uses to identify teachers at different steps on the salary scale: 1) those with Bachelors' degrees and, in some instances, additional credits; 2) those with Masters' degrees or the credit equivalent; 3) those with Masters' degrees and additional credits; and 4) teachers who do not fit into any of these categories. The third category is the highest degree-related step recognized on the DOE's salary schedule.

We find that, of the three most prominent degree categories, teachers in the lowest degree level were associated with the highest rates of turnover. As Table 7 reveals, within three years of having first begun teaching in schools, 55% of teachers with only Bachelors' degrees had left their schools, as compared with 52% of teachers in the highest degree-level category and 50% of teachers in the middle degree-level category. The most notable differences in turnover on this measure are related to teachers in the "other" degree-level category (36% of whom left their schools within three years), which represented about 5% of our analytical dataset. At the present time, we have very little information about who these teachers are and what types of positions they hold in schools—two topics which researchers should investigate in the future.

We also examined the relationship between turnover and middle school teachers' gender, race, and subject area. Table 7 shows that there was a statistically significant relationship between turnover and each of these individual characteristics. In subsequent analyses, we explore the relationship between teacher turnover and the match between teachers' and students' race.

In the larger body of literature on teacher turnover, there is some evidence that rates of turnover are higher among teachers whose subject areas are in greater demand in fields other than teaching, such as in math- and science-related professions (Kirby, Berends, & Naftel, 1999; Murnane et al., 1991). We were curious to see whether this same pattern was evident among NYC middle school teachers, whose assignments are typically less subject-specific.

We found that math and science middle school teachers did leave their schools at higher rates than their non math/science colleagues. Within one year of having begun teaching in their schools, 30% of math and science teachers had left their schools, as compared with 27% of non math/science teachers. Within three years, 59% of math and science teachers were no longer in their schools, as compared with 54% of their colleagues who taught other subjects. Within five years of having begun teaching in their schools, 69% of math and science teachers and 65% of non math/science teachers were no longer in their schools.

Full model

All of the teacher characteristics remained highly statistically significant predictors of turnover after simultaneously controlling for all of the teacher characteristics and baseline covariates. Thus, each of these characteristics tells us something important about teachers that is related to their decision about whether to remain in their schools. Table 8 depicts both the results from the individual and full models for this second analytical stage.

Readers will note that the patterns depicted across the individual and full models in Table 8 are similar, although there are a few subtle differences. For instance, when teachers' age, years of experience, and degree-level are simultaneously included in our model, the relationship between turnover and each of these characteristics changes slightly. After controlling for age and years of experience in NYC schools, we predict that teachers with the highest degree credentials would be more likely to leave their schools than teachers who possess only a B.A. More specifically, an estimated 55% of middle school teachers in the highest degree category left their schools within three years, as compared with 51% of teachers with a B.A. By contrast, when we examined the relationship between turnover and degree credentials alone, teachers with only a B.A. left their schools in greater percentages (55%) than teachers with the highest degree credentials (52%). These changes may indicate that these measures are related to each other.

Similarly, when examining the individual relationship between turnover and whether teachers taught math or science, we observed that 59% of math and science teachers left their schools within three years, as compared with 54% of non-math and science teachers. However, after simultaneously controlling for other measures of teachers' background characteristics, such as teachers' gender, the relationship between turnover and subject area becomes less pronounced (i.e., a 2 percentage point difference within the same timeframe rather than a 5 percentage point difference). The most salient conclusion that we draw from these analyses, however, is that all of the teacher characteristic measures are important predictors of middle school teacher turnover. Thus, in the following section of the report, we control for all these characteristics, in addition to our baseline covariates, when investigating the relationship between turnover and the characteristics of middle schools.

Table 8
The results of individual and full models that examine the relationship between
NYC middle school teacher turnover and teachers' characteristics,
among teachers who were new to their schools between 2002 and 2009

		Individual Models				Full Model			
		% leaving within			Statistical Significance	% leaving within			Statistical Significance
		1 YR	3 YRS	5 YRS		1 YR	3 YRS	5 YRS	
Gender	Female	26.3	53.5	64.7	***	23.5	51.3	64.5	***
	Male	27.8	55.9	67.1		24.7	53.4	66.7	
Ethnicity	White	27.6	55.4	66.4	***	24.2	52.5	65.7	**
	Black	26.4	53.4	64.4		23.9	52.0	65.2	
	Hispanic	24.6	50.5	61.3		21.9	48.4	61.4	
	Other	28.6	57.0	68.1		25.1	54.0	67.3	
Years experience in NYC schools	< 3 years	28.8	57.5	69.0	***	25.9	55.3	68.7	***
	> 3-6 years	24.7	51.1	62.2		22.9	50.3	63.4	
	> 6-9 years	22.9	47.9	58.8		21.3	47.4	60.2	
	> 9 years	22.8	47.8	58.7		19.5	44.1	56.5	
Degree	B.A.	26.7	54.9	66.7	***	23.2	50.7	63.8	***
	M.A. or credit equiv.	23.4	50.2	61.7		22.8	50.0	63.1	
	M.A. and 30 additional credits	24.8	51.8	63.5		25.8	55.2	68.5	
	Other	36.3	68.9	80.2		31.7	64.3	77.5	
Age	< 30	27.8	57.1	69.5	***	25.1	53.9	67.2	***
	>30-55	22.7	48.7	60.7		22.2	49.0	61.9	
	>55	28.7	58.5	71.0		29.4	60.8	74.2	
Subject area	Math or science teacher	29.7	58.5	69.4	***	25.1	54.0	67.3	**
	Non-math/science teacher	26.6	53.6	64.5		23.6	51.5	64.6	

Source: Discrete time survival analyses that model the probability of teacher turnover for each of the individual teacher characteristics separately, controlling for baseline covariates, as well as a survival analysis of a full model that examines the relationship between turnover and teachers' characteristics, controlling for all of the teacher characteristics and baseline covariates.

Notes: Statistical significance key: ~ p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

Stage 3: Examining the relationship between NYC middle school teacher turnover and schools' characteristics

Information about the school characteristics that influence turnover can help administrators and school leadership teams identify strategies for managing turnover that fit with their organizational goals and realities. To form preliminary hypotheses along these lines, we examined the relationship between turnover and the following organizational characteristics of schools: size (number of students enrolled), the demographics of the student population (race/ethnicity and level of poverty), per pupil expenditures, student performance on NY's standardized mathematics exam,[21] and various measures of schools' environment and operational functioning, including schools' Quality Review scores and their environment scores from the NYC Department of Education's (DOE) *School Survey*.[22] Following research by CCSR (2009) and others (e.g., Dee, 2005; NCTAF, 2007), we also examine the relationship between turnover and the match between teachers' and students' racial/ethnic backgrounds.

Individual models

As with our analyses of the relationships between turnover and school characteristics, we first examined how the percentage of teachers who left their schools within one, three, and five years differed across each individual school characteristic, controlling for all of the teacher characteristics and baseline covariates. As Table 9 depicts, as individual characteristics, each of the school characteristics was strongly related to middle school turnover. Again, readers should be mindful that Table 9 depicts the associations between middle school teacher turnover and each individual school characteristic, when each school characteristics is individually added to a model containing the baseline covariates and the teacher characteristics discussed above.

Table 9 reveals a number of interesting patterns regarding turnover. For instance, echoing recent research on teacher turnover in Chicago Public Schools (CCSR, 2009), we found that rates of turnover were higher in smaller schools. As Table 9 reveals, the percentage of teachers who remained in their schools after various lengths of time was associated with the size of their school. For example, within three years, 56% of middle school teachers had left small middle schools (schools at the 25th percentile of the school size distribution enrolled, on average, 692 students), whereas 49% of teachers had left large middle schools (schools at the 75th percentile of the school size distribution enrolled, an average, 1,383 students). Average-sized middle schools (i.e., schools at the 50th percentile of the school size distribution enrolled, an average, 1,122 students), lost 51% of their new-to-school teachers within three years. We identified similar patterns in turnover after 1 and five years.

Like researchers in Chicago, we wonder whether these findings may be the result of small schools placing greater demands on fewer staff or small schools being newer and, thus, more chaotic places to work. In addition, Chicago researchers point out that "conflict in small schools may be more acute" (p. 20, CCSR, 2009) and that small schools may face greater staffing uncertainty from one year to the next. It may also be the case that small schools are better able to gain accurate assessments of teachers' instructional capabilities and, thus, may find it easier to counsel out less effective teachers. If this were the case, the higher rates of turnover in small schools could be indicative of functional, if atypical, organizational characteristic. Another potential explanation is that teachers may be less able to transition across subjects or grades within small schools in order to find a better teaching assignment match.[23]

Table 9

The results of individual models that examine the relationship between
NYC middle school teacher turnover and schools' characteristics,
among teachers who were new to their schools between 2002 and 2009

		% leaving within			Statistical significance
		1 YR	**3 YRS**	**5 YRS**	
School size[a]	692 (25th percentile)	26.1	55.6	68.9	
	1,122 (50th percentile)	23.6	51.3	64.4	***
	1,383 (75th percentile)	22.1	48.7	61.7	
Quality review score (2008)	Underdeveloped	30.7	62.9	76.2	
	Underdeveloped w/ Proficient features	29.3	60.8	74.2	***
	Proficient	25.6	55.0	68.4	
	Well Developed	22.3	49.3	62.3	
Peer index[b]	2.88 (25th percentile)	27.3	58.1	71.8	
	3.08 (50th percentile)	24.1	52.9	66.5	***
	3.33 (75th percentile)	20.6	46.6	59.8	
% students in poverty[c]	59 (25th percentile)	22.7	50.0	63.2	
	71 (50th percentile)	24.1	52.4	65.8	***
	83 (75th percentile)	25.6	54.9	68.3	
Per pupil expenditures[a] **(dollars)**	10,971 (25th percentile)	22.9	49.1	60.9	
	14,018 (50th percentile)	25.1	52.9	64.8	***
	16,709 (75th percentile)	27.1	56.2	68.3	
% proficient on NY math exam[a]	30 (25th percentile)	25.3	57.4	73.3	
	49 (50th percentile)	21.2	50.1	65.8	***
	69 (75th percentile)	17.4	42.8	57.7	
Weighted school environment score from *School Survey*[c]	8.1 (25th percentile)	23.6	51.5	64.7	
	9.4 (50th percentile)	22.5	49.7	62.8	***
	11 (75th percentile)	21.2	47.4	60.3	
Interaction between teachers' race and percentage of schools' student body that is White	(White teacher; high % White students)	18.6	42.8	55.3	
	(White teacher; not a high % White students)	27.1	57.6	71.3	
	(Black teacher; high % White students)	22.5	49.9	63.2	
	(Black teacher; not a high % White students)	24.1	52.7	66.2	***
	(Hispanic teacher; high % White students)	22.1	49.3	62.5	
	(Hispanic teacher; not a high % White students)	22.0	49.0	62.3	
	(Other race teacher; high % White students)	20.4	46.2	59.2	
	(Other race teacher; not a high % White students)	26.6	56.8	70.5	

Source: Discrete time survival analyses that model the probability of teacher turnover for each of the individual school characteristics separately, controlling for teachers' characteristics and baseline covariates.

Notes: Statistical significance key: ~ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

a: The categories reported for the measures of school size, per pupil expenditures, and the percentage of a school's students who are proficient on the NY math exam represent prototypical schools at the 25th, 50th, and 75th percentiles in the distribution of each measure across all of the years in the person, spell, period dataset (2002-09).

b: Lower values on the peer index measure indicate lower-performing schools. The categories reported for this measure represent prototypical schools at the 25th, 50th, and 75th percentiles in the distribution of this measure in 2008.

c: The categories reported for this measure represent prototypical schools at the 25th, 50th, and 75th percentiles in the distribution of this measure in 2008.

Whatever the case, the fact that two recent studies of teacher turnover in large urban public school systems—and across elementary, middle and high schools—have noted the same

relationship between school size and teacher turnover should give policymakers and education reforms pause. This finding warrants further inquiry.

Many of the other patterns depicted in Table 9 are consistent with previous research on turnover. For instance, high rates of teacher turnover tend to be associated with schools where student performance is lower (Goldhaber, Gross, & Player, 2009; Hanushek, Kain, & Rivkin, 2004; Loeb & Reininger, 2004; Watson, 2001)—a finding reflected in this descriptive analysis of NYC middle school teacher turnover.

Full model

To further explore the associations between turnover and the characteristics of middle schools, we examined whether and how the nature and strength of the relationship between turnover and school characteristics changed when we simultaneously added them to a full model that controlled for our baseline covariates and characteristics of teachers.

As Table 10 reveals, the relationship between turnover and a number of our school characteristics—such as school size or student performance on NY mathematics exams—are similar regardless of whether they are generated from individual or full models. However, some school characteristics, such as schools' quality review ratings and per pupil expenditures, appear to have either weak relationships with turnover or relationships that differ in nature from the relationships identified in individual models. Indeed, when added to a full model, neither schools' quality review ratings nor schools' per pupil expenditures remained a statistically significant predictor of middle school teacher turnover. Lastly, the nature of the associations between turnover and several of the school characteristics—such as the percentage of students in poverty and the interaction between teachers' and students' race—change slightly, warranting a different interpretation than the relationships from the individual models described above.

The nature of the relationship between turnover and the interaction of teachers' race and whether their schools' student population was comprised of a high percentage of White students is, perhaps, the most notable difference between the individual and full models. For instance, if examining the individual relationship between turnover and this interaction measure, we would observe that larger percentages of White and Black teachers, as well as teachers from "Other" racial/ethnic backgrounds, leave schools that do not have a high percentage of White students. More specifically, within three years after having first begun teaching, 53% of Black teachers have left schools that do not have high percentages of White students, as compared with 50% of Black teachers working in schools that do have high percentages of White students.

By contrast, when we fit a full model that controls for other measures—such as students' poverty level and performance, and measures of the school environment—we predict that a greater percentage of Black and Hispanic teachers, and teachers from "Other" racial/ethnic backgrounds, leave schools with high percentages of White students. More specifically, the full model predicts that 53% of Black teachers would leave schools with a high percentage of White students within three years and that 47% of Black teachers would leave schools that did not have a high percentage of White students within the same time period.

The changing nature of this relationship is likely due to correlations between measures in our model—such as between students' race, performance on standardized tests, and/or the percentage of a school's students living in poverty—that affect teachers' decisions about whether to remain in their schools or in the NYC public school system.

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Table 10
The results of individual and full models that examine the relationship between
NYC middle school teacher turnover and schools' characteristics,
among teachers who were new to their schools between 2002 and 2009

		Individual Models				Full Model			
		% leaving within			Statistical Significance	% leaving within			Statistical Significance
		1 YR	3 YRS	5 YRS		1YR	3YRS	5YRS	
School size[a]	692 (25th percentile)	26.1	55.6	68.9		24.5	54.7	69.7	
	1,122 (50th percentile)	23.6	51.3	64.4	***	22.1	50.6	65.4	***
	1,383 (75th percentile)	22.1	48.7	61.7		20.8	48.1	62.8	
Quality review score (2008)	Underdeveloped	30.7	62.9	76.2		22.1	50.5	65.3	
	Underdeveloped w/ Proficient features	29.3	60.8	74.2	***	23.3	52.8	67.7	0.3544
	Proficient	25.6	55.0	68.4		22.6	51.5	66.3	
	Well Developed	22.3	49.3	62.3		22.2	50.7	65.5	
Peer index[b]	2.88 (25th percentile)	27.3	58.1	71.8		24.6	55.1	70.0	
	3.08 (50th percentile)	24.1	52.9	66.5	***	22.9	52.0	66.9	***
	3.33 (75th percentile)	20.6	46.6	59.8		20.8	48.2	62.8	
% students in poverty[c]	59 (25th percentile)	22.7	50.0	63.2		22.8	51.9	66.8	
	71 (50th percentile)	24.1	52.4	65.8	***	22.2	50.8	65.6	**
	83 (75th percentile)	25.6	54.9	68.3		21.6	49.6	64.4	
Per pupil expenditures[a] **(dollars)**	10,97 (25th percentile)	22.9	49.1	60.9		23.0	52.1	67.0	
	14,018 (50th percentile)	25.1	52.9	64.8	***	22.4	51.1	66.0	~
	16,709 (75th percentile)	27.1	56.2	68.3		21.9	50.2	65.0	
% proficient on NY math exam[a]	30 (25th percentile)	25.3	57.4	73.3		23.9	53.8	68.8	
	49 (50th percentile)	21.2	50.1	65.8	***	22.5	51.2	66.1	***
	69 (75th percentile)	17.4	42.8	57.7		21.0	48.6	63.2	

Table 10 is continued on the next page…

Table 10, *continued from previous page…*

Weighted school environment score from *School Survey*[c]	8.1 (25th percentile)	23.6	51.5	64.7		22.2	50.7	65.5	
	9.4 (50th percentile)	22.5	49.7	62.8	***	21.2	49.0	63.7	***
	11 (75th percentile)	21.2	47.4	60.3		20.1	46.9	61.4	
Interaction between teachers' race and the percentage of schools' student body that is White	(White teacher; high % White students)	18.6	42.8	55.3		20.1	46.8	61.3	
	(White teacher; Not a high % White students)	27.1	57.6	71.3		24.7	55.1	70.1	
	(Black teacher ; high % White students)	22.5	49.9	63.2		23.6	53.2	68.2	
	(Black teacher; Not a high % White students)	24.1	52.7	66.2	***	20.0	46.8	61.3	***
	(Hispanic teacher; high % White students)	22.1	49.3	62.5		23.5	53.0	68.0	
	(Hispanic teacher; Not a high % White students)	22.0	49.0	62.3		19.3	45.5	59.8	
	(Other race teacher; high % White students)	20.4	46.2	59.2		21.7	49.8	64.6	
	(Other race teacher; Not a high % White students)	26.6	56.8	70.5		23.8	53.5	68.5	

Source: Discrete time survival analyses that model the probability of teacher turnover for each of the individual school characteristics separately, controlling for teacher characteristics and baseline covariates, as well as a survival analysis of a full model that examines the relationship between turnover and schools' characteristics, controlling for all of the school and teacher characteristics and baseline covariates.

Notes: Statistical significance key: ~ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

a: The categories reported for the measures of school size, per pupil expenditures, and the percentage of a school's students who are proficient on the NY math exam represent prototypical schools at the 25th, 50th, and 75th percentiles in the distribution of each measure across all of the years in the person, spell, period dataset (2002-09).

b: Lower values on the peer index measure indicate lower-performing schools. The categories reported for this measure represent prototypical schools at the 25th, 50th, and 75th percentiles in the distribution of this measure in 2008.

c: The categories reported for this measure represent prototypical schools at the 25th, 50th, and 75th percentiles in the distribution of this measure in 2008.

When we simultaneously control for all the measures in our analysis and examine the main effect of the interaction between teachers' and students' race, higher levels of turnover are associated with circumstances where teachers' do not share the same racial/ethnic characteristics as a substantial percentage of students in their schools. There are quite likely additional associations between variables included in this analysis, such as between teachers' race and gender, that might also influence affect turnover and, thus, how we interpret the relationships depicted here.

What are the characteristics of the middle schools with low, medium and high predicted levels of teacher turnover?

For readers looking for an alternative way to interpret the statistics and tables presented above, we offer another approach for understanding some of the key findings from our analyses of turnover. Here, we describe the characteristics of schools with different predicted levels of teacher turnover. We derive these predicted levels of teacher turnover from a model that controls for our baseline covariates and for the various characteristics of teachers in our dataset. As Table 11 indicates, schools where we would predict that a very small percentage (2%) of teachers would leave within three years tended to be schools where a large percentage of students (74%) scored well on the state's standardized math assessment, an average of 21% of students were White, approximately 60% of students were from high poverty backgrounds, and slightly more than half (54%) of the teachers had five or more years of experience.

By contrast, schools with medium levels of predicted teacher turnover—in other words, schools where we would estimate that an average of 30% of teachers would leave within three years—had fewer students scoring at the Proficient or higher level on the state math assessment (65%), had significantly larger percentages of students from minority racial/ethnic backgrounds, higher percentages of English Language Learners and special education students, and fewer teachers (50%) with five or more years of experience.

These same patterns were even more pronounced in schools where we would predict high levels of teacher turnover. Schools where we would predict that an average of 72% of teachers would leave within three years had smaller percentage of students scoring at the Proficient or higher level on the state math assessment (53%) and a high percentage of students (95%) from minority racial/ethnic and high poverty (75%) backgrounds. In these schools, an average of 15% of students were English Language Learners, and 17% were identified as receiving special education-related services.

Table 11

The characteristics of NYC middle schools

with low, medium, and high predicted percentages of teacher turnover within three years

(n=196)

School Characteristics	Low Turnover Schools (n=50)	Medium Turnover Schools (n=97)	High Turnover Schools (n=49)
Average School Characteristics			
Predicted % of teachers leaving within one year	2%	30%	72%
School size (number of students enrolled)	680	811	394
Per pupil expenditures	$16,648	$17,909	$18,467
Peer Index score	3.28	3.13	2.98
School Environment score (weighted)	9.29	8.26	7.41
% of students Proficient or higher on NY math exam	74%	65%	53%
Percentage of students with various background characteristics			
White	21%	10%	5%
Black	30%	33%	38%
Hispanic	36%	41%	51%
Other racial/ethnic background	13%	16%	6%
Female	49%	52%	52%
% of students from high poverty backgrounds	59%	69%	75%
% of students who are English Language Learners	9%	13%	15%
% of students with special education needs	13%	16%	17%
Teacher Characteristics			
% of teachers with more than two years of experience	65%	61%	47%
% of teachers with more than five years of experience	54%	50%	40%

Source: Discrete time survival analysis that predicts the probability of teacher turnover from the Stage 2 full model, which contains the discrete time period measures, all of the baseline covariates, and all of the teacher characteristics described in the discussion of the Stage 2 analysis in Part II of this report.

Discussion and Implications

Descriptive studies typically raise as many, or more, questions as they answer, and this adage seems true in this instance. This study helps establish important, foundational information about who middle school teachers are and how their rates of turnover compare with those of other groups of teachers within NYC. Before drawing firm conclusions or enacting policies intended to influence turnover, the education community needs more research that quantifies the effects of turnover and points to a clear set of policies and practices that would increase the retention of effective teachers across middle schools. This study raises important questions that can guide these subsequent efforts, and our findings have a number of notable implications for policymakers, researchers, and practitioners working to improve NYC middle schools. In this concluding section, we explore these questions and outline how the two remaining components of our larger study will extend the findings that we present here and contribute to our understanding of middle school teacher turnover.

Discussion for policymakers and practitioners

While researchers have identified and estimated numerous turnover-related costs (e.g., Milanowski & Odden, 2007; NCTAF, 2007), it remains difficult to quantify how varying rates of turnover affect important educational outcomes, such as growth in student learning or students' social/emotional development. However, policymakers and administrators in the NYC school system may be concerned by both the rates and patterns of middle school teacher turnover that we identify in this report. Certainly, some amount of turnover is healthy for organizations, especially if it means that schools are making informed, selective decisions about which teachers would be most effective in their particular contexts. However, that the rates of turnover that we describe here likely pose costs to schools, even if a proportion of the turnover presents some opportunities for schools. For instance, with 55% of new-to-school middle school teachers leaving their schools within three years, principals and school hiring committees will have to devote time to posting vacancies, screening applications, and interviewing new candidates rather—time principals might have otherwise spent strengthening their schools' instructional core. To support new hires, schools will have to spend time and resources—already scarce commodities in schools—to support novice teachers and to introduce new and new-to-school teachers to school and system-wide practices.

In addition, the rates of turnover that we describe here suggest that attempts to build momentum and coherence on school-wide initiatives may be challenging. New teachers will have to accommodate themselves quickly to students with whom they have no previous familiarity. And students will be asked to accommodate teachers who are new to their schools at the time when, developmentally and academically, students might benefit from consistency and predictability. We are not aware of any studies that explore the extent to which turnover influences the relationships between schools and community organizations, but it also seems plausible that high rates of turnover might weaken ties between teachers and local community organizations and thus, possibly, weaken the relationships between schools and their communities in general.

Beyond the numbers pertaining to turnover, policymakers and practitioners alike may also take note of the patterns that we describe related to middle school teachers' attrition from

the school system. With the majority (59%) of the departing new-to-school middle school teachers choosing to leave NYC schools, the system faces a loss of teachers familiar with DOE initiatives, protocols, and practices. Some of these teachers were undoubtedly more effective than others, and a precise estimate of the costs of turnover would have to weigh the strengths of the outgoing teachers with those of the incoming teachers. Some simulations suggest that replacing large quantities of ineffective teachers with new teachers could moderately increase student performance (Staiger & Rockoff, 2010); however, these studies do not estimate how other student outcomes might be affected by this type of approach, nor do they consider whether approaches of this nature would have detrimental effects on school culture and rapport between colleagues that could, in turn, limit estimated gains in student outcomes.

Furthermore, in losing (rather than retaining within the school system) the majority of the outgoing new-to-school teachers, the NYC system loses the investment it made in strengthening the foundation on which later success could be built. In the most supportive middle schools, principals, assistant principals, and master and mentor teachers rally around struggling teachers and work to support their growth. The turnover rates and patterns that we identify here suggest that a sizable proportion of new-to-school middle school teachers may exit the NYC system before the benefits associated with their colleagues' investments in their instructional skills have been realized.

When confronted with circumstances that warrant improvement, policymakers typically look for malleable factors that research suggests can influence the outcome of particular interest. While descriptive studies of this nature do not establish causal connections with desirable outcomes, our findings can help steer policymakers towards several potential strategies for influencing turnover. First, our findings suggest that influencing turnover may require directing policies at both building-level practices and larger system-wide factors. We find that the former, building-level policies and practices—such as those captured in the *School Survey's* environment score (e.g., schools' safety and academic expectations)—are related to turnover after controlling for numerous other factors that are associated with turnover, such as students' level of poverty.

We also find that turnover is related to a number of characteristics that may be most effectively addressed through system-wide policies and initiatives, such as policies aimed at influencing school size or teachers' residency within the five NYC boroughs. We find that rates of turnover are highest in Manhattan and the Bronx and that, when teachers move between schools, they most frequently seek out assignments in the same NYC borough. It is highly possible that our measure of schools' borough location is a proxy for some unmeasured characteristic of schools or teachers, such as the distance between a teacher's home and school, so we must be cautious in attributing too much weight to these descriptive findings. Nonetheless, our preliminary conversations with NYC practitioners and researchers familiar with NYC schools have yielded some interesting hypotheses about why the relationship between borough location and turnover that we depict here may be so. Some have speculated that there is greater variation across Manhattan middle schools than across middle schools in the other boroughs, which might make discontented Manhattan teachers more likely than those in other boroughs to transfer to another school within the same borough. Still others have suggested that Manhattan may be drawing the largest contingent of teachers who intend to have only short-term stays from the outset of their careers. Policymakers might naturally wonder whether schools' support networks or district resources differ notably in Manhattan from those in other boroughs. This finding warrants further investigation.

The patterns in turnover that we observe across boroughs suggest that the geographic location of teachers' initial assignment is the location where most teachers will spend the duration of their stint in NYC schools. Thus, if policymakers wish to influence the distribution of middle school teachers across NYC boroughs, they might consider developing or extending inducement and transfer incentives aimed at getting particular subgroups of middle school teachers—such as those with experience working with English Language Learners—to the schools where they are most needed. While the NYC DOE has experimented with such incentives in the past,[24] it has yet to attempt these policies on a larger scale or to assess their effectiveness.

Schools are not helpless in their ability to influence which teachers they ultimately hire. Our findings suggest the importance of strengthening partnerships with teacher preparation programs or with local businesses that allow employees to volunteer in schools. These and similar efforts can help schools attract desirable teacher candidates who, through internships and substitute teaching assignments, are already familiar with schools' policies and practices when and if they choose to begin teaching in schools full-time (see Johnson et al., 2004).

Our descriptive portrait of middle school teachers' background characteristics suggests another area in which system-wide policies might influence both teacher turnover and important student outcomes. As we identify in this report, between 2001 and 2009, the percentage of NYC middle school teachers who were White remained high and relatively stable (roughly 60%), and the share of female teachers increased (from 62% in 2001 and 69% in 2009). Given Dee's (2006, 2005, 2004) findings that students perform better when they are taught by teachers who share their racial/ethnic and gender characteristics, it may be encouraging that middle school teachers from minority racial/ethnic backgrounds are moderately more inclined than their non-minority colleagues to remain in schools that serve large percentages of students from minority backgrounds. However, given the substantial divide between teachers' and students' race across the larger New York City public school system, it seems critical that researchers and practitioners make a concerted effort to learn more about how to promote constructive relationships between teachers and students from different racial backgrounds. Simultaneously, we need to learn more about whether teachers from different backgrounds seek different types of support or interactions with teacher colleagues, administrators, students and parents—topics that we intend to explore with data from our survey of middle school teachers.

Discussion for researchers

This study represents the second recent investigation related to teacher turnover that has found higher rates of turnover in small schools (CCSR, 2009). These findings come on the heels of a number of reform efforts aimed at creating smaller schools with more personalized learning environments. One recent assessment of a NYC small school reform effort establishes a causal link between attending small high schools and higher levels of student outcomes, such as graduation rates (see MDRC, 2010 for an assessment of the effects of NYC's initiative to create Small Schools of Choice.)[25] These findings suggest that there is more to learn about the relationship between school size and important measures of school climate and student growth. Is it possible that small schools create the conditions that enhance short-term student growth but which burn teachers out in the process? If so, will it be possible for newly created small schools to sustain student gains? To what extent is creating a personalized learning environment in a

school contingent on the school preserving and developing a stable teaching corps? Is the turnover in small schools indicative of school hiring committees and/or principals actively counseling out ineffective teachers and searching for talented, effective teachers who are better matches for their schools?

This study raises many larger questions about teacher turnover, which future research should address. For instance, we need to clarify the extent to which patterns of turnover are the result of teachers' voluntary decisions, as opposed to involuntarily transactions initiated by administrators through informal or formal practices. More generally, why are middle school teachers leaving their schools and what incentives or changes to their working conditions would convince the most effective among them to remain in their schools? Do middle school teachers feel prepared to address their students' emotional and developmental needs? Are grade configurations that incorporate the middle grade years into a longer span of grades (e.g., K-8 or 6-12 schools) more suitable to NYC students at this phase in their development? To what extent is out-of-field teaching driving the mobility of middle school teachers?

Researchers have a great deal of work to do to understand the relationship between various types of school supports and teachers' career decisions and growth as effective practitioners. In addition, future studies should explore the relationship between teacher turnover and student outcomes and the extent to which growth in student outcomes are sustainable based on: rates of teacher turnover, projections of teacher supply, and estimates of how the quality of teaching instruction in schools is likely to change based on the patterns of entry and turnover among the most effective teachers.

Extending this study

There are a number of logical next steps that we intend to take to expand this analysis and deepen our understanding of the patterns and relationships that we identify here. First, we intend to conduct separate, parallel analyses of the likelihood of teachers' exiting the NYC public school system versus transferring across schools within the system. In doing so, we will examine whether and how the relationships between turnover and the characteristics of teachers and schools differ depending on whether teachers exit the system or transfer to another school. When coupled with the data from our survey about which factors influence teachers' decisions about whether to remain in their schools, this information could help researchers construct comparative profiles of the middle school teachers who leave and of the schools to which they transfer. In addition, we could investigate whether different types of teachers (e.g., novice, second-stage, or veteran teachers; teachers from minority backgrounds; teachers with different credentials) consider different factors when weighing career decisions.

Another discovery that warrants further exploration is that a sizable proportion of middle school teachers leave middle schools with traditional 6-8 grade configurations for assignments in schools that include, but are not limited to, the middle grades (e.g., K-8 or 6-12 schools). To extend this finding, we intend to examine how rates of turnover differ in schools with varying middle-grades grade configurations. By obtaining additional datasets that allow us to identify teachers' grade-level assignments, we can gain a better understanding of the extent to which teachers who transfer between schools that include different middle-grades grade configurations are pursuing a different type of school or a non-middle-grades teaching assignment. This is a critical analytical step to take before making any inferences about how patterns of turnover may

be related to teachers' perspectives about the desirability, or lack thereof, of teaching the middle grades. Examining patterns of mobility and attrition among elementary and high schools teachers might also help us discern whether transitioning across grade-level assignments is a phenomenon that is common throughout the NYC public school teacher workforce or a unique characteristic of middle school teachers.

Adding additional sources of data about teachers' and schools' characteristics will also help us extend the findings in this report. For instance, adding information about teachers' route of entry into the profession and their certification credentials can help us examine whether rates and patterns of turnover differ for teachers who receive different types of pre-service preparation. Information about teachers' effectiveness would help us examine whether some schools, especially schools serving high-need student populations, are succeeding in retaining the most effective teachers—an approach that, if it exists, many other schools would undoubtedly benefit from implementing. Examining the transaction-level data on the DOE's human resources dataset would allow us to examine a variety of important issues, such as whether patterns of mobility and attrition vary across schools that take different approaches to granting teachers temporary leaves of absence, part-time positions, or assignments in different grades. It may be the case that some schools "lose" more teachers temporarily but, in doing so, are able to retain the most effective teachers in the long-run—teachers who might have otherwise left the profession were it not for their schools' flexibility with regard to short-term leaves of absence.

Lastly, while we examine the interactions between some of the individual measures in this analysis, such as between teachers' and students' racial/ethnic backgrounds, an extensive investigation of interactions was beyond the scope of this initial descriptive component of the study. As we extend the findings from this study, we will be keen on exploring additional interactions, such as whether math and science teachers tend to stay in their schools (and/or in the NYC school system) longer when their initial assignment is in a particular type of middle school (e.g., schools with high student performance on the NY state mathematics exam or schools with extensive collaboration between teachers). In addition, we will be interested in examining whether the patterns of turnover relative to teachers' and students' race differ for male and female teachers.

Conclusion

While the descriptive statistics and patterns identified in this report contribute important foundational information about NYC middle school teacher turnover, we aim to extend these findings further using data from the remaining survey and case study components of the larger study. Data from our survey will help us understand middle school teachers' short- and long-term career intentions, as well as their perspectives on various aspects of their work and worksite for which there is no current, comprehensive source of information. The case studies will allow us to investigate the causes and consequences of turnover in four middle schools that serve high-need student populations—schools that stand to gain the most from identifying how to minimize the consequences of turnover that are damaging. Collectively, we believe that the evidence and analyses from these three components of our larger study will provide policymakers, practitioners, and researchers with critical information about NYC middle school teacher turnover that can help improve a sector of the city's public schools that many agree is vital but imperiled.

Appendix A
The Middle School Teacher Turnover Project
Overview

Beginning in the 2009-10 school year, The Research Alliance for New York City Schools, in partnership with researchers at New York University, Teachers College and Baruch College, will undertake a three-year, mixed-method study of teacher turnover and retention in the City's middle schools. The study will build on prior research analyzing original survey and case study data in conjunction with extensive administrative data on middle school teachers' school assignments. It will shed light on factors associated with teacher turnover and retention and on the relationship between the stability of the teaching force and school functioning. The study has three main components, each with its own set of objectives, research questions, data sources, and methodologies. The study has the potential to offer substantial benefits for New York City schools as a whole and particularly the participating schools while minimizing any burden and risk that may be associated with participation in the study.

Component 1: *Analyzing turnover patterns and identifying teachers' characteristics*

Researchers at the Research Alliance and NYU will use ten years of administrative data (2000-09) to investigate the patterns of teacher turnover and retention across NYC middle schools. The research team will examine middle school teachers' personal and professional characteristics—such as age, gender, race/ethnicity, tenure, licensure, or highest degree earned—and explore changes in the composition of the teaching core over time. The study will employ a discrete-time survival analysis to examine teachers' length of stay in middle schools and to investigate which teacher and school characteristics are associated with staying in or exiting from middle school teaching assignments. Researchers will also investigate the relationship between the overall stability of the middle school teaching force and both indicators of school functioning and measures of student performance.

Component 2: *Identifying teachers' career plans and their impressions of school functioning*

In the spring of 2010, researchers at Teachers College, Columbia will administer a survey to middle school teachers. The survey will contain 37 items and take approximately 20 minutes to complete. The survey examines middle school teachers' career plans and their impressions of the organizational functioning of their schools that may be related to turnover, such as the level of administrative support or the degree of student behavior problems in their building.

We estimate that our teacher sample may include as many as 9,869 middle school teachers (50.35 teachers per 196 sample middle schools). An assumed overall response rate of 65% would yield approximately 6,400 completed surveys. We will work in concert with leaders from the UFT, CSA, and NYCDOE to develop a strategy to maximize participation. We hope to solicit the support and approval of all of these organizations and to have UFT, CSA, and NYC DOE leaders co-author a letter that introduces the study to middle school principals. Subsequently, project staff would contact principals to ascertain their willingness to participate,

identify an appropriate contact person, and negotiate a time and place for the survey administration, such as during a faculty meeting. On the day of administration, project staff would bring a prepared packet of surveys and cover letters, and a tray of complimentary cookies, to the school site. In introducing the survey, project staff would highlight that the survey is anonymous and that participants' responses will be kept confidential—individual identifiers, such as teachers' name or district ID number, will not be recorded on the survey. They will then distribute the copies to full-time teachers and collect them at the conclusion of the administration. We estimate the total elapsed time to be 25 minutes.

In our analysis of the survey responses, we will summarize participants' career plans and their impressions of various aspects of their schools' organizational functioning. Next, we will construct composite indicators of various aspects of organizational functioning—such as schools' working conditions, the degree of collaboration between colleagues, the level of administrative supportiveness, etc.—and examine the relationship between teachers' career intentions and their assessments of school functioning. Lastly, we will aggregate teachers' responses to the school level and examine the relationship between organizational functioning and teacher stability.

Component 3: *Examining the relationship between turnover & school functioning*

Researchers at Baruch College will conduct case studies of four middle schools in an effort to deepen an understanding of the relationships between stability of the teaching force and school functioning. This portion of the study will focus on schools serving high-need student populations, which typically struggle to retain teachers, and where teacher turnover arguably has the most damaging consequences.

Appendix B
Additional Information about the Middle Schools in
The Study Sample

There was variation across boroughs in the average number of students enrolled in sample schools. Table A-1 depicts the mean enrollment in sample schools over the past decade. On average over the entire period, sample schools in Staten Island enrolled the greatest number of students, with 1,313 students per school, as compared with 1,241 in Queens, 880 in Brooklyn, 735 in the Bronx, and 566 in Manhattan. As the right-hand column in Table 1 reveals, the average student enrollment in sample schools was lower in 2009 than in 2000, though some districts—such as Brooklyn and Manhattan—experienced more substantial decreases in student enrollment than others. The average number of students enrolled in sample schools across the five boroughs increased slightly from 1,037 students in 2000 to 1,083 students in 2002, then decreased annually, reaching an average of 790 students per school in 2009.
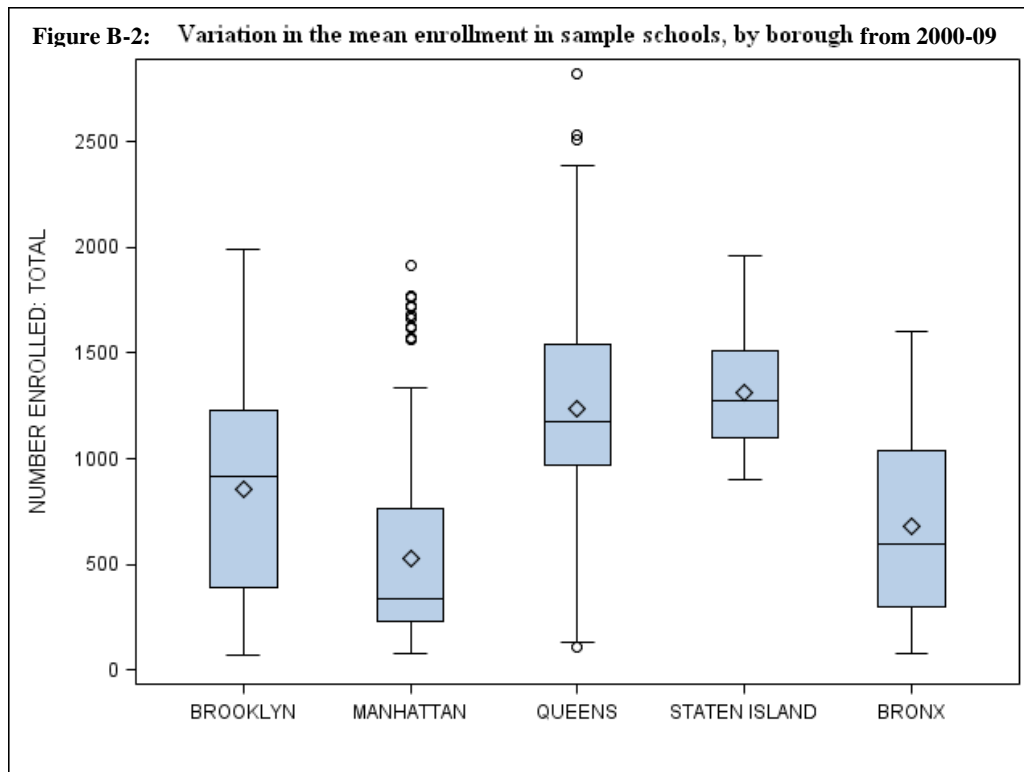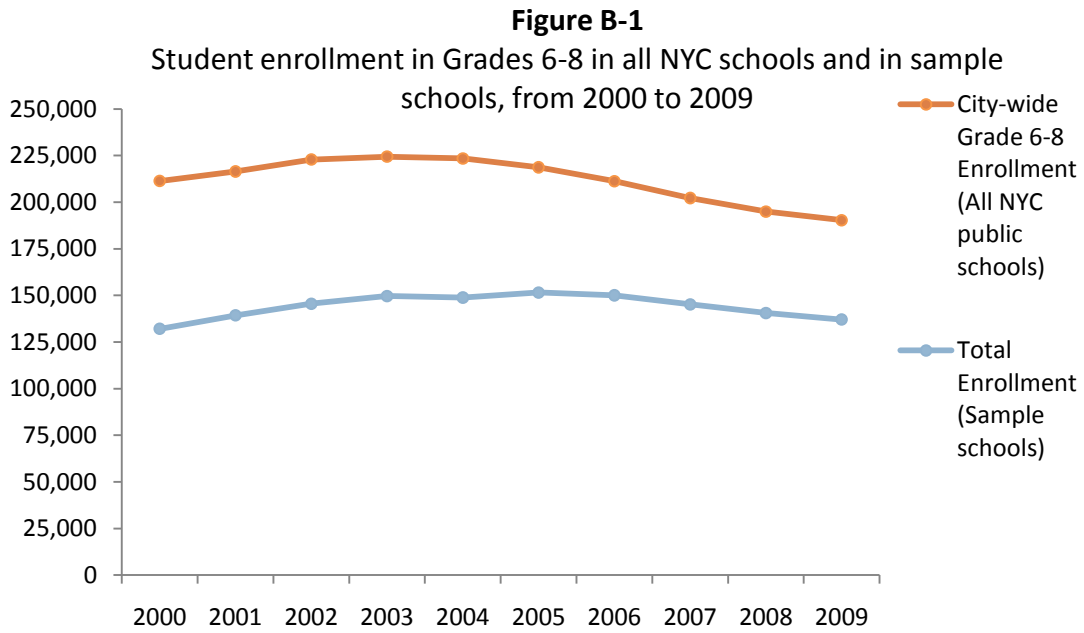
Table B-1
Mean total enrollment in sample middle schools by NYC borough and school year
(n=196 in 2009)

	School Year										Avg. by district	Differential (2000-09)
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		
Brooklyn	1040	1031	1037	1037	971	827	754	723	698	680	880	-361
Manhattan	771	702	664	648	636	469	458	467	437	411	566	-360
Queens	1302	1315	1332	1330	1295	1256	1203	1134	1132	1115	1241	-187
Staten Island	1279	1337	1373	1390	1376	1337	1298	1262	1244	1232	1313	-47
Bronx	793	912	1007	930	853	686	568	562	528	514	735	-279
Avg. by year	1057	1063	1078	1061	1006	847	766	741	717	699		-358
N (schools)	125	131	135	141	148	179	196	196	196	196		

The decrease in mean enrollment over the period of observation appears due to a city-wide decrease in middle school enrollment as well as the creation of new schools in recent years. The number of students enrolled in grades 6-8 citywide—and the number of students enrolled in sample schools—fluctuated over the period of observation but declined on average. Figure A-1 depicts both the Grade 6-8 enrollment trends for all New York City schools and for the sample schools. As Figure A-1 reveals, city-wide enrollment in the middle grades increased gradually from 211,384 students in 2000 to 224,450 students in 2003, then slowly declined over the next six years, reaching a ten-year low of 190,333 students in 2009. Enrollment in sample schools followed a similar trajectory

The average number of students enrolled in sample schools varied substantially in some districts and less so in others. In other words, some districts contained both large and small schools, while other districts housed schools that were relatively similar in size. Figure A-2 depicts the variation in mean enrollment by borough over the entire period of observation.

Queens had the largest variation in student enrollment, with a number of schools that served fewer than 200 students and with other schools serving well over 2,000 students.

Figure B-1
Student enrollment in Grades 6-8 in all NYC schools and in sample schools, from 2000 to 2009

Figure B-2: Variation in the mean enrollment in sample schools, by borough from 2000-09

Appendix C
Additional Tables, Part I of the Report

Table C-1

NYC elementary, middle, and high school teachers' background characteristics, 2009

Teachers' Background Characteristics	Elementary School Teachers (n=31,207)	Middle School Teachers (n=11,591)	High School Teachers (n=17,217)
Average years experience in NYC schools	10	9	10
Average age	41	40	41
Gender			
Female	90%	69%	55%
Race/ethnicity			
White	61%	58%	61%
Black	18%	23%	18%
Hispanic	16%	13%	12%
Other	5%	6%	9%
Degree Level			
Base (BA, credits; MA, PA, QA on DOE salary schedule)	12%	19%	15%
MA or credit equivalent (RA, SA, TA on DOE salary schedule)	45%	41%	37%
MA and additional credits (UA on DOE salary schedule)	43%	40%	47%
Experience			
Percentage with three years of NYC experience or less	16%	21%	18%
Percentage with more than nine years of NYC experience	41%	33%	38%

Table C-2

NYC elementary, middle, and high school teachers' background characteristics, 2001

Teachers' Background Characteristics	Elementary School Teachers (n=34,733)	Middle School Teachers (n=10,909)	High School Teachers (n=15,722)
Average years experience in NYC schools	10	10	11
Average age	42	42	45
Gender			
Female	88%	62%	51%
Race/ethnicity			
White	62%	59%	65%
Black	20%	26%	17%
Hispanic	15%	12%	12%
Other	3%	3%	5%
Degree Level			
Base (BA, credits; MA, PA, QA on DOE salary schedule)	27%	31%	18%
MA or credit equivalent (RA, SA, TA on DOE salary schedule)	34%	30%	29%
MA and additional credits (UA on DOE salary schedule)	39%	38%	51%
Experience			
Percentage with three years of NYC experience or less	25%	30%	18%
Percentage with more than nine years NYC experience	43%	41%	49%

Table C-3

The characteristics of all NYC middle school teachers and those who were new to their schools, 2009

Teachers' Background Characteristics	Middle School Teachers (n=11,591)	New-to-School Middle School Teachers (n=7,944)
Average years experience in NYC schools	9	5
Average age	40	35
Gender		
Female	69%	70%
Race/ethnicity		
White	58%	58%
Black	23%	23%
Hispanic	13%	12%
Other	6%	7%
Degree Level		
Base (BA, credits; MA, PA, QA on DOE salary schedule)	19%	45%
MA or credit equivalent (RA, SA, TA on DOE salary schedule)	41%	35%
MA and additional credits (UA on DOE salary schedule)	40%	18%
Experience		
Percentage with three years of NYC experience or less	21%	55%
Percentage with between three-nine years of NYC experience	46%	35%
Percentage with more than nine years of NYC experience	33%	10%

Table C-4

The characteristics of *Stayers*, *Movers*, and *Leavers* among teachers who were new to their schools between 2002 and 2009

Teachers' Background Characteristics	*Stayers* (n=20,323)	*Movers* (n=7,687)	*Leavers* (n=12,283)
Gender			
Female	70%	68%	69%
Race/ethnicity			
White	58%	52%	60%
Black	23%	28%	22%
Hispanic	13%	13%	10%
Other	6%	7%	8%
Degree Level			
Base (BA, credits; MA, PA, QA on DOE salary schedule)	44%	50%	53%
MA or credit equivalent (RA, SA, TA on DOE salary schedule)	33%	29%	26%
MA and additional credits (UA on DOE salary schedule)	18%	15%	13%
Age			
Average age	37	35	35
30 or younger	37%	46%	54%
>30-55 years-old	56%	49%	37%
Older than 55	6%	6%	10%

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Endnotes

[1] It is possible that Grade 6-8 middle schools differ from schools with other grade configurations that include the middle grades (e.g., K-8 schools of 6-12 schools) in ways that affect turnover. In future studies, we will examine whether turnover differs according to the grade configurations of middle grades teachers' schools. The primary reason we opted not to conduct this analysis at this preliminary stage is because our existing data did not allow us to identify the middle grades teachers in schools without Grade 6-8 grade configurations. In other words, while we could examine rates of teacher turnover in K-8 schools, we would not be able to examine whether the turnover rates among Grade 6-8 teachers differed from those among grade K-5 teachers.

[2] There were additional criteria we considered in selecting the schools in our study sample. We only included schools that had not closed and re-opened at any point over the ten-year period of observation. Some of the schools in the sample served students in one or two of the middle school grades (e.g., only grade 6, grades 6 and 7, only grade 7) in prior years but served students in all three grades by 2009. Schools that added middle grades over time were included in the sample so long as they enrolled students in all three grades (and in no other grades) by 2009. We excluded schools that dropped one or more of the middle grades over the period of observation. In other words, if a school had served students in grades 6-8 from 2003-05 and then dropped grade 6 from 2006-08, the school *was excluded* from the sample regardless of whether it had returned to enrolling students in grades 6, 7, and 8 by 2009.

[3] This figure includes general education, special education, and English as a Second Language teachers.

[4] Some middle school teachers, including those who were new to their schools between 2001 and 2010, appear multiple times in our analysis because they transfer between traditional Grade 6-8 middle schools. Thus, while we conduct our analysis of turnover with 15,628 unique new-to-school teachers, the total number of new-to-school teachers over the period of observation is actually 18,019 or 65% of the total number of all middle school teachers during the time period (27,636). Please see the Technical Documentation for additional descriptive information about the teachers in the study.

[5] While we have human resources data through the 2009-10 school year, we are not able to examine rates of turnover in the final school year as we are not able to observe whether teachers leave their schools. Thus, we consider the 2008-09 school year the "most recent" school year in this section of the report.

[6] Because middle school teachers were fairly senior in terms of age and experience in 2001, it is possible that our estimates of turnover capture, in part, teachers' expected exit from schools at the end of their career. However, our methodology and sample selection should negate substantial bias in this regard. By focusing our analysis on a sample of new-to-school teachers, we necessarily identify greater percentages of starting and second-stage teachers and a smaller percentage of more experienced veterans. Veteran teachers are included in the sample if they were new to a sample school during the period of observation.

[7] Several readers of earlier drafts of this report, most notably Jim Wyckoff, observed that our definition of turnover may not be sensitive to teachers who take a brief, temporary leave of absence and then return to their school. Indeed, our strategy for identifying turnover would label these teachers as having left their school and then having begun again in that same school as a new-to-school teacher in a second "spell" in their schools. We conducted several analyses to explore the consequences of our strategy for identifying turnover. We first examined the frequency of occasions where teachers left their schools for one year (and were not employed in any other NYC school during that time period) and then returned to the same school. Such occurrences were rare—less than 225 cases. Next, we examined how our estimates of these teachers' lengths of stay differed if we counted them as having remained in their schools during the year that we had previously identified them as having departed. We found that the estimates of these teachers' length of stay were, on average, only a little over one-half of a year longer (3.2 years, as opposed to 2.4) when we did not identify them as having left their schools. Lastly, we examined how our overall estimates of middle school teachers' median length of stay in schools differed using this alternative identification strategy and determined that this difference was negligible (about 0.01 of a school year).

Endnotes

[8] Another scenario is that teachers who change roles do so because their assignment is made redundant due to declining enrollment in a school. We do not have an ideal way for dealing with this possibility, though we attempt to control for it in our statistical models by incorporating a time-varying change in enrollment variable, *ENRNUMDIFF,* as a baseline covariate in all of our models.

[9] Of course, we must reiterate that we cannot identify when the 2000-01 teachers first entered their schools and, thus, these turnover estimates may be biased downwards. We can only measure how long these teachers remained in their schools after the 2000-01 school year. Thus, if a number of these teachers had been in their schools for substantial periods of time prior to 2000-01, the actual rates of turnover might be lower than those we report here.

[10] Goertz, Loeb, & Wykoff (2010) note, however, that many of these inexperienced teachers might have simply left teaching if they did not have any viable options for transfer, so there is no clear implication of how this policy might affect turnover even among inexperienced teachers.

[11] We fit a separate discrete time survival analysis to investigate this research question. In this analysis, we fit a model where we used the interaction between new-to-school teachers' entering cohort year and the discrete specifications of time to predict the probability of turnover. Then, we converted the survival probabilities to an estimate of the percentage of teachers within each cohort that left within 1, 2, and three years. The negative trends are consistent across each of these time periods, though we only report the last statistic—the percentage of new-to-school teachers who leave within three years. In order to have enough data to examine teachers' behavior for three years, the last new-to-school cohort year that we could include in this analysis first entered their schools during the 2006-07 school year.

[12] It should be noted that our sample of Grade 6-8 middle schools does not include 6-8 schools that were opened after the 2006 school year. We explain the reasoning behind this decision in the introduction of this report. As a result, an additional percentage of *Movers* (82 out of 2,282 *Movers* overall, or 4%) appear to have pursued teaching assignments in Grade 6-8 schools that are not in our sample. We report this detail in the spirit of transparency; however, even were we to identify this subgroup as remaining in Grade 6-8 middle schools, it would not change the overall finding: greater percentages of *Movers* choose to pursue teaching positions in high schools, elementary schools, and schools with less common grade configurations than those who pursue assignments in schools with typical Grade 6-8 middle school configurations.

[13] We should note that, in addition to these baseline covariates, our baseline control model also contains the discrete specifications of time, referred to as "periods" in our analyses and models, that teachers remain in their schools. These discrete time dummies are the primary question predictors in all of our analyses. The accompanying Technical Documentation includes detailed information about our modeling procedure and measures.

[14] In other words, when examining the relationship between turnover and teachers' characteristics during the second stage of our analysis, we fit a series of individual models where we add and remove each teacher characteristic to a model that contains the baseline covariates. When examining the relationship between turnover and schools' characteristics during the third stage of our analysis, we fit a series of individual models where we add and remove each school characteristic to a model that contains the baseline covariates and the teacher characteristics from the previous second stage.

[15] Technically, these are still "predicted" percentages of turnover, as we are controlling for our baseline covariates when examining the relationships between turnover and teachers' characteristics.

[16] Specific statistical tests of difference can be produced upon request.

[17] As noted previously, for categorical covariates such as teachers' cohort year, we report the statistical significance of the relationship between turnover and the entire group of categories that comprise the individual measure. Thus, while some of the individual differences between each of the categories—for instance, the difference in percentage of teachers who entered their schools in 2005 and left within one year and the percentage of teachers who entered their schools in 2006 and left within one year—are not statistically distinguishable, all of the cohort year categories as a group are statistically significant predictors of teacher turnover.

Endnotes

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[18] Schools that lost an average of 99 students a year were in the 10th percentile of the distribution of this measure of annual changes in student enrollment. Because this analysis predicts the likelihood of teachers leaving schools, we estimated the distribution of this measure across the entire person, spell, period dataset for all of the years during the period of observation.

[19] Schools that experienced annual declines of enrollment of 0 were the median (50th percentile) of the distribution of this measure when estimated across the entire person, spell, period dataset.

[20] Readers may notice that the percentages of new-to-school NYC middle school teachers who left their schools within three years for this measure (teachers' cohort year) differ slightly from those reported in Part 1 of the report in response to the question about whether rates of turnover have declined over time. The explanation for this difference is that the earlier analysis in Part I examined the relationship between turnover and the interaction between teachers' entering cohort year and the discrete measures of time over the period of observation. The analysis in Part II does not include this two-way interaction effect.

[21] Our original intention was to include both schools' average mathematics and ELA exam scores in our analysis; however, a number of schools did not report ELA exam scores, most likely because they administered an alternative evaluation and, thus, possessed a legitimate exemption from the state. Rather than have missing values on this measure from some schools, we opted to use mathematics exam scores, for which we had data across our entire sample of 196 middle schools, and schools' peer index value as our measures of student performance.

[22] The *School Survey* was formerly known as the *Learning Environment Survey*.

[23] We thank Richard Arum and Sean Corcoran for this insight.

[24] such as the DOE's Housing Support initiative described here:
http://schools.nyc.gov/TeachNYC/incentives/financial/default.htm

[25] MDRC's report (2010), *Transforming the High School Experience*, can be found at:
http://www.mdrc.org/publications/560/overview.html

About the Author

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About
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The Research Alliance for New York City Schools is a non-partisan research center that is committed to conducting, supporting, and disseminating rigorous research for and about New York City Schools. Our research and dissemination activities aim to support the search for effective school improvement strategies and to build capacity in schools to implement those strategies so that all young people have access to a high quality education.

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