

The **Research Alliance** for
New York City Schools

Who Stays and Who Leaves? Findings from a Three-Part Study of Teacher Turnover in NYC Middle Schools



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WITH THE MIDDLE SCHOOL
TEACHER TURNOVER PROJECT

March 2013

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Technical Appendices

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APPENDIX A: DESCRIPTION OF DATA SOURCES AND SAMPLES

Cumulative Turnover

For the longitudinal analyses, we chose to examine turnover in grade 6-8 middle schools—the most common type of middle grades school. For the purposes of this study, we selected schools that existed in 2009, served students in the traditional middle grades (6, 7 and 8), *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.ⁱ

Between 2001 and 2010, 24,598 full-time teachersⁱⁱ 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 conducted 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 constituted roughly 65 percent of all the teachers who were employed in traditional grade 6-8 middle schools between 2001 and 2010.ⁱⁱⁱ The bulk of the longitudinal analysis focused on the rates of turnover among the 15,628 new-to-school teachers, as we could only generate accurate estimates of how long middle school teachers remained in their schools if we knew 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 had to focus our analysis on the subset of new-to-school teachers. *Please note, the cumulative 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 more accurate, but also more cumbersome.

Annual Turnover

When examining the annual rates of turnover (as seen in Figure 3 and shown in Table A1 below), we included all teachers who worked in the spring semester of each academic year. Teachers were then categorized by the school in which they were assigned. Unlike the samples from other components of this study, the middle school teachers included in this analysis were not limited to teachers who taught in schools with grade 6-8 configurations.

For the analysis in which we examined the percentage of teachers who were not in their schools from one year to the next (and one year to one-and-a-half years later), we used the population of teachers who worked in the spring of 2010 at the grade 6-8 schools we sampled for our survey, as reported by NYC DOE’s human resources database. We only kept teachers who had full information available in the HR data (i.e., age, race/ethnicity, number of years taught in the system, highest degree attained, and salary) and who were in schools where at least one teacher from the school had responded to our survey questions about school environment. Our analytic sample for this analysis included 5,765 teachers in 121 grade 6-8 middle schools. Our sample of teachers accounts for 54 percent of all teachers in middle schools that serve grades 6 through 8, representing 52 percent of all middle schools that serve grades 6 through 8.

The Survey

The survey analysis is based on a survey administered to teachers in May and June of 2010. In the spring of 2010, researchers contacted the principal at each of the 196 middle schools in New York City serving only grades 6 through 8. Of the 196 principals, 125 agreed to allow researchers to survey full-time teachers in their schools, a school-level response rate of 64 percent. In the vast majority of instances, teachers completed the paper-and-pencil survey in a group setting on a day in which students were not in the building, with a member of the research team distributing and collecting the surveys. In 116 schools, at least 10 teachers completed the survey. The total number of full-time New York City middle school teachers who responded to the survey is 4,214, representing 42 percent of the

estimated population of teachers in New York City's true middle schools at the time of the survey. Within schools that allowed us to administer surveys to teachers in a group administration, we surveyed 79 percent of the full-time teachers.

Case Study

From the population of 125 middle schools that completed surveys, we selected four high-need^{iv} case sites that had experienced different degrees of attrition^v over 10 years, in order to facilitate comparative case studies.^{vi} Specifically, we identified two high-turnover sites and two low-turnover sites, with one of each in Brooklyn and one of each in the Bronx.^{vii} We contacted the principals of our first-choice schools directly to seek their participation, and all agreed to join the study.

The case studies for each of the four schools were created using information coming from interviews with school faculty and staff as well as documented observations. Table A2 on the next page summarizes our data sources across the four case study sites (see Appendix B for more information about the qualitative methods).

Table A1
Number of Teachers Represented in Figure 3

	Elementary	Middle	High
2000	37,358	14,249	15,137
2001	38,513	14,788	14,850
2002	38,286	15,016	15,126
2003	38,374	15,335	15,530
2004	37,498	15,064	16,371
2005	36,654	15,037	17,018
2006	36,810	15,142	17,174
2007	37,161	15,359	17,314
2008	38,022	15,493	17,308
2009	37,894	15,308	17,058
2010	36,853	14,734	16,309
Total	413,423	165,525	179,195

Table A2
Data Sources for Case Study

	Southern Blvd	Roseville	Eastside	Memorial	Total
Beginning teachers (1-5 years)	2	2	3	3	10
Established teachers (6-10 years)	3	6	3	5	17
Veteran teachers (>10 years)	5	4	7	4	20
Teacher leaders	2	5	8	1	16
Administrators	2	2	2	2	8
English Language Arts teachers	4	4	2	0	10
Math teachers	1	7	2	2	12
Special education/ collaborative team teachers	2	3	6	4	15
Teachers of other subjects	3	5	9	5	22
Total interviewees	12	16	16	14	58
Total interviews	21	25	26	21	93
Documented observations	7	7	7	11	32

APPENDIX B: METHODS

Cumulative Turnover

To address our research questions on teacher mobility longitudinally (as shown in Figures 1, 2, 4, 6a and 6b), we used a discrete time survival analysis methodology (DTSA). DTSA is a specialized type of event-history logistic regression analysis designed to address research questions that ask whether and when events occur.^{viii} For this component of the study, we were interested in determining the extent to which middle school teachers leave their schools and, if so, how long they remain in their schools before leaving. Among the features that make DTSA superior for this type of analysis is its ability to account for the right-hand censoring of data that occurs as, in this case, teachers approached the end of the period of observation in 2010 where we have less information about whether or not these teachers stay in their school in the future. Alternative methodologies either exclude censored cases or impute estimates of when censored cases experience the “events” in question.^{ix}

The dichotomous outcome of our logistic regression model was called *MOVE*, though it refers both to teachers’ decision to move between schools and to exit schools. Further, because we were ultimately interested in investigating the extent to which turnover is disruptive to schools, we employed an expansive definition of turnover, identifying a teacher as having “moved” if she either: a) left her school (due to move or exit); or b) assumed a role other than as a full-time teacher (e.g., a principal or librarian), regardless of whether she remained in her school. Our rationale for considering role-changers as having “turned over” is that this transition ultimately leaves building administrators facing the same scenario: needing to fill a vacant teaching position.^x Thus, we coded *MOVE* “1” if teachers experienced the event of moving, exiting, or changing roles, and “0” otherwise. To examine the relationship between turnover and the characteristics of teachers, we sequentially added and removed each teacher-level predictor and its two-way interaction with the continuous specification of time to the baseline control model.

To examine the extent to which school characteristics predict the probability of teacher turnover, we embarked on a similar model building process that entailed adding and removing each school-level predictor to the full teacher model and examined the nature of the relationship between turnover and each of the school characteristics. In addition, we examined the nature and strength of these relationships in a full school-level model (see Marinell, 2011 for more information), which contained all of the school-level variables, as well as all of the previously described covariates and the teacher-level main effects and their interactions with the continuous specification of time.

Annual Turnover

To address our research question about the extent to which school characteristics are associated with the probability that a teacher leaves within one-and-a-half years (as seen in Figure 7), we used a multilevel logistic mixed model in which teachers were nested in their middle schools (see tables below for the output from these models). Our dependent variable was a dichotomous variable such that teachers who left their schools within one-and-a-half years were given a value of “1” and those who stayed were given a value of “0.”

In our two-level model, we included a number of control variables at the teacher level: gender, race/ethnicity (White, Black, Hispanic, other), years of experience as of June 2010 (less than 1 year, 1 to 6 years, 6 to 10 years, 10 or more years), highest degree attained (Bachelor’s degree, Master’s degree and/or the credit equivalent, Master’s degree and 30 additional credit hours, degree credential other than those identified), age (30 years old or younger, 31 to 54 years old, 55 or older), and a dummy for whether the teacher was licensed to teach math or science.

At the school level, we controlled for the school’s location (Bronx, Brooklyn, Manhattan, Queens, Staten Island); size; percentage of students scoring at or above the proficiency standard on the NY State standardized mathematics assessment, among all of the grades tested in a middle school; whether the school has a high percentage of White students (16 percent or more of a school’s student population is White); peer index measure, which is a measure developed by the NYC DOE indicating how well a school’s students score on the NY State standardized test relative to schools that serve similar student populations—the index ranges from 1-4 (lower values indicating lower performing schools that serve higher-need student populations); weighted environment score according to the NYC

DOE's 2008 *School Survey*; percentage of students in the school that are eligible for free or reduced-priced lunch; and average attendance rate for all students in the school.

The teacher- and school-level intercepts were allowed to vary while teacher- and school-level predictors were fixed at their respective levels.

The Survey

The bulk of this analysis was based on teachers' responses to a series of questions about their future plans (as seen in Figure 5).^{xi} More specifically, the majority of the survey analyses used teacher responses to the question about whether they had considered leaving their school during the current school year as the outcome variable. Teachers could respond 'yes' or 'no.' Because this variable is dichotomous, we use multinomial logistic regressions with teacher-level and school-level predictors and standard errors that take the clustering of teachers within schools into account. For ease of interpretation, we created adjusted percentages based on the predicted values from these models.

Unlike the objective measures of school demographics discussed in the previous section, the measures in this section reflect a teachers subjective experiences in a given school. We developed measures of the school as a workplace that reflect the aggregate views of all responding teachers in the school. These measures are thus school-level measures, rather than the perceptions of an individual teacher. Different teachers within a school may have differing perceptions and experiences, but those are best interpreted as attributes of the teacher, rather than as attributes of the school, which is the focus of the survey analysis.

For more information on methods used in this study, see the full report.^{xii}

Case Study

Case study methodology is particularly fitting to address questions of *how* and *why*, piecing together relationships between variables over time. The primary window of data collection occurred during the fall of 2010 through the spring of 2011. We conducted two waves of semi-structured interviews, one in the fall of 2010 and a second in the spring of 2011, with 93 interviews total (see Appendix A for more details on who we interviewed). Prior to beginning our data collection, we also piloted a draft interview protocol in the spring of 2010 with a few teachers in two of the sites (Southern Boulevard and Eastside), making adjustments based on those results.

For our fall interview protocols (teacher and administrator), we drew on prior literature on teacher retention.^{xiii} For our spring protocols, we drew on our preliminary analysis of the fall interviews—determining themes where we wanted to probe more deeply—as well as added themes that had not been addressed in the fall. We were also able to draw on our preliminary analysis of the survey research in the case schools for the spring protocol.

While researchers obviously observed the case sites informally all year long, gaining impressions and insights, we conducted 32 formal documented observations in the spring. Researchers followed an observation protocol in order to facilitate cross-site comparisons.

The qualitative data collection process and analysis of qualitative data informed one another in an ongoing way through a variety of tools. Researchers engaged in analytic memoing following site visits to summarize field notes and capture insights and held regular team meetings to discuss technical and analytical aspects of the work.

We developed a coding schema, relying heavily on our protocols-in-use and then our own progressive refinements, rather than data management software. We then created coding rules for the schema where needed, prior to coding the data.

We attempted to establish the reliability of the coding schema across the two field researchers and the project director. When this did not occur, we changed course and one of the field researchers who was tightly correlated to the project director coded all of the data. At this point all coded documents were entered into the software NVivo for qualitative data management purposes. The database was then queried to test the researchers' hypotheses and establish preliminary findings for the purpose of this report.

Table B1
Results from Annual Turnover Analyses
(Predicted Probability of Leaving One's School Within 18 Months)

	Principal leadership			Professional control			School disorder			Teacher collegiality		
	Coef.	SE	P-value	Coef.	SE	P-value	Coef.	SE	P-value	Coef.	SE	P-value
Intercept	-1.375	2.721	0.614	-2.011	2.673	0.454	-2.117	2.681	0.431	-1.039	2.713	0.702
Teacher Characteristics												
Male	0.098	0.072	0.169	0.102	0.072	0.153	0.098	0.072	0.170	0.101	0.072	0.157
Black	-0.396	0.108	0.000	-0.386	0.108	0.000	-0.394	0.108	0.000	-0.397	0.108	0.000
Hispanic	-0.329	0.090	0.000	-0.318	0.090	0.000	-0.335	0.090	0.000	-0.333	0.090	0.000
Other race/ethnicity	0.031	0.147	0.834	0.033	0.147	0.824	0.031	0.147	0.830	0.035	0.147	0.813
Experience as of June 2010												
Less than one year	0.478	0.124	0.000	0.489	0.124	<.0001	0.477	0.124	0.000	0.477	0.124	0.000
Six to ten years	-0.348	0.097	0.000	-0.349	0.097	0.000	-0.348	0.097	0.000	-0.359	0.097	0.000
Ten or more years	-0.400	0.101	<.0001	-0.391	0.101	0.000	-0.397	0.101	<.0001	-0.405	0.101	<.0001
Highest Degree Attained												
Bachelor's degree	0.318	0.110	0.004	0.319	0.110	0.004	0.318	0.109	0.004	0.328	0.110	0.003
Master's degree and/or the credit equivalent	-0.206	0.079	0.009	-0.210	0.079	0.008	-0.211	0.079	0.007	-0.205	0.079	0.010
Other degree credential	1.353	0.673	0.044	1.368	0.672	0.042	1.373	0.673	0.041	1.366	0.676	0.043
Age												
30 years old or younger	0.544	0.090	<.0001	0.545	0.090	<.0001	0.546	0.090	<.0001	0.552	0.090	<.0001
55 or older	0.798	0.091	<.0001	0.793	0.091	<.0001	0.792	0.091	<.0001	0.799	0.091	<.0001
Has math or science licensure	0.058	0.083	0.485	0.059	0.083	0.474	0.057	0.083	0.491	0.057	0.083	0.490

Table B1 Continued
Results from Annual Turnover Analyses
(Predicted Probability of Leaving One's School within 18 Months)

	Principal leadership			Professional control			School disorder			Teacher collegiality		
	Coef.	SE	P-value	Coef.	SE	P-value	Coef.	SE	P-value	Coef.	SE	P-value
Intercept	-1.375	2.721	0.614	-2.011	2.673	0.454	-2.117	2.681	0.431	-1.039	2.713	0.702
Borough												
Bronx	0.078	0.115	0.499	0.023	0.117	0.846	0.092	0.111	0.410	0.064	0.113	0.574
Queens	-0.157	0.127	0.220	-0.145	0.126	0.253	-0.149	0.125	0.238	-0.116	0.125	0.359
Manhattan	0.290	0.142	0.043	0.253	0.143	0.080	0.267	0.141	0.060	0.310	0.139	0.028
Staten Island	-0.134	0.207	0.521	-0.193	0.206	0.350	-0.190	0.210	0.367	-0.093	0.206	0.653
School Characteristics												
Size	-0.001	0.000	<.0001	-0.001	0.000	<.0001	-0.001	0.000	<.0001	-0.001	0.000	<.0001
NYDOE Peer Index Measure	-0.385	0.251	0.128	-0.534	0.246	0.032	-0.388	0.251	0.124	-0.477	0.251	0.059
NYDOE Environment Score	-0.076	0.030	0.014	-0.132	0.030	<.0001	-0.084	0.029	0.004	-0.077	0.031	0.015
Student Characteristics												
Students who qualify for free or reduced price lunch (%)	0.001	0.004	0.820	0.000	0.004	0.921	0.001	0.004	0.874	0.001	0.004	0.858
Average attendance	0.024	0.034	0.480	0.045	0.032	0.170	0.036	0.032	0.261	0.023	0.034	0.493
High percentage of white students	-0.049	0.151	0.746	-0.085	0.149	0.570	-0.028	0.149	0.853	-0.125	0.154	0.417
Workplace Measure												
Quartile_1 (lowest)	0.290	0.143	0.045	-0.310	0.169	0.070	-0.331	0.185	0.077	0.270	0.151	0.076
Quartile_2	0.139	0.126	0.270	-0.312	0.168	0.066	-0.151	0.133	0.258	-0.038	0.132	0.771
Quartile_3	0.069	0.125	0.581	-0.395	0.141	0.006	-0.225	0.119	0.062	0.023	0.129	0.861

APPENDIX C: WHO ARE MIDDLE SCHOOL TEACHERS IN NYC?

Describing teacher characteristics in any one year or across several years can obscure changes that occur over a larger period of time. Below, we briefly describe some key characteristics of the population of NYC middle school teachers and identify some of the notable differences across two cohorts—to illuminate broad changes that occurred during the years covered by this study.

As shown in Table C1 below, on average, 2009 middle school teachers were, on average, about 40 years old and had taught in NYC schools for approximately 9 years. Specifically, 33 percent of middle school teachers had more than nine years of experience in NYC schools. Yet middle schools also had a high percentage of inexperienced teachers: 21 percent of middle school teachers had been in NYC schools for three years or less. Not surprisingly, given their average age and years of experience, less than half (40 percent) of middle school teachers had the highest level of credentials recognized in the NYC salary step schedule.

Compared to the middle school teachers in 2009, those in 2001 were slightly older (42, as compared with 40) and more likely to be veterans (41 percent had more than nine years of experience teaching in NYC schools, compared with just 33 percent in 2009). A smaller percentage of middle school teachers were women in 2001 than in 2009 (62 and 69 percent, respectively), while a greater percentage were Black (26 percent, as compared with 23 in 2009).

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 described in the report, differ as a function of teachers' levels of experience.^{xiv}

**Table C1
Background Characteristics of Middle School Teachers
(2001 and 2009 Cohorts)**

Characteristic	2001 Middle School Teachers (N=10,909)	2009 Middle School Teachers (N=11,591)
Average age	42	40
Female	62%	69%
Race/ethnicity		
White	59%	58%
Black	26%	23%
Hispanic	12%	13%
Other	3%	6%
Years of teaching experience		
Average years of experience in NYC schools	10	9
Three years of NYC experience or less	30%	21%
More than nine years of NYC experience	41%	33%
Degree level		
Bachelor's degree	31%	19%
Master's degree and/or the credit equivalent	30%	41%
MA and additional credits	38%	40%

Appendix Notes

ⁱ 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.

ⁱⁱ This includes general education, special education, and English as a Second Language teachers.

ⁱⁱⁱ Some middle school teachers, including those who were new to their schools between 2001 and 2010, appeared multiple times in our analysis because they transferred 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 percent of the total number of all middle school teachers during the time period (27,636). Please see the technical documentation from the *The Middle School Teacher Turnover Project: A Descriptive Analysis of Teacher Turnover in New York City's Middle Schools* report (available on the Research Alliance website: <https://files.nyu.edu/RANYCS/public/media/2011001.pdf>) for additional descriptive information about the teachers in the study.

^{iv} Given the high correlation among existing measures of need (the percentage of students coming from poverty backgrounds, the amount of per pupil expenditures coming from federal Title I support, the percentage of students in a school scoring at or above the proficiency level on standardized state test scores, schools' DOE peer index value), we chose the DOE's peer index value for its ease of interpretation and because we had values on the measure across all middle schools in a recent year (2008). We considered any NYC middle school with a peer index value in the

bottom 25th percentile of the distribution to be a high-need school or a school that served high-need students.

^v Using the DOE's human resources datasets, we identified the observed rates of teacher turnover among new-to-school teachers in all of the high-need middle schools. From these observed values, we generated turnover statistics indicating the percentage of teachers who left within one, two, and three years after having first begun teaching in sample schools.

^{vi} Johnson, Berg, and Donaldson, 2005.

^{vii} After examining a variety of school-level characteristics (the previously described turnover statistics, the year the schools began enrolling students, the schools' borough location, peer index value, percent of students scoring at or above the proficiency on the state's English Language Arts and math exams, the number of students enrolled in a school, the percentage of those students from poverty backgrounds, the percentage of students from African American and Hispanic racial/ethnic backgrounds, the number of teachers, the percentage change in the number of regular education teachers between 2008 and 2009, the number of principals the school had between 2005-09, and when the school had a new principal), we attempted to find schools that were located in different NYC boroughs, and which had not experienced substantial principal turnover between 2005-09 and chose two high- and two low-teacher-turnover schools for the case study analysis.

^{viii} Singer and Willette, 1992; Singer and Willette, 2003;

^{ix} Singer and Willette, 1992.

^x 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 as a baseline covariate in all of our models.

^{xi} Similar methods have been used in these studies: Buckley, J., M. Schneider, and Y. Shang. (2005). "Fix It and They Might Stay: School Facility Quality and Teacher Retention in Washington, DC." *Teachers College Record* 107(5), 1107-1123. Ladd, Helen F. (2011) "Teachers' Perceptions of Their Working Conditions: How Predictive of Planned and Actual Teacher Movement?" *Educational Evaluation and Policy Analysis*, 33(2), 235-261.

^{xii} Pallas and Buckley, 2012

^{xiii} Johnson, Berg, and Donaldson, 2005.

^{xiv} 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 identified 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.

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