



# **The Cost of Teacher Turnover in Five School Districts: A Pilot Study**

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## **Abstract**

In this paper, we report the results of a pilot study of the cost of teacher turnover in five school districts. We examine the rate of turnover, the relationship between turnover and teacher and school characteristics, and the costs associated with recruiting, hiring, and training replacement teachers. We find evidence that turnover costs, although difficult to quantify, are significant at both the district and the school level. We also find that teachers left high minority and low performing schools at significantly higher rates. This has implications for the differential impact of the costs of teacher turnover on high-need schools. The relationship between teacher turnover and other school and teacher characteristics varied across the five school districts.

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## **Executive Summary**

### **The Cost of Teacher Turnover**

Low performing schools rarely close the student achievement gap because they never close the teaching quality gap – they are constantly rebuilding their staff. An inordinate amount of their capital – both human and financial – is consumed by the constant process of hiring and replacing beginning teachers who leave before they have mastered the ability to create a successful learning culture for their students.

Student achievement suffers, but high turnover schools are also extremely costly to operate. Trapped in a chronic cycle of teacher hiring and replacement these schools drain their districts of precious dollars that could be better spent to improve teaching quality and student achievement.

Several previous studies have attempted to estimate the costs, but the majority of the studies have not been based on actual cost data from specific districts. Instead the previous studies relied on turnover formulas derived from industry to estimate turnover costs in education. The size of these estimates is staggering. But because these estimates are not derived from a detailed analysis of actual school data, and because they do not provide school leaders with the specific management tools they could use to control costs, the findings of these previous studies have been downplayed by policymakers.

To overcome these problems, the National Commission on Teaching and America's Future (NCTAF) conducted a pilot study of actual cost data. The study provides school leaders with a detailed picture of the recruitment, hiring, and replacement costs in five school districts.

### **The Study**

NCTAF's pilot study quantifies the real costs of teacher turnover in five school districts. These districts, Chicago Public Schools (IL), Milwaukee Public Schools (WI), Granville County Schools (NC), along with Jemez Valley Public Schools and Santa Rosa Public Schools (NM), represent a range of communities, large and small, urban and rural. The study is summarized in the findings and recommendations below. The data collection and analysis protocol that was used in this study was the basis for the development of the NCTAF Teacher Turnover Cost Calculator that other schools and districts can use to estimate the costs they incur each year when teachers leave [[www.nctaf.org](http://www.nctaf.org)].

### **Key Findings**

#### **1. The costs of teacher turnover are substantial.**

In both small and large districts, the study found that the costs of recruiting, hiring, and training a replacement teacher are substantial. In Granville County, North Carolina, the cost of each teacher who left the district was just under \$10,000. In a small rural district

such as Jemez Valley, New Mexico, the cost per teacher leaver is \$4,366. In Milwaukee, the average cost per teacher leaver was \$15,325. In a very large district like Chicago, the average cost was \$17,872 per leaver. The total cost of turnover in the Chicago Public Schools is estimated to be over \$86 million per year. It is clear that thousands of dollars walk out the door each time a teacher leaves.

**2. Teacher turnover undermines at-risk schools.**

Low school performance and high poverty were correlated with high teacher turnover in both in the Milwaukee and Chicago Public Schools.

**3. At-risk schools spend scarce dollars on teacher turnover.**

Low performing, high minority, and high poverty schools expend scarce resources on teacher turnover. Because teacher attrition rates in these at-risk schools are chronically high, turnover costs become a drain on already scarce resources that could otherwise be invested to improve teaching effectiveness and student growth.

**4. At-risk schools could recoup funds by investing in teacher retention.**

An up-front investment in retaining teachers can reduce teacher turnover, and thus reduce the costs associated with teacher turnover. For example, Chicago Public Schools lose \$17,872 on every teacher who leaves the district. By implementing an effective retention strategy, such as a high quality induction program at a cost of \$6,000 per teacher, Chicago could reduce teacher turnover and save millions of dollars.

**5. Turnover costs *can* be identified, aggregated, and analyzed.**

Teacher turnover can be calculated and the costs associated with teacher turnover can be aggregated. When combined, this information allows districts to analyze which teachers are leaving, from where they are leaving, and how to invest in teacher retention in order to reduce turnover costs.

**6. District data systems are not designed to control the costs of turnover.**

Rather than providing access to relevant information, most district data systems stand as formidable obstacles to managing and controlling turnover. The costs of turnover are hidden in mounds of teacher records, school data, and district financial information. Without new, coherent data systems that break down the silos of existing systems, calculating the full cost of teacher turnover is difficult for many districts

**Recommendations**

**1. Invest in new teacher support and development**

Comprehensive induction programs have been proven to increase teacher retention and improve student achievement. The costs of such programs could be offset by the savings achieved through decreases in the costs of turnover.

## **2. Target comprehensive retention strategies to at-risk schools**

Teachers leave at-risk (low-income, high-minority, low-performing) schools at high rates. Retention initiatives in these schools have the greatest potential for a high return on investment, both in terms of resources and school performance.

## **3. Track teacher turnover and its costs annually**

In order to make sound decisions, school leaders and policymakers need data on teacher turnover and its costs. By tracking teachers and costs year by year, school leaders and policymakers will be able to determine where to invest in teacher retention and the impact of these investments.

## **4. Amend NCLB to hold school leaders accountable for turnover and its costs**

To ensure that every child has access to a school with a rate of teacher attrition and experience that is comparable to all other schools served by its local education agency, each local and state education agency should be required to publicly report the distribution of qualified teachers, the average years of teaching experience in each school, the annual rate of teacher and principal attrition, and the cost of that attrition for each school it serves.

## **5. Upgrade district data systems**

Most districts have huge collections of data on the cost elements associated with teacher turnover, but the current data systems stand in the way of accurate and timely analysis. Coherent data systems should be created to house cost data in a way that is easily accessible and analyzable. Teacher turnover data should be added to current systems and should be included in the design of new systems. With easily accessible data, districts could begin to analyze and manage teacher turnover and its costs. Robust data systems that provide sufficient information about teacher effectiveness in specific schools will also enable district human resource departments to be increasingly accountable for the retention of high quality teachers.

## **The Teacher Turnover Cost Calculator**

Using the data collection and analysis protocol from this study, NCTAF has created a Teacher Turnover Cost Calculator to make these findings accessible to school leaders and members of the public. Using the NCTAF Teacher Turnover Cost Calculator, educators and members of the public can estimate the dollars spent on teacher turnover for a specific school or school district anywhere in the country. The Calculator contains enough background information on this tool to enable school leaders to design and conduct their own detailed turnover cost analyses. NCTAF's Teacher Turnover Cost Calculator can be found at [www.nctaf.org](http://www.nctaf.org). At the site, NCTAF will host a Wiki for discussion and comparison of costs that have been calculated by users in communities around the country.

The Cost of Teacher Turnover Study examined teacher turnover and its costs in five school districts: Chicago Public Schools (CPS), Milwaukee Public Schools (MPS), Granville County Schools (GCS), Jemez Valley Public Schools (JVPS), and Santa Rosa Public Schools (SRPS). The goals of the study were to assist school leaders and inform policymakers by testing the feasibility of collecting actual turnover costs and providing a sense of the magnitude of these costs. This paper examines prior work on the cost of turnover, reports the results of the study, and presents several implications and recommendations based on the findings.

## **THE RATIONALE**

In recent years compelling evidence has emerged that teacher turnover is a significant problem affecting school performance and student achievement (Grissmer and Kirby, 1987 and 1997; Ingersoll, 2001). Drawing on the Schools and Staffing Survey (SASS) from the National Center on Education Statistics (NCES), the National Commission on Teaching and America's Future (NCTAF) reported in 2003 that approximately a third of America's new teachers leave teaching sometime during their first three years of teaching; almost half leave during the first five years. In many cases, keeping our schools supplied with qualified teachers is comparable to trying to fill a bucket with a huge hole in the bottom. Teaching is increasingly an "occupation with relatively high flows in, through, and out of schools" (NCTAF, 2003, 21-40).

Equally evident from the data is the differential impact of teacher turnover on schools (Center for the Future of Teaching and Learning, 2001; NCTAF, 2003). NCTAF's analysis of the SASS data found that teacher turnover is almost a third higher in low-income urban school districts (NCTAF, p. 28). Further confirmation of the relationship between teacher turnover and school characteristics comes from the largest analysis of school-level turnover conducted to date. The Southeast Center for Teaching Quality (SECTQ) used employment and teacher turnover data for 270,000 teachers in over 7,000 schools across five states - *every* school and *every* classroom teacher in those states. SECTQ found that "the highest rate of teacher turnover occurs in schools where 75% or more of the student body is eligible" for free and reduced price meals (SECTQ,

2003). For high poverty schools, the teacher turnover rate was 5.5% above the average. The same multi-state analysis of 7,000 schools found teacher turnover rates higher at low-performing schools than in other schools. For schools with low pupil achievement, the teacher turnover rate was 5.6% above the average. While the SECTQ study determined that teacher turnover varies with school performance, other studies establish a clearer link between teacher turnover and student achievement.

The NCTAF and SECTQ studies measured the impact of student performance on teacher turnover at the school level. Recent studies have supported the connection between student performance and teacher turnover. In a study of Texas students and teachers in grades 4-8, Hanushek et al. (2004) reported that the teachers in lower achieving schools tended to leave at higher rates than teachers in higher achieving schools. The study included hundreds of thousands of teachers and more than fifty thousand pupils and found that “teaching lower achieving students is a strong factor in decisions to leave Texas public schools, and the magnitude of the effect holds across the full range of teacher experience” (Hanushek, Kain, and Rivkin, 2004). This is not just a U.S. phenomenon. A large-scale study of teacher turnover in Norway reported that teachers of lower performing students were more likely to move or leave teaching (Falch and Ronning, 2005, 14).

These studies suggest that lower student achievement leads to higher teacher turnover. What about the impact of teacher turnover on student achievement? Studies of “teacher effects” demonstrate a strong relationship between teaching and student achievement gains (Sanders and Rivers, 1996; Wright, Horn and Sanders, 1997; Mendro, Jordan, Gomez, Anderson, and Bembry, 1998; Rivkin, Hanushek and Kain, 2005). These studies also argue that teacher effectiveness improves with experience during the early years of a teacher’s career (McCaffrey, Koretz, Lockwood, and Hamilton, 2003; Rivkin et al., 2005; Skolnik et al., 2002). Based on this research, it stands to reason that student achievement will suffer when students are continually faced with a parade of inexperienced teachers. In a vicious cycle, teacher turnover lowers student achievement, and lower student achievement leads to teacher turnover.

In addition to impacting student achievement, teacher turnover forces school districts and states to spend money on recruiting, hiring, and training replacements. While

it makes intuitive sense that high teacher turnover has significant financial consequences for the education system, there are few studies of what it costs to lose teachers. ***A key question is whether the costs associated with teacher turnover can, in fact, be identified and measured in a consistent manner.*** This question is the focus of the Cost of Teacher Turnover Study.

Most studies of teacher turnover costs have produced estimates that are quite large, ranging from 20 percent to 200 percent of the leaving teacher's salary (Table 1). However, because these estimates are based on incomplete methodologies, and because the estimates vary so widely, they have had little practical utility for policymakers. A recent—and welcome exception—is a 2006 paper by Shockley and his colleagues on the costs of teacher turnover in two Florida school districts.<sup>1</sup> For the most part, though, teacher turnover costs have only recently been a focus of education researchers.

A Texas analysis is the first large scale study to have addressed the topic of teacher turnover costs by using actual data on the rate of teacher turnover in public schools (Texas Center for Educational Research, 2000). The study was flawed, however, because it used an industrial model to estimate costs in schools, and because it failed to account fully for costs in its more in-depth study of three school districts. A Chicago study used three models for estimating teacher turnover costs, where the actual teacher turnover data was available for sixty-four elementary schools (ACORN, 2004). None of the models used actual costs, however, and the assumptions for estimating costs under each model produced widely varying results. A third study of turnover costs – based on a formula and not actual cost calculations – was produced by Breaux and Long (2003). The study drew on the work of human resource specialists in industry and concluded that the loss of a teacher costs nearly 2.5 times the teacher's initial salary in recruitment, personnel expenditures and lost productivity. In a 2005 policy brief on turnover costs, the Alliance for Excellent Education tapped a US Department of Labor estimate “that attrition costs an employer 30% of the leaving employee's salary”. The Alliance estimated national teacher turnover costs at \$4.9 billion, only about twice as high as the upper bound for the Texas report of annual costs *for Texas alone*.

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<sup>1</sup> Shockley, R., Guglielmino, P., and Watlington, E. (2006). *The Costs of Teacher Attrition*.

Table 1: Summary of Results from Earlier Reports and Studies

<b>Study</b>	<b>Area</b>	<b>Number of Teachers</b>	<b>Reported Turnover Rate</b>	<b>Claimed Cost of Teacher Turnover</b>	<b>Claimed Cost per Turnover</b>
Texas Center for Educational Research (2000)	Texas Public Schools	258,000	15.5%	Model 1: \$329M Model 2: \$2.1B	Model 1: \$8,227 Model 2: \$52,513
Chicago ACORN (2003)	64 Chicago Public Schools	2377	22.9%	Model 1: \$ 5.6M Model 2: \$42.2M Model 3: \$34.7M	Model 1: \$10,294 Model 2: \$77,574 Model 3: \$63,787
Breaux & Wong (2003)	Nation			Model 1: 2.5 x initial salary Model 2: 1.75 x initial salary	
Alliance for Excellent Education (2005)	Nation	2,998,795	13.1%	\$4.9B	\$12,546
Shockley et al. (2006)	2 Florida districts	Broward: 1206 St. Lucie: 320	Broward: 7.25% St. Lucie: 16.4%	Broward: \$15.3M St. Lucie: \$1.48M	Broward: \$12,652 St. Lucie: \$4,631

The most recent study of turnover costs is the only one that appears to make use of real cost data (instead of estimates derived from other fields). Shockley and his colleagues (2006) conducted a study of teacher turnover in two countywide Florida school districts. Broward County, where Fort Lauderdale is located, had a one-year turnover rate of 7.25% and an average cost of turnover per teacher of \$12,652. St. Lucie, on the other hand, had annual one-year turnover of 16.4% and a cost per teacher of \$4,631. The authors explain the differential turnover costs this way: “A possible explanation ... is the infrastructure investment that the Broward County School System is making in their teacher/induction support system” (Shockley et al., 2006, 6). This is a plausible and highly interesting association of induction, lower turnover, and higher costs per teacher. The paper does not discuss directly the cost of induction, but the authors did collect detailed expenditure information from the two districts (personal communication, Sept. 14, 2006).

These studies have made contributions by establishing the possible scope and scale of teacher turnover costs, but important empirical work remains to be done. Since many of the approaches estimate teacher turnover costs using either borrowed, but untested, formulas, or calculate turnover costs from incomplete data on actual costs, work on the cost of teacher turnover must move to the next level by implementing a protocol for collecting actual turnover cost data. Shockley and his Florida colleagues have made an important contribution here. It seems reasonable to think that accurate data on the true magnitude of turnover costs will provide district and state policymakers with a strong basis for data-based decisions that help them to manage the costs of turnover.

## **THE STUDY**

To strengthen the existing knowledge base, NCTAF conducted a cost of teacher turnover study in five school districts. The study sought to determine how several variables impact teacher turnover and attempted to calculate actual district costs associated with teacher turnover. To accomplish these goals, we first developed a working definition of teacher turnover, cost categories associated with turnover, and several hypotheses.

### **Defining teacher turnover**

The starting point for this and other research on teacher turnover is a clear definition of what is meant by the term. In 2003-04, NCTAF worked with a national research panel through a project funded by the Rockefeller Foundation to develop a working definition of teacher turnover. This definition builds on the work of Richard Ingersoll (Ingersoll, 2001 and 2003; Ingersoll and Smith, 2003) and on the analyses and policy recommendations made by NCTAF in its 2003 report, *No Dream Denied: A Pledge to America's Children*. The definition of teacher turnover has three dimensions:

- ***Within-District Movers:*** Teachers employed in a classroom teaching role in a school in Year 1 (e.g., 2002-03) who are employed as classroom teachers at a

different school *in the same district* in Year 2 (e.g., 2003-04), constitute a group defined as “cross-school, within-district movers”;

- ***Cross-District Movers:*** Teachers employed in a classroom teaching role in a school in Year 1 who are employed as classroom teachers at a different school *and a different district* in Year 2, are described by NCTAF as “cross-school, cross-district movers”;
- ***Leavers:*** Teachers employed in a classroom-teaching role in a school in Year 1 and not employed as classroom teachers *in any district* in Year 2 are described as “leavers”.

Different researchers utilize different combinations of these three groups. Krieg’s analysis of teacher turnover and pupil achievement in Washington State focuses only on teachers who leave the profession (Krieg, 2004). Feng’s study of public school teachers in Florida describes the same kinds of teacher turnover employed by this paper (Feng, 2005, 2), but concentrates on leavers because “migration does not represent a net loss in the total supply of public school teachers” (Feng, 3). Scafidi and his colleagues make the same choice in their Georgia study of whether teachers leave the classroom for higher paying jobs (Scafidi et al., 2003). Like Ingersoll (2003), we define teacher turnover as the combined total of those who *move* and those who *leave*, although our base of reference in defining these measures is the individual district. Thus we define movers as within-district movers only, and leavers as those who leave the district, whether to teach in another school outside the district or to leave teaching altogether. Like Ingersoll, we reason that movers and leavers have the same impact on the specific school whose employment they depart from, whether or not they exit the profession.

### Cost categories

In initial work with the national research panel, NCTAF identified eight cost elements that must be considered when examining the actual cost of teacher turnover. These cost elements were refined during discussions with the participating school

districts. Some costs are direct expenditures (e.g., advertising, recruiting, and hiring incentives). Others derive from the proportional value of time spent by school or district administrators interviewing teacher candidates, doing outplacement, and so on. Similarly, the locus of costs varies by the nature of the activity. Some costs occur at the school level, while others occur at the district level (Hertert, 1995; Miles and Roza, 2002). The eight cost categories are:

1. ***Recruitment and Advertising***, including the cost of advertising space, the cost of travel to job fairs and interview sites, the design of advertising formats, website design and development costs, posting information on recruitment websites, responding to inquiries from prospective candidates, coordinating recruitment activities with state programs, working with teacher preparation programs to identify strong candidates, training student teachers, special costs associated with overseas recruiting, etc.
2. ***Special Incentives***, including signing bonuses, payment of moving expenses, salary supplements, housing allowances, rent subsidies, relocation bonuses, day care subsidies, reduced teaching loads, etc.
3. ***Administrative Processing*** of new hires and costs associated with separation, including criminal background checks, health record checks, reference checks, meeting with candidates and members of search committees, completing affirmative action paperwork, corresponding with applicants, drafting letters of acceptance/rejection, setting up interview and visitation schedules, purchasing equipment for digital fingerprinting, archiving teacher records, adding new teachers to payroll and benefit programs, conducting exit surveys, removing teachers from payroll and health plans, processing refunds of retirement contributions that may be due, etc.
4. ***Training for New Hires***, including introducing new hires and teacher transfers to school goals and governance procedures; integrating new hires into the community of other teachers, staff, parents, and students; explaining benefit programs; conducting tours of facilities and school resources; etc.

5. *Training for First-Time Teachers*, including mentoring programs and related forms of structured induction, stipends for mentors, payments to substitutes who replace mentors with reduced teaching loads, travel to training sessions, etc.
6. *Training for All Teachers*, including instruction on the goals and specific elements of the state's testing programs, training mentor teachers, workshops and professional development activities, salaries for substitutes used to cover for teachers at training activities, tuition and fees reimbursements, travel to professional meetings, etc.
7. *Learning Curve*, including the cost to student learning at the school that results from having new teachers each year and from having a teaching staff with little experience.
8. *Transfer*, including paperwork to change a teacher's school sites, time and effort spent matching a teacher with a new school, salaries for substitutes used to cover for teachers who transfer during the school year, etc.

While some costs, such as recruitment, are only incurred when a teacher leaves the district, other costs are incurred for both movers and leavers. For instance, school-based orientation programs for new hires are necessary for all new teachers, even if they move from one school in a district to another school in the same district. This is not true of professional development costs at the district level. Movers carry their professional development training from one school to another and such a move does not cost the district additional professional development funds, although changes in teaching assignments and other activities unique to a new school may alter the nature and content of professional development that teachers will require. The cost categories are more rigid than the reality at the school and district level, and this presented a challenge to collecting accurate costs.

### Hypotheses

The literature on teacher turnover discussed earlier supports the view that **teacher turnover has significant learning and monetary costs for school districts**. Drawing on previous work, therefore, the NCTAF study tested the following hypotheses:

1. ***Turnover costs can be identified, aggregated, and analyzed at the district and school level.*** Previous efforts have attempted to estimate the costs of teacher turnover. Few school districts or states currently have the tools to track their teacher turnover; fewer still have the tools to track or control their turnover costs. As a result, the data and tools needed to understand how a school district's financial resources could be saved through reductions in the incidence and costs of teacher turnover, and redirected to investments in teacher support systems, simply do not exist. This pilot study examined the process of collecting and making sense of turnover costs.
  
2. ***Turnover costs will vary by school type*** (urban/rural, rich/poor, high achieving/low achieving). This hypothesis drove the selection of school and district sites for the data collection and analysis—explained in the next section of this paper. We expect that turnover costs are lowest in suburban schools, but it is not entirely clear whether to expect urban turnover costs to be higher or lower than those in rural schools and districts. At the school level, the study tests the argument that turnover costs are higher in urban schools, higher in poor schools (as measured by student participation in the school lunch program), and higher in low-achieving schools.
  
3. ***Higher performing schools will have lower levels of teacher turnover, and conversely, lower performing schools will have higher levels of teacher turnover.*** Even after controlling for a wide variety of school, teacher, and context variables, studies by Hanushek et al. and others find a strong “rookie teacher” effect. Teachers in their first few years of teaching do not perform as well as teachers with a few years experience. This indicates that schools with high turnover and high percentages of new teachers will have lower student achievement than schools with less new teachers. The NCTAF study design includes low- and high-performing schools, calculates their respective turnover rates, and measures the costs per teacher and per school.

4. *Schools with higher turnover rates will have correspondingly higher costs of turnover.* Although this is a logical expectation, the nature and strength of the relationship have not been tested. School-level data on turnover cost permit us to test this hypothesis.

Because of the size of the pilot study and data limitations discussed in this report, we were not able to adequately test all of the hypotheses. For instance, the pilot study contained only urban and rural districts. The absence of suburban districts meant that we could not test the variance of turnover costs across urban, suburban, and rural districts.

### Key Findings

Through our work with the five school districts, several things have become clear:

1. **Turnover costs can be identified, aggregated, and analyzed, but current data systems make this process a difficult one.**

This report will provide a sense of the costs of teacher turnover, the shortcomings of district data capacity, and the need for improvements in this capacity so that the impact of teacher turnover can be measured and understood.

2. **The costs of teacher turnover are substantial, in some cases at a level that surprised district leaders.**

Through the process of determining the cost of turnover, district leaders realized the wide ranging impact of teacher turnover. Prior to the study, districts did not know what teachers were leaving or how this turnover impacted district resources.

3. **A correlation exists between teacher turnover and school characteristics such as student achievement and race.**

We delve into the process and the results that led to these findings, and then discuss the implications for school leaders and policymakers.

## **THE PROCESS**

The five study sites include two urban school districts (Chicago Public Schools (CPS) and Milwaukee Public Schools (MPS)), one countywide suburban district (Granville County Schools (GCS)), and two quite small rural districts (Jemez Valley Public Schools (JVPS) and Santa Rosa Public Schools (SRPS)). With the active participation of officials from each district, three databases were created to house data on teachers, schools, and costs.

The first of the three databases houses information on individual teachers. This **Teacher Database** includes a teacher identifier to link with district databases. The second database, the **Schools Database**, holds information on each school in the study. We also have obtained the numerical school identification codes for each school in all five districts. This identifier links each school to the federal Common Core of Data (CCD) at the National Center for Education Statistics (NCES). CCD is a source of a wide range of information about each school. The third database, the **Costs Database**, contains the disaggregated components of turnover costs. Sorted by cost category, the database permits project researchers to derive total annual costs of turnover at the school and district level. It also enables various other calculations important to the determination of turnover costs.

### **Data Collection**

By design, the three databases permit turnover rates and turnover costs to be measured in a common way, and identify key variables that would explain differences in rates and costs within and among districts. Researchers and district personnel began collecting data in the spring of 2005. Data on costs were collected for the 2003-04 fiscal year. Because resources expended in the 2003-04 year were based on turnover that occurred in the *previous* year, the data on teachers and schools were collected for the 2002-03 and 2003-04 school years. The overarching goal was to collect the most recent data available without having to rush the normal data collection cycles of the schools and districts.

While this decision ensured that the data of interest would be potentially available at the district level, it did not mean that all of the data would be available according to common definitions and accessible in the formats sought. For that reason, the decision was made to visit each district in order to discuss the definitions, formats and idiosyncrasies of the local data. Pre-data collection visits were conducted to all five districts over a two-month period. Discussions typically involved the chief human resources officer, the accountability officer, a researcher or data director, and other key district level leaders. In Granville County, the district superintendent and the chief financial officer were both included, a decision that in hindsight suggests boosted support for the project and commitment to complete all of the various data collection tasks. Instructions for the data collection reflected the protocols and definitions agreed to during the site visits, and were distributed after the district meetings.

The results of the data collection were impacted by the structure of the pilot study in several ways. First, the study examined one year of data. There may be variation from one year to the next in terms of teacher turnover and costs, and the study simply provides a snapshot of each of the five districts. Second, the rural districts are very small and this must be kept in mind when interpreting the data. For instance, JVPS had one reading teacher in 2002-03. The turnover rate will either be zero or 100 percent depending on the decision of the sole reading teacher. This turnover rate is important to JVPS, but the sample size is too small to allow for meaningful generalizations. The issues of a data snapshot and small rural sample size arise throughout our discussion of the data.

It bears underscoring that the purpose of the CTT study in its first phase was to demonstrate the feasibility of collecting requisite data at the district level. Therefore, the process of collecting the data is as important, if not more important, than the results. This is evident from several of our findings and recommendations, which are directed at making the calculating of teacher turnover and its costs more efficient, accurate, and systematic. With the data districts were able to provide, we draw preliminary conclusions about the extent of turnover, the factors that influence it, and the costs associated with it. This report is an examination of what we learned, but it is also a preview of what school leaders and policymakers could learn from analyzing the costs of teacher turnover. We first present the results of the data on teachers, schools, and costs, and then discuss the

implications of these results. We begin with a discussion of the data collected on teachers.

## **TEACHERS**

Districts provided individual teacher identifiers that were used to link records from 2002-03 to 2003-04. NCTAF and district staff shared an understanding that no individual data would be released; that all analyses would present data only in aggregate form; and that individually identifiable data would be destroyed at the conclusion of the study.

Turnover was defined as being employed by a particular school as a teacher in the base year of 2002-03, but not in the follow-up year record for 2003-04. *At the school level, therefore, turnover is the sum of within-district movers and out-of-district leavers.* This means that turnover for the district was calculated as the sum of the number of teachers who turned over at each school in the district. All districts submitted data that permitted the calculation of turnover rates. Unlike the other districts, CPS included both full and part-time teachers at the district level in its data submission. While all of the CPS teachers were labeled as full-time, a comparison with New Teacher Center data from CPS revealed that over 1,400 of the teachers were actually part-time. When examining the CPS teacher data, it is important to keep in mind that it includes both full and part-time teachers. Table T-1 displays the number of teachers in the study from each participating district for the 2002-03 base year.

Table T-1: Teacher Population for the Study, 2002-03

	<b><u>Teachers</u></b>
<b>CPS</b>	25,300
<b>MPS</b>	6,139
<b>GCS</b>	532
<b>JVPS</b>	41
<b>SRPS</b>	58

Some data about teachers in these districts needed to analyze turnover were missing, incorrect, or incomplete. PRAXIS and other licensure test scores, which might

be viewed as measures of teacher quality, were not available from any of the five district files even though district officials during local site visits with NCTAF staff had generally believed that they were probably available somewhere in their records. During site visits, district officials were certain that other measures of teacher quality such as the undergraduate or graduate grade point averages were certainly not available and therefore were not part of the data request. Thus, the district level data contained no information on common measures of teacher quality.

The CTT project also sought data on turnover by *teaching* field in order to see whether turnover in mathematics, science, special education, and foreign language are higher than in other fields. Because licensure areas and subject assignment codes varied widely in how they were captured by district data sets, participating districts defined 12 aggregated categories, and a 13<sup>th</sup> “other” category.

Districts were asked to report each teacher’s areas of licensure/endorsement and subject areas taught, using these categories. Recognizing that teachers often have multiple endorsements and teaching assignments, space was provided for up to three fields for each variable. In addition, space for up to two college majors was provided. This data collection strategy produced three measures of a teacher’s field: area of endorsement, subject of teaching assignment, and college major.

**Table T-2: Availability of Teacher Data by School District**

<b>Variable</b>	<b>All</b>	<b>CPS</b>	<b>MPS</b>	<b>GCS</b>	<b>JVPS</b>	<b>SRPS</b>
Age	95.9	96	95.3	94.2	100	93.1
Race/Ethnicity	99.9	100	99.5	99.4	100	100
Gender	100	100	100	100	100	100
Undergraduate Major <sup>2</sup>	81.9	100	0.0	100	100	100
Total Years Experience <sup>3</sup>	100	100	100	100	100	100
Years of Experience in School	81.8	100	0.0	99.6	97.6	93.1
Area of Endorsement <sup>4</sup>	97.7	97.1	100	94.9	100	100
Subject Assignments	1.8	0.0	0.0	88.9	100	100
Grade Level <sup>5</sup>	81.9	100	0.0	100	100	100

<sup>2</sup> CPS reported that 84% of teachers possessed an undergraduate degree in Elementary Education/Other.

<sup>3</sup> The MPS data system capped teacher experience at 16 years.

<sup>4</sup> CPS reported that 97% of teachers were endorsed in Elementary Education/Other; MPS reported that 48% of teachers were endorsed in Other; and SRPS reported that 70.7% of teachers were endorsed in Other.

<sup>5</sup> CPS reported that all teachers taught at elementary schools.

Mentoring Role <sup>6</sup>	81.9	100	0.0	100	100	100
Own Classroom	1.9	0.0	0.0	95.3	100	100
Highly Qualified (NCLB Requirement) <sup>7</sup>	20.7	0.0	100	85.3	100	0.0
Highest Earned Degree	99.6	99.6	100	98.3	100	100
Student Contacts/week	1.8	0.0	0.0	99.1	95.2	0.0
Salary/Comp	100	100	100	100	100	100
Licensure Test Scores	0.0	0.0	0.0	0.0	0.0	0.0

Table T-2 shows significant gaps in data provided for field of study and subject assignment. For example, in the case of the undergraduate major, MPS had no data to report, while CPS reported (erroneously, we surmise) that 84 percent of their teachers had majored in elementary education or in “other”. Similarly, the two urban districts were unable to report the subject assignments of their teachers. In order to deal with flaws in the data related to teaching and licensure fields in the multivariate analysis, the NCTAF staff created a *teaching field variable* for any teacher whose record included any data on teaching assignment, licensure/endorsement area, or major field of study.

Districts reported partially incomplete or inaccurate data for other teacher variables, such as whether teachers were serving as a mentor, whether they were highly qualified, whether they taught in their own classroom, or what grade level they taught. As a result, the study cannot incorporate these measures of interest into our analysis of turnover rates and costs. MPS was not able to provide data on any of these variables while CPS had no information on whether teachers were highly qualified (data were not available in 2002-03 and 2003-04) or had their own classroom, and they reported all teachers as teaching at the elementary level and as having no mentoring role. Thus, the largest districts could not provide good and complete data on any of these four variables.

During early discussions with district-level personnel, each variable was identified as a possible influence on teacher turnover. District-level staff agreed to provide as much of the data as their data systems could provide. What Figure 3 makes clear is that their data systems either did not contain the data, or they could not provide easy access to the data. CPS, for example, reported that they stored personnel data in 38

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<sup>6</sup> CPS reported no mentors.

<sup>7</sup> MPS reported that all teachers were highly qualified under the No Child Left Behind Act.

separate “program level” databases that, for the most part, were kept isolated and were often restricted to subgroups of employees. Even though this urban district was installing a new integrated personnel system that would tap some of their old legacy data systems, they mostly looked forward to having better data. Given all of the missing data for MPS, it is clear that their systems were even more limited, given the data requirements of the study. By contrast, Table T-2 indicates that data on teachers’ age, race/ethnicity, gender, and highest earned degree were available and reliable.

On reflection, we believe that an important determinant of whether a school district had data on a variable of interest is whether it is used to determine teacher position on the salary scale. For example, virtually all districts were able to report the level of the highest earned degree—baccalaureate or masters or above—because it was needed to establish placement of individual teachers on the district salary grid. However, information about specific major was often missing. Similarly, because information on total years of experience was needed to determine position on the salary scale, districts were able to report these figures. However, they often were unable to report teacher years of experience *at a particular school*.<sup>8</sup> On balance, Table T-2 indicates that years of teaching experience and degree level are complete for all districts, but years of teaching experience data may not always be precise.

Finally, despite the fact that there was variation in the availability and comparability of **salary and fringe benefits data**, all districts were able to report this information. We sought data on *actual* salary and fringe benefits paid to each teacher, believing this is the most accurate way to gauge the impact of compensation on turnover. However, the varied ways in which districts housed salary and fringe benefit information produced data that was comparable within districts but not across districts. This is an area where more precision in data definitions, data systems, and data reporting by districts would permit these costs to be taken into account fully in calculating teacher turnover costs.

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<sup>8</sup> Interestingly, the relationship between data availability and salary scales did not guarantee that data on years of experience would be accurate since the reported years of experience was always the number negotiated during the hiring process, rather than the actual number. Moreover, more than one district capped the number of years of teaching experience at the level in which the salary scale flattened. Notice that MPS reported no teachers with more than 16 years of teaching experience, a consequence of this practice. CPS initially reported no teachers with fewer than four years of experience, but was able to correct the data on a later submission.

## Results

Our analysis of the teacher data starts with descriptive statistics and bivariate relationships between turnover and each teacher variable of interest (see Figure 3), and then proceeds to multivariate analyses employing Ordinary Least Squares (OLS) and Logistic Regressions. In all cases, we use data from 2002-03, the baseline year for our calculations of teacher turnover and the cost of turnover. Of the teacher variables, low levels of teacher experience were closely correlated with high rates of teacher turnover. The other teacher variables provide interesting information about the teacher workforce in the five districts but were not found to be correlated with teacher turnover.

### *Teacher Turnover*

The teacher turnover rate equaled or exceeded the national average of 16 percent in all five school districts.<sup>9</sup> The data show that over 30 percent of teachers in CPS moved to another school or left the district between 2002 and 2003, although the inclusion of part-time teachers most likely inflated the turnover rate.<sup>10</sup> In JVPS, over 40 percent of teachers in 2002 were no longer in the district in 2003, with most of these teachers having left the district. MPS and GCS had similar rates of turnover, although the districts differed in the rate of movers and leavers.

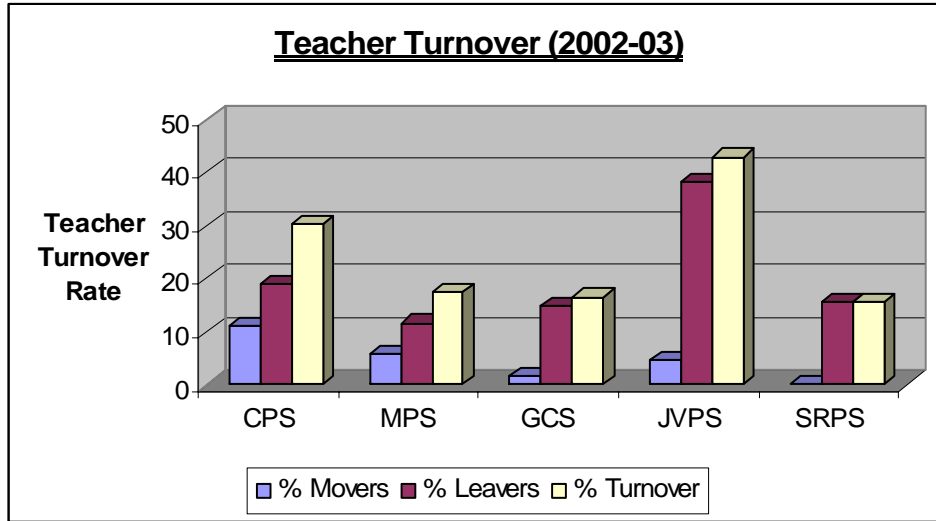
Table T-4: Teacher Turnover Rate, 2002-03 to 2003-04

	<u>Movers (%)</u>	<u>Leavers (%)</u>	<u>Turnover (%)</u>
<b>CPS</b>	11.0	19.1	30.2
<b>MPS</b>	5.8	11.6	17.4
<b>GCS</b>	1.7	14.8	16.5
<b>JVPS</b>	4.8	38.1	42.9
<b>SRPS</b>	0	15.5	15.5

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<sup>9</sup> Ingersoll, R. & Perda, D. (2006). *What the data tell us about shortages of mathematics and science teachers*, p. 46.

<sup>10</sup> In examining data on full-time CPS teachers, the New Teacher Center found a 23% turnover rate between 2002-03 and 2003-04.



The turnover rate gives districts a general idea of how many teachers leave or move from one year to the next. But the turnover rate does not allow districts to examine who is leaving. For that, we collected data on teacher characteristics and analyzed the relationship between these characteristics and teacher turnover.

### *Gender*

In general, all five teaching workforces were overwhelming female—as is the teacher workforce nationally (75% female in 1999-2000).<sup>11</sup> At the same time, however, our two small rural districts had significantly higher proportions of male teachers than the urban districts and GCS.

Table T-5: Teacher Gender, 2002-03

	<b>CPS</b>	<b>MPS</b>	<b>GCS</b>	<b>JVPS</b>	<b>SRPS</b>
<b># of teachers</b>	25,300	6,139	533	42	58
<b>Female (%)</b>	77.5	75.2	78.4	66.7	60.3
<b>Male (%)</b>	22.5	24.8	21.6	33.3	39.7

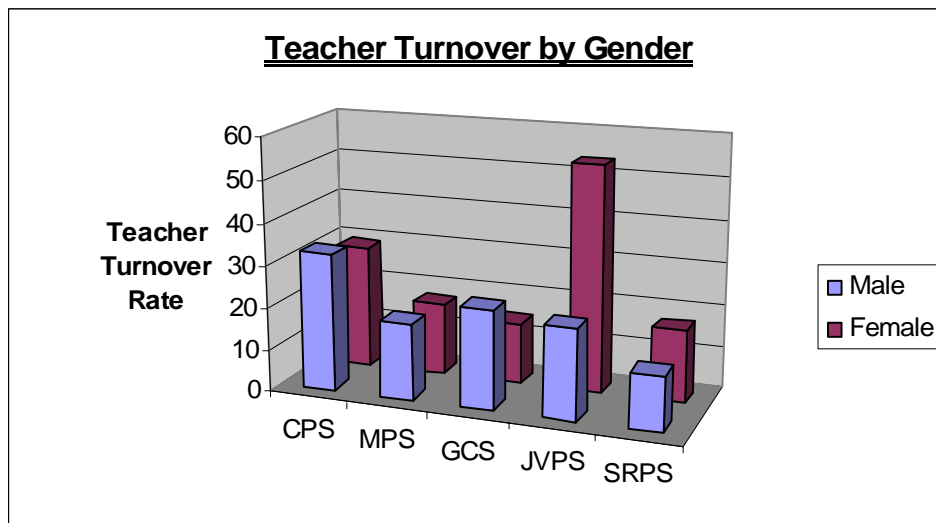
In terms of teacher turnover, there was a noticeable difference between the turnover of female and male teachers in two of the smaller districts. In JVPS, male

<sup>11</sup> National Center for Education Statistics, *Fast Facts (1999-2000)*.

teachers were much more likely to stay. In GCS, female teachers were more likely to stay than their male counterparts. As previously mentioned, the small size of these districts necessitates cautious interpretation of the data. In the large urban districts, turnover was fairly equivalent for male and female teachers. Overall, the turnover rate was slightly higher for male teachers (29.5% to 26.9%), but the difference was not statistically significant.

**Table T-6: Teacher Turnover Rate by Gender**

	<b>Male</b>	<b>Female</b>
<b>CPS</b>	32.7	29.4
<b>MPS</b>	18.3	17.2
<b>GCS</b>	23.5	14.6
<b>JVPS</b>	21.4	53.6
<b>SRPS</b>	13	17.1



*Race/Ethnicity*

Nationwide, there has been concern about a growing disconnect between the number of minority students and the number of minority teachers.<sup>12</sup> With respect to teacher ethnicity, the data show a great deal of variation among the five districts—

<sup>12</sup> National Education Association (NEA), *NEA and teacher recruitment: An overview*; and Rodriguez, J.V. (2000), *Minority teacher shortage plagues region, nation*.

although again, the small size of the two rural districts suggests caution in interpreting these data.

Table T-7: Teacher Ethnicity, 2002-03

	<b><u>CPS</u></b>	<b><u>MPS</u></b>	<b><u>GCS</u></b>	<b><u>JVPS</u></b>	<b><u>SRPS</u></b>
<b># of teachers</b>	25,300	6,139	533	42	58
<b>Black (%)</b>	39.5	19.8	18.9	0	0
<b>Hispanic (%)</b>	12.5	5.4	0.6	23.8	82.8
<b>White (%)</b>	45.1	72.5	79.9	69.0	13.8
<b>Other (%)</b>	3.0	1.9	0	7.2	3.4
<b>Missing (%)</b>	0	0.5	0.6	0	0

However, it is clear across the school districts that the percentage of minority students is larger than the percentage of minority teachers. All of the districts except for SRPS have at least a 25% gap between the percentage of minority students and the percentage of minority teachers.

Table T-8: Student and Teacher Ethnicity, 2002-03

	<b><u>CPS</u></b>	<b><u>MPS</u></b>	<b><u>GCS</u></b>	<b><u>JVPS</u></b>	<b><u>SRPS</u></b>
<b>Minority Students (%)</b>	90.8	84.3	45.2	86.6	95.3
<b>Minority Teachers (%)</b>	55	27.1	19.5	31	86.2

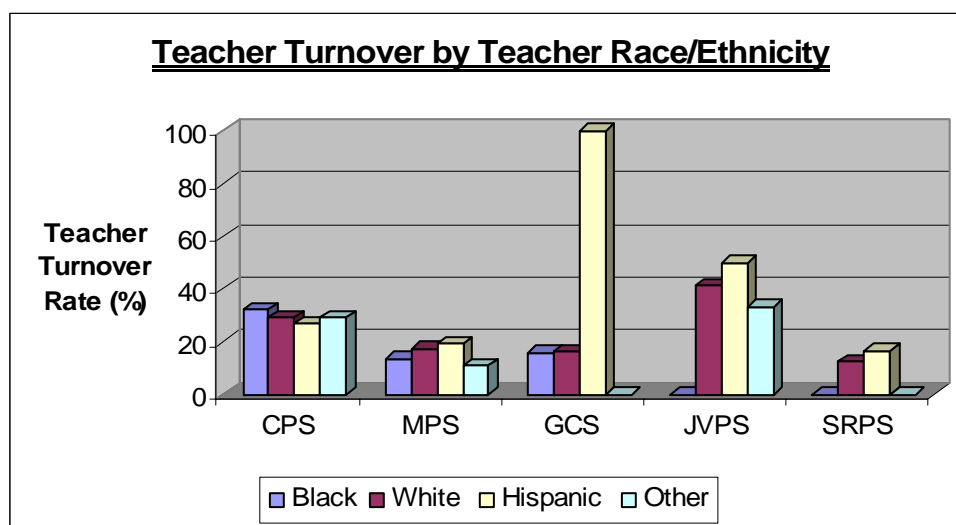
The rate of teacher turnover varied slightly across categories of race and ethnicity. In CPS, black (32%) teachers were more likely to turnover than white (29%) or Hispanic (27%) teachers. Interestingly, black teachers in CPS were less likely than their white colleagues to leave the district (18% to 20%) and more likely to move to a new school within the district (14% to 9%).<sup>13</sup> In MPS, black teachers were less likely to turnover than their white and Hispanic colleagues (14% to 17% and 19%, respectively). The GCS turnover rate was equal for black and white teachers. The high GCS turnover rate for Hispanic teachers is due to the fact that all three Hispanic teachers in GCS either left the district or moved to a new school between 2002-03 and 2003-04. In general, the teacher turnover rate did not vary significantly due to teachers' race and ethnicity.

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<sup>13</sup> The mover rate accounts for the higher turnover rate among black teachers in CPS. Fourteen percent of black teachers moved to a different school within the district, while only 9% of white teachers and 10% of Hispanic teachers moved.

T-9: Teacher Turnover Rate by Teacher Race/Ethnicity

	<b>Black</b>	<b>White</b>	<b>Hispanic</b>	<b>Other</b>
<b>CPS</b>	32.3	29.3	26.6	28.9
<b>MPS</b>	13.5	17.4	19.3	11.1
<b>GCS</b>	15.8	16	100	0
<b>JVPS</b>	-	41.4	50	33.3
<b>SRPS</b>	-	12.5	16.7	0



*Teacher Age and Experience*

There has been a great deal of national conversation about the impact of age and experience on teacher retention. Despite evidence that retirement is a small factor in overall teacher turnover (Ingersoll, 2001; NCTAF, 2003), the aging of the teacher workforce has to be considered in seeking to understand teacher turnover and its public policy implications.

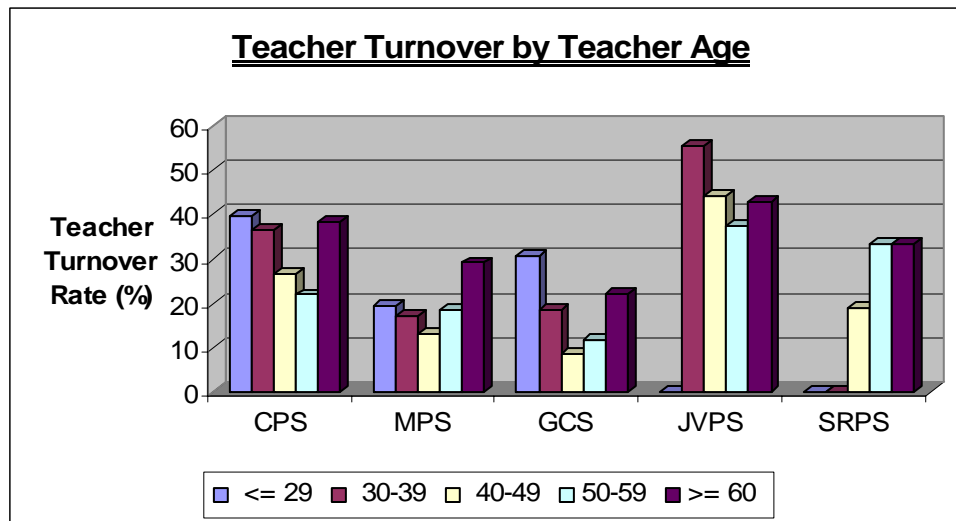
Table T-10: Teacher Age, 2002-03

	<b><u>CPS</u></b>	<b><u>MPS</u></b>	<b><u>GCS</u></b>	<b><u>JVPS</u></b>	<b><u>SRPS</u></b>
<b># of teachers</b>	25,300	6,139	533	42	58
<b>Pct. &lt;29</b>	7.4	11.5	17.8	2.4	5.2
<b>Pct. 30-39</b>	20.7	25.8	22.5	21.4	25.9

<b>Pct. 40-49</b>	16.4	21.8	23.6	21.4	36.2
<b>Pct. 50-59</b>	33.6	30.0	22.5	38.1	20.7
<b>Pct. &gt;60</b>	18.0	6.1	7.7	16.7	5.2
<b>Pct. Missing</b>	4.0	4.7	5.8	0	6.9

T-11: Teacher Turnover Rate by Teacher Age

	<= 29	30-39	40-49	50-59	>= 60
<b>CPS</b>	39.9	36.4	26.5	21.9	38.5
<b>MPS</b>	19.4	17	12.9	18.4	29.1
<b>GCS</b>	30.5	18.3	8.7	11.7	22
<b>JVPS</b>	0	55.6	44.4	37.5	42.9
<b>SRPS</b>	0	0	19	33.3	33.3



In addition to having few teachers in general, both of the small rural districts have very few teachers under the age of 30. Therefore, it is not surprising that the turnover levels in the rural districts were nonexistent for young teachers. In terms of teacher age, the urban districts and GCS had similar patterns of turnover. The youngest and the oldest teachers left at the highest rates, while middle aged teachers were most likely to stay.

The high turnover of young teachers indicates that a relationship exists between turnover and teacher experience. To examine this relationship, school districts reported data on *total teaching experience* and for teaching experience *at the current school* (Table T-12). Clearly, the teaching population has moved from school to school during

their careers—with only about half of total teaching experience taking place in the school where they were employed in 2002-03. In CPS, the differential between school and overall teaching experience was even larger. This large differential could be the result of two factors: the movement of experienced teachers from other districts and the movement of experienced teachers from school to school within CPS.

Table T-12: Total and School Teaching Experience, 2002-03<sup>14</sup>

	<u>CPS</u>	<u>MPS</u>	<u>GCS</u>	<u>JVPS</u>	<u>SRPS</u>
<b>Average Teaching Experience</b>	12.6	8.7	12.3	12.3	12.3
<b>Average Teaching Experience at Current School</b>	3.5	-	6.7	5.6	7.1

Table T-13: Teacher Experience, 2002-03

	<u>CPS</u>	<u>MPS</u>	<u>GCS</u>	<u>JVPS</u>	<u>SRPS</u>
<b>&lt;1 year (%)</b>	7.1	9.6	7.9	2.4	5.2
<b>1-3 years (%)</b>	17.0	17.9	17.4	14.7	5.2
<b>4-5 years (%)</b>	7.3	10.0	9.2	12.2	12.1
<b>6-10 years (%)</b>	22.0	18.3	15.6	17.1	29.3
<b>11-20 years (%)</b>	20.2	44.2	26.1	36.6	24.1
<b>&gt;21 years (%)</b>	26.4	0	23.8	17.1	24.1

Table T-12 shows the distribution of teachers by level of total teaching experience. A comparison of Tables T-10 and T-13 shows a slight disconnect in the expected relationship between age and teaching experience. We might have expected to see roughly the same proportions of teachers younger than 30 who also had fewer than five years of teaching experience. In fact, however, this is not the case. For instance, 31 percent of CPS teachers had five years of experience or less but only eight percent of

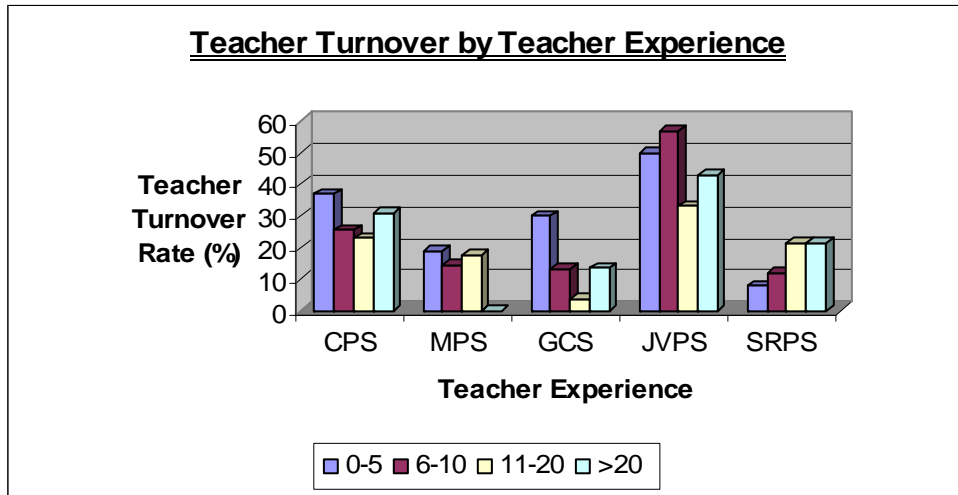
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<sup>14</sup> Certain districts (such as MPS) cap the amount of experience that will be recognized for teachers transferring from other districts. In addition, districts sometimes offer a “bump” on the salary schedule (and a subsequent bump in the recorded experience level) in order to recruit teachers. This means that district files on teacher experience contain data about individual teachers that may not match actual teaching experience. At the same time, the distortions between actual and recorded teaching experience are systematic within each district, not random—for the reasons discussed. This suggests that comparisons of teacher experience and turnover rates *within districts* can be instructive.

CPS teachers were under the age of 30. Similarly, 37 percent of MPS teachers had five years of experience or less but only 12 percent of MPS teachers were under the age of 30. This disparity is most likely due to mid-career changers, most of whom are older than 30 and enter the profession with little teaching experience.

**T-14: Teacher Turnover Rate by Teacher Experience**

	<b>0-5 yrs</b>	<b>6-10 yrs</b>	<b>11-20 yrs</b>	<b>&gt;20 yrs</b>
<b>CPS</b>	37	25.7	23.1	31.1
<b>MPS</b>	18.8	14.5	17.6	-
<b>GCS</b>	29.9	13.3	3.6	13.4
<b>JVPS</b>	50	57.1	33.3	42.9
<b>SRPS</b>	7.7	11.8	21.4	21.4



In terms of turnover by teacher experience, the small rural districts show a great deal of variation, while the larger districts follow a similar pattern. The small amount of data from a single year makes analysis of the rural districts difficult, but it does appear that JVPS struggled to retain teachers with less than 10 years experience and SRPS struggled to retain experienced teachers. In the larger districts, teachers with five or less years of experience turned over at the highest rate. CPS also lost a high percentage of teachers with twenty or more years of experience. Presumably this turnover is mainly due to retirement, but the data did not allow analysis of turnover decisions. The graph of MPS turnover clearly shows the impact of the way MPS caps experience at 16 years. We

presume that the turnover for teachers with 11 to 20 years of experience would be lower, and the turnover for teachers with 20 years or more would be higher, if the experience level of teachers was not capped at 16 years in MPS's data system. Despite this data quirk, it is clear that teacher turnover is highest among teachers with little teaching experience.

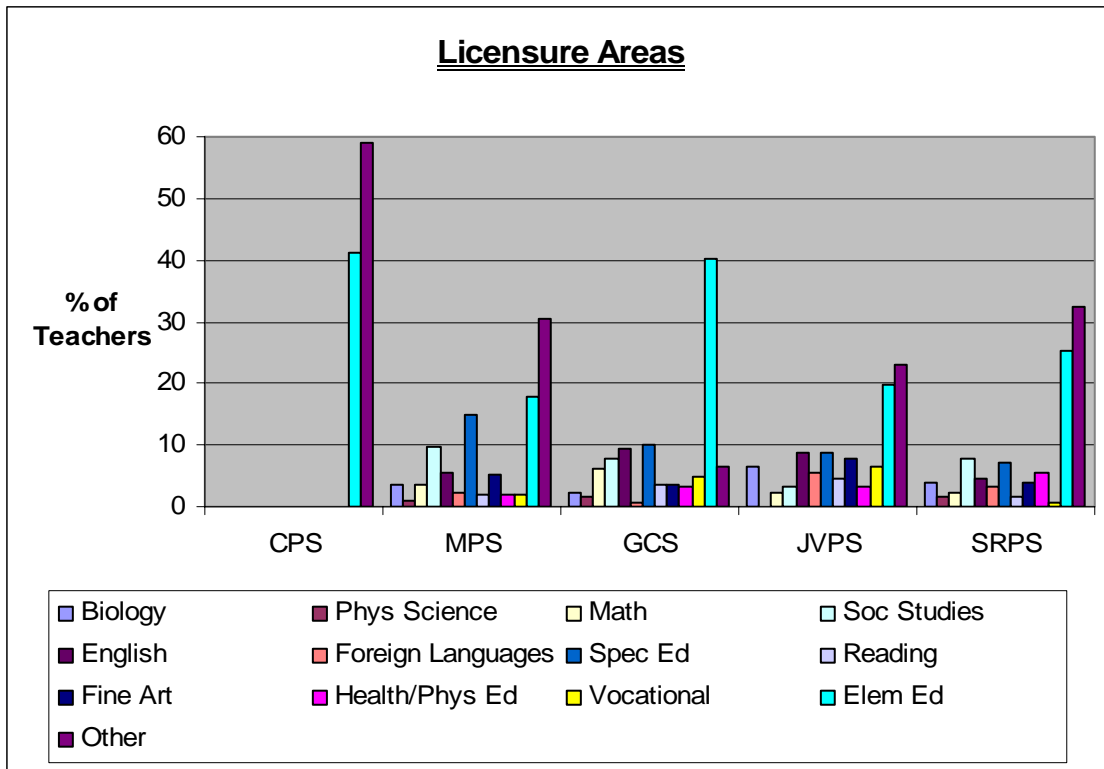
*Teacher Licensure*

Information about teacher turnover, age, and experience can allow school districts to target retention strategies at populations that are more likely to leave. Similarly, data on teacher turnover and teacher licensure provide districts with information on the types of teachers leaving the district. Nationally, there has been great concern over high teacher turnover and teacher shortages in licensure areas such as math, science, and special education.

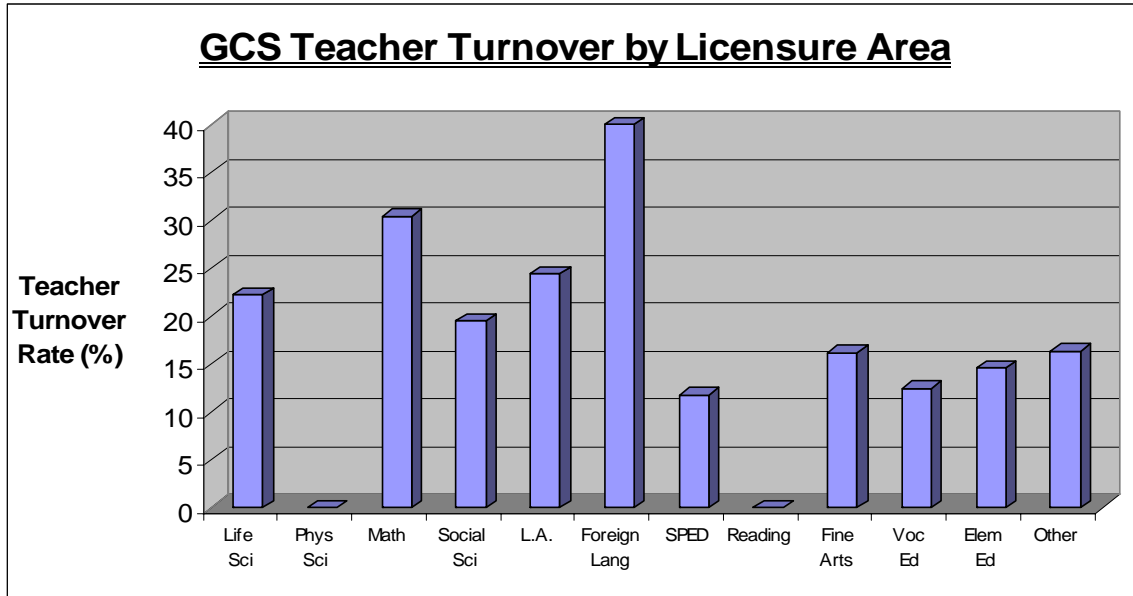
Table T-15: Teacher Distribution by License Area, 2002-03

	<u>CPS</u>	<u>MPS</u>	<u>GCS</u>	<u>JVPS</u>	<u>SRPS</u>
<b># of Teachers</b>	25,300	6,139	533	42	58
<b>Biology (%)</b>	0	3.5	2.1	6.6	3.9
<b>Physical Science (%)</b>	0	1.1	1.5	0	1.6
<b>Math (%)</b>	0	3.5	5.9	2.2	2.4
<b>Social Studies (%)</b>	0	9.7	7.7	3.3	7.9
<b>English/Language Arts (%)</b>	0	5.5	9.1	8.8	4.7
<b>Foreign Language (%)</b>	0	2.3	0.5	5.5	3.1
<b>Special Education (%)</b>	0	15.0	9.5	8.8	7.1
<b>Reading (%)</b>	0	2.0	3.5	4.4	1.6
<b>Fine Arts/ Music (%)</b>	0	5.3	3.5	7.7	3.9
<b>Health/Physical Education (%)</b>	0	1.8	2.9	3.3	5.5
<b>Vocational (%)</b>	0	1.8	4.5	6.6	0.8
<b>Elementary Education (%)</b>	40.3	17.9	39.9	19.8	25.2
<b>All Other (%)</b>	57.8	30.4	6.4	23.1	32.3

<b>Missing (%)</b>	1.9	0	3.1	0	0
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Unfortunately, the large urban districts were unable to accurately report the licensure areas of their teachers, as evidenced by the large percentage of teachers in the “Other” category. In the rural districts, the small number of teachers made analysis by licensure area difficult. In GCS, the teacher turnover for different licensure areas is revealing. Although special education is often referred to as a high demand, high turnover area, GCS retained their special education teachers at a relatively high rate. However, the district lost a high percentage of foreign language (2 of 5 teachers) and math (7 of 23) teachers.



The difference between local and national trends in turnover highlights the importance of districts examining actual local data on teacher turnover. The lack of accurate licensure data in the urban districts indicates that these districts may not currently have the capacity to conduct such analyses. The lack of such data precludes any findings as to the overall relationship of teacher licensure and teacher turnover.

### **Summary**

Teacher turnover was significant in all five school districts, but the turnover rate varied greatly across the districts and across teacher characteristics. Of the characteristics studied, teacher experience had the largest impact on teacher turnover, with new teachers leaving at significantly higher rates than experienced teachers. The study also brings to light the lack of accurate data on certain teacher characteristics, such as licensure area, licensure test scores, and subject assignments. In order to generate an accurate picture of which teachers are leaving, school districts will need to collect and analyze these variables.

### **Schools**

To test the hypothesis that teacher turnover is influenced by school characteristics, researchers and district officials identified and collected data on 12 school variables.<sup>15</sup> We describe an expected effect as positive if increases in the school variable are associated with increases in teacher turnover; negative if increases in the school variable are associated with decreases in teacher turnover; and neutral if the school variable can not increase or decrease. With school type and geographic setting, teacher turnover can only vary with changes to the variable. For these variables, we describe the expected relationship in more detail. The twelve school-level variables and their expected effects on teacher turnover are listed below:

1. Performance level of students as measured by the State’s end-of-grade and end-of-course testing program<sup>16</sup> – negative;
2. School type (elementary including K-8; middle; secondary) – neutral (higher teacher turnover in middle schools than in elementary or secondary schools);
3. Geographic setting (urban, rural, suburban) – neutral (higher teacher turnover in rural and urban schools than in suburban schools);
4. Total school enrollment (used to derive school size variable) – positive;

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<sup>15</sup> School-level data on grade range, geographic setting, enrollment, school lunch rate, and race/ethnic composition of the student body (elements 2, 3, 4, 5, and 8) were drawn from the Common Core of Data (CCD) collected by the U.S. Department of Education for each public school in the United States. This information can be accessed through the National Center for Education Statistics (NCES) and was extracted from that file unless a district provided its own data on the variables. Data on the remaining seven variables were to be provided directly by each district.

<sup>16</sup> Defining standardized pupil achievement categories proved challenging. First, states differ in the performance tests and in the school performance categories that they use. Districts were reluctant to classify schools as “high” or “low” performing when these were not categories explicitly recognized in their state’s testing and assessment programs. In addition, districts expressed a desire to assign performance levels based on both **current** test score levels and **improvement** in test scores, measures that could, and often did, move in opposite directions. Moreover, no district was able to provide school performance rankings for their schools. Given these difficulties, it was decided that the districts would provide current mean test scores for schools and that NCTAF staff would convert them to performance categories *for the purpose of this study only*. This was done by arraying the average test scores of schools in each district in descending order and then designating those at or below the 16<sup>th</sup> percentile of this distribution as “low” performing, and those at or above the 84<sup>th</sup> percentile as “high” performing. These percentiles correspond to the tails of a normal distribution that begin one standard deviation from the mean. It is believed that they correspond roughly to the categories typically used in state testing programs: “below expectation” and “exceeds expectation.” Thus schools in the “below” category were treated as low performing, and schools in the “above” category were treated as high performing. Our two rural districts were too small to employ this method, and so they are not included in analyses of the relationship between pupil achievement and teacher turnover.

5. School lunch participation rate (percentage of students eligible for free or reduced price lunch) – positive;
6. Principal tenure (years served by a school’s current principal) – negative;
7. Principal count (number of principals employed by the school over the last ten years) – positive;
8. Student body percentages in each race/ethnic category (in order to calculate the percent minority at each school) – positive for teachers in schools with high minority populations;
9. Limited English proficiency percentage for the student body – positive;
10. Special education student percentage of the student body – positive;
11. Student stability rate (defined as the percentage of all students who were enrolled in both semesters) – negative; and
12. Annual attendance rate of all students during the school year – negative.

Expectations about the affects of some of these school variables may require elaboration. For example, variables 6 and 7 address the common view that stable leadership in a school creates a positive working condition that is conducive to teacher retention, but we have not seen this tested in earlier studies. Our hope was that we could combine these two variables to form a categorical variable that would rate principal turnover as high, medium or low, but our inability to collect data on both of these variables in all districts made this problematic.

Our hypothesis about schools with large numbers of students with limited English proficiency or with disabilities (variables 9 and 10) was that they would be more difficult for regular teachers to teach and would therefore be more conducive to teacher attrition. Similarly, we believed that schools with low student attendance rates, or high turnover of students during the year, would discourage their teachers and lead them to leave or move to another school. Variables 11 and 12, both of which are part of NCLB data collection, were therefore included to capture these effects.

In terms of school performance and turnover, we felt that teachers would be more likely to leave schools in which student performance was relatively low. We also thought that teachers would be more likely to leave schools with higher minority populations

based on earlier studies. We also decided to test whether the race of the teacher and the race of the students impacted teacher turnover. We therefore constructed a categorical variable for each teacher that took the value “1” if the majority race/ethnicity of students at the school matched that of the teacher; it took the value of “0” otherwise. We called this variable “racial concordance.”

Our efforts to collect data on these variables were fairly successful (see Table S-1). Although our data collection requested data on both the 2002-03 and the 2003-04 year, we used only the 2002-03 data in our analysis because it described the school environment in the year in which teachers were making decisions to stay or leave. The information in Table S-1 applies only to the 2002-03 school data.

Table S-1: Availability of School Data by District

<b>Variable</b>	<b>All</b>	<b>CPS</b>	<b>MPS</b>	<b>GCS</b>	<b>JVPS</b>	<b>SRPS</b>
Performance Level	97.1	97.7	100.0	92.9	0.0	0.0
School Type	92.0	95.8	100.0	100.0	66.6	100.0
Geographic setting	100.0	100.0	100.0	100.0	100.0	100.0
Enrollment	92.0	95.8	100.0	100.0	66.6	100.0
Free and Reduced Lunch	100.0	100.0	100.0	100.0	100.0	100.0
Principal Tenure	23.4	0.0	100.0	28.6	100.0	100.0
10-Year Principal Count						
Race/Ethnicity	99.9	99.8	100.0	100.0	100.0	100.0
Limited English Proficiency	100.0	100.0	100.0	100.0	100.0	100.0
Special Education	100.0	100.0	100.0	100.0	100.0	100.0
Student Stability Rate	16.4	0.0	68.3	28.6	100.0	100.0
Attendance Rate	23.4	0.0	100.0	28.6	100.0	100.0

On balance, school data were more widely available than teacher or cost data. One reason for this difference was that school data were available on some variables from the Common Core of Data that are collected by the National Center for Education Statistics when they were otherwise missing from district databases. Another reason is that some variables such as counts and percents of students with limited English proficiency and disabilities are required to administer special programs for such students. Even so, there were notable gaps in some of the data on schools. Data on Principal Tenure and the 10-Year Count of Principals at a school had to be added manually by

some districts, and could not be reported by others. The same was true for the Student Stability Rate and the Attendance Rates. This meant that data on Principal Tenure and the 10-Year Count of Principals were not available for any of the schools in the CPS district, and for only 28.6 percent of the schools in the GCS district. Similarly, the performance level data for JVPS and SRPS schools was not available in a format that could be compared to data from the other districts. Consequently it was not available for these two districts.

Although the gaps in the data collection are relatively minor when compared to the gaps in teacher data, they have significant consequences for our ability to conduct multivariate analyses on turnover rates in each district. Missing variables mean that models to explain turnover rates are modified to fit the available data, a procedure that leads to specification error in the estimates of variable affects. While every statistical model is subject to some specification error, the problem is made worse when variables shown to be significant predictors for one model (district) are missing in another. This means that readers should be cautious in interpreting the “relationships” between turnover rates and our teacher and school variables.

## Results

The school data allowed for analysis of teacher turnover in relation to school level, performance, percent minority, percent limited English proficiency (LEP), percent free and reduced lunch (FRL), percent special education (SPED), and school size.

Table S-2: School-level characteristics by district, 2002-03

	<u>CPS</u>	<u>MPS</u>	<u>GCS</u>	<u>JVPS</u>	<u>SRPS</u>
<b>District Type</b>	Urban	Urban	Countywide/ Rural	Rural	Rural
<b>Number of schools</b>	577	167	14	3	5
<b>Enrollment</b>	426,000	95,654	8,548	411	700

With this analysis, we tested which, if any, school demographics had an impact on teacher turnover.

*School Level*

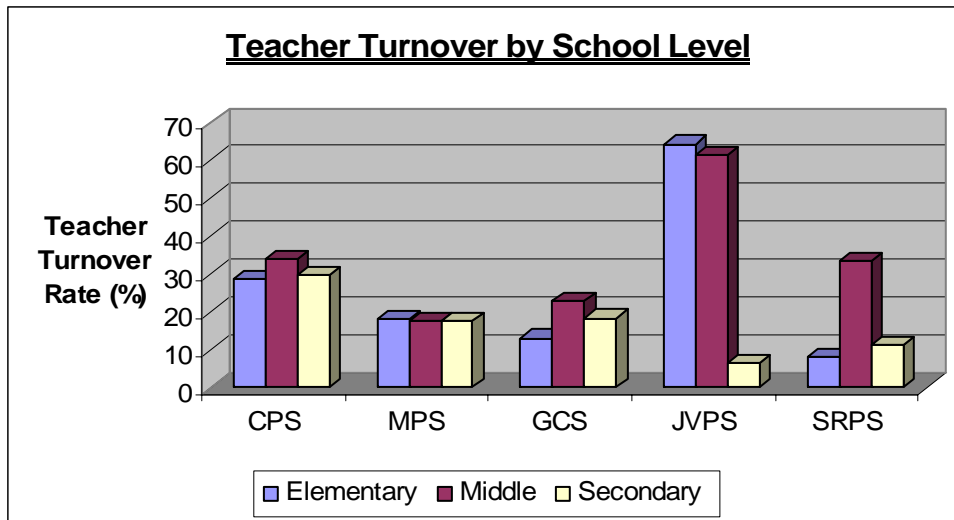
Few studies have reported the impact of school level on teacher turnover. We hypothesized that the turnover rate would be higher in middle schools because middle school teachers face the challenge of teaching adolescents.

Table S-3: Schools by Grade Level, 2002-03

	<u>Elementary</u>	<u>Middle</u>	<u>Secondary</u>	<u>Other</u>	<u>District Total</u>
<b>CPS</b>	464	21	68	24	577
<b>MPS</b>	87	22	22	36	167
<b>GCS</b>	9	3	2	-	14
<b>JVPS</b>	1	1	1	-	3
<b>SRPS</b>	2	2	1	-	5

Table S-4: Teacher Turnover Rate in Elementary, Middle, and High Schools

	<u>Elementary</u>	<u>Middle</u>	<u>Secondary</u>	<u>District Total</u>
<b>CPS</b>	28.5	34	29.6	30.2
<b>MPS</b>	18.3	17.7	17.5	17.4
<b>GCS</b>	13.1	22.8	18.4	16.5
<b>JVPS</b>	64.3	61.5	6.7	42.9
<b>SRPS</b>	8.0	33.3	11.1	15.5



In CPS and GCS, middle schools were the most prone to turnover; they came in second highest for MPS. While the turnover rates in JVPS are amazingly high for elementary and middle schools, these should be viewed with caution because there is only one school in each category for this district. The small size does not minimize the impact of these rates of turnover on the schools themselves or on the pupils enrolled in them. Relative to scale, it creates the same difficulties for administrators, other teachers, and children. Recall that we have included two rural districts in this pilot study to understand the extent and dynamics of teacher turnover (and its associated costs) for rural schools. A good deal of anecdotal evidence from policymakers and school administrators from these districts suggests the JVPS and SRPS experience are widespread across the country.

*Poverty*

Previous studies have found that high poverty at a school is associated with high teacher turnover.<sup>17</sup> A commonly used measure of the level of poverty at a school is the percentage of students receiving free or reduced lunch (FRL). In order to analyze the relationship between poverty and teacher turnover, we divided schools into three categories:

- Low Poverty (less than 50% FRL students)
- Medium Poverty (between 50% and 75% FRL students)
- High Poverty (more than 75% FRL students)

A breakdown of the number of schools in each category can be seen in Table S-5.

Table S-5: Number of Schools by % of FRL Students, 2002-03

	<b><u>Low Poverty</u></b>	<b><u>Medium Poverty</u></b>	<b><u>High Poverty</u></b>
<b>CPS</b>	49	56	472
<b>MPS</b>	25	48	94
<b>GCS</b>	8	5	1

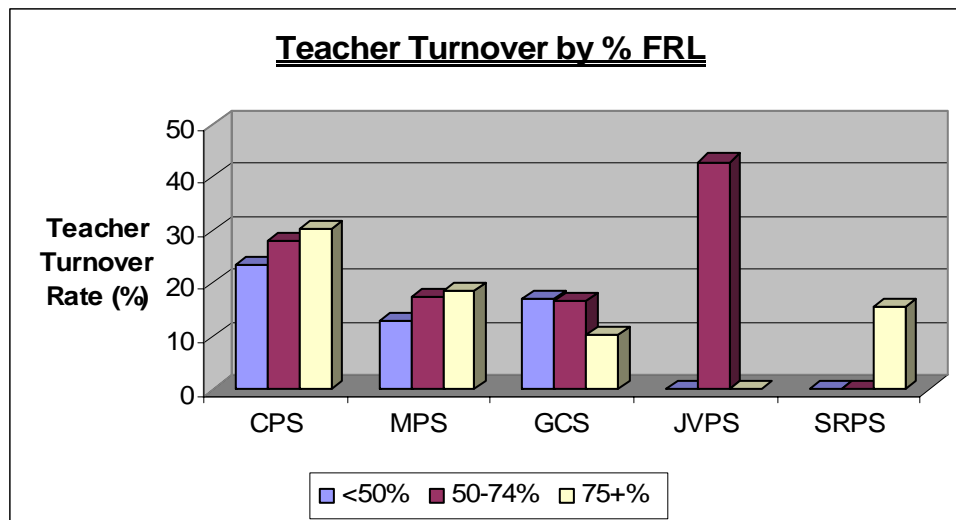
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<sup>17</sup> Ingersoll, R. (2001). *Teacher turnover and teacher shortages: An organizational analysis*, p. 516.

<b>JVPS</b>	-	3	-
<b>SRPS</b>	-	-	5

Table S-6: Teacher Turnover Rate in Schools with Varying Levels of FRL Students

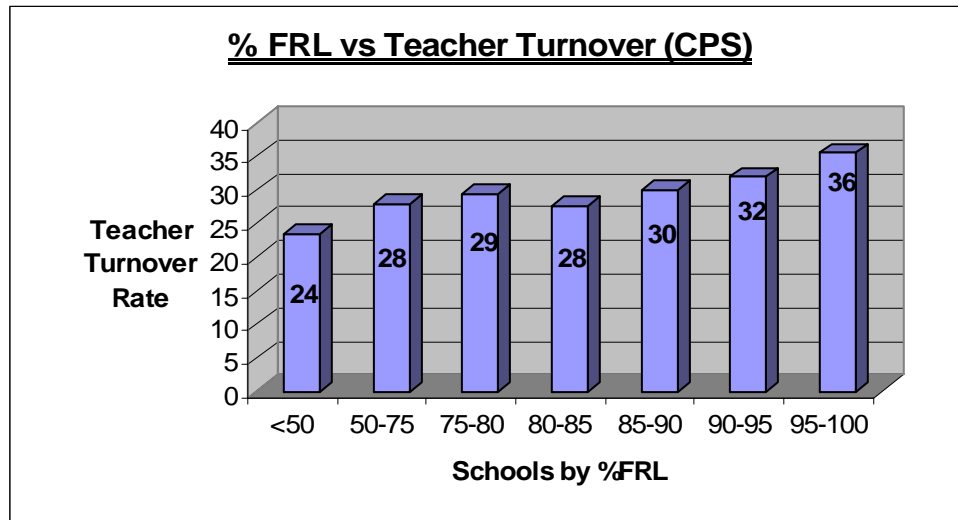
<b>District</b>	<b>FRL &lt;50%</b>	<b>FRL 50-74%</b>	<b>FRL 75+%</b>
<b>CPS</b>	23.5	27.9	30.2
<b>MPS</b>	12.8	17.4	18.6
<b>GCS</b>	17.2	16.7	10.3
<b>JVPS</b>	-	42.9	-
<b>SRPS</b>	-	-	15.5



The rural districts did not have enough variety in the poverty levels of their schools to allow for a useful analysis of poverty as an indicator of turnover. Figure S-4 shows that GCS had low teacher turnover in high poverty schools, but this is due to the fact that the one high-poverty school in the district had low turnover. However, when examining urban schools of varying poverty levels, we found that the higher the poverty, the higher the turnover (Table S-6).

Given that more than three quarters of the schools in CPS fell into the High Poverty category, we took a more fine-grained look at those schools. Consistent with our overall finding, the High Poverty schools with the highest levels of FRL students had the

highest rates of turnover. The turnover rate for the schools with the highest poverty (36%) was 1.5 times the turnover rate for the schools with the lowest poverty (24%).



### *Limited English Proficiency*

Students with limited English proficiency (LEP) are often cited as one of the challenges teachers face. To analyze the impact of LEP students on teacher turnover, we divided schools into four categories:

- Low Occurrence of LEP (less than 5% LEP students)
- Medium Low Occurrence of LEP (between 5% and 10% LEP students)
- Medium High Occurrence of LEP (between 10% and 30% LEP students)
- High Occurrence of LEP (more than 30% LEP students)

A breakdown of the number of schools in each category can be found in Table S-7.<sup>18</sup>

Table S-7: Schools by % of Limited English Proficiency (LEP) Students, 2002-03

District	LEP <5%	LEP 5-10%	LEP 10-30%	LEP >30%
CPS	320	34	122	101

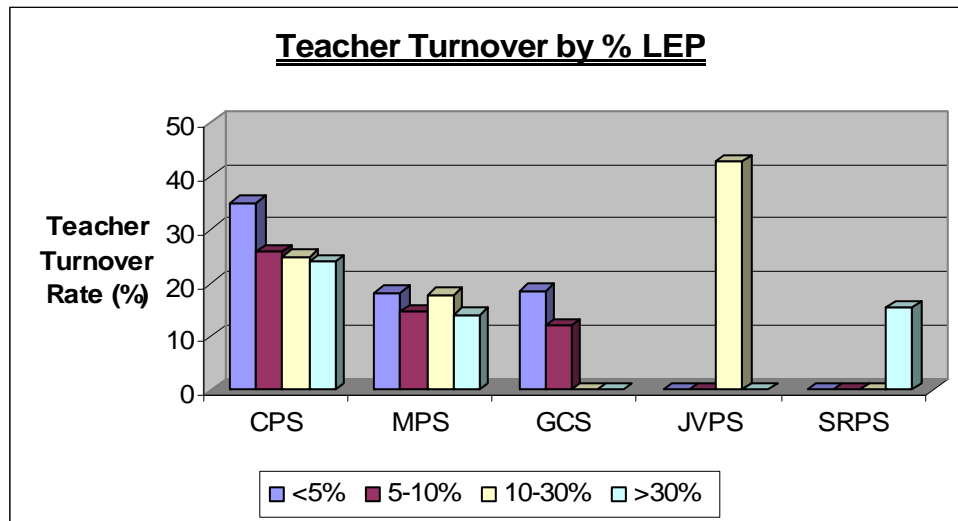
<sup>18</sup> In each of the rural districts, schools were concentrated in one LEP category.

<b>MPS</b>	124	13	15	15
<b>GCS</b>	9	5	-	-
<b>JVPS</b>	-	-	3	-
<b>SRPS</b>	-	-	-	5

Our hypothesis was that schools with high percentages of LEP students would create challenges for teachers, and that this would lead to higher teacher turnover. In fact, this was not the case. In CPS, MPS, and GCS, the highest levels of teacher turnover occurred in schools with the fewest LEP students.

Figure S-8: Teacher Turnover Rate in Schools with Varying Levels of LEP Students

<b>District</b>	<b>LEP &lt;5%</b>	<b>LEP 5-10%</b>	<b>LEP 10-30%</b>	<b>LEP &gt;30%</b>
<b>CPS</b>	35.1	25.9	25	24.1
<b>MPS</b>	18.3	14.8	17.9	14.2
<b>GCS</b>	18.6	12.1	-	-
<b>JVPS</b>	-	-	42.9	-
<b>SRPS</b>	-	-	-	15.5



*Special Education*

As with LEP students, special education (SPED) students are often viewed as a challenge to teachers. In order to analyze the relationship between the percentage of SPED students and teacher turnover, we divided schools into four categories:

- Low Occurrence of SPED (less than 5% SPED students)
- Medium Low Occurrence of SPED (between 5% and 10% SPED students)
- Medium High Occurrence of SPED (between 10% and 30% SPED students)
- High Occurrence of SPED (more than 30% SPED students)

A breakdown of the number of schools in each category can be found in Table S-9.<sup>19</sup>

Table S-9: Schools by % of Special Education (SPED) Students, 2002-03

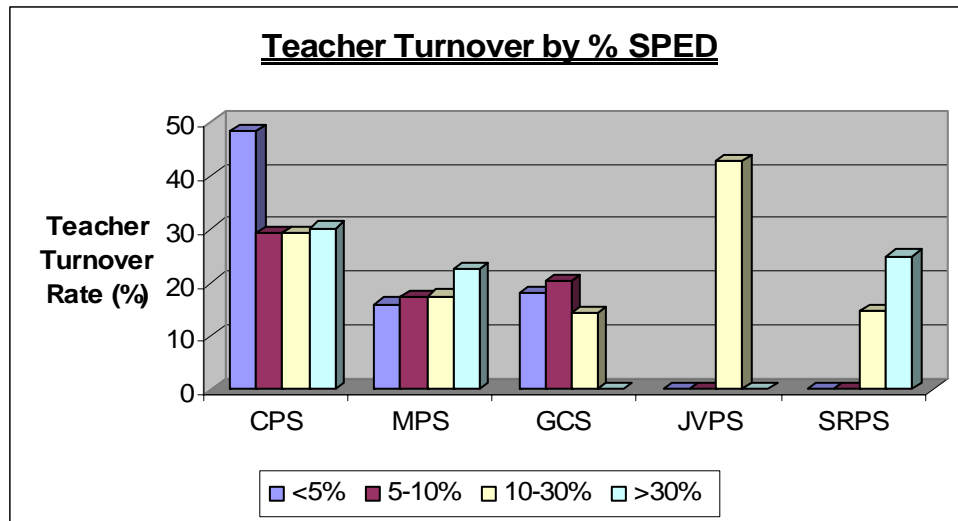
<b>District</b>	<b>SPED &lt;5%</b>	<b>SPED 5-10%</b>	<b>SPED 10-30%</b>	<b>SPED &gt;30%</b>
<b>CPS</b>	7	109	450	11
<b>MPS</b>	12	42	110	3
<b>GCS</b>	4	2	8	-
<b>JVPS</b>	-	-	3	-
<b>SRPS</b>	-	-	4	1

From the data gathered, we did not find a relationship between the percentage of SPED students and the rate of teacher turnover.

Table S-10: Teacher Turnover Rate in Schools with Varying Levels of SPED Students

<b>District</b>	<b>SPED &lt;5%</b>	<b>SPED 5-10%</b>	<b>SPED 10-30%</b>	<b>SPED &gt;30%</b>
<b>CPS</b>	48.4	29.3	29.4	30.2
<b>MPS</b>	16	17.3	17.5	22.6
<b>GCS</b>	18.1	20.3	14.3	-
<b>JVPS</b>	-	-	42.9	-
<b>SRPS</b>	-	-	14.8	25

<sup>19</sup> In each of the rural districts, schools were concentrated in one SPED category.



### *Minority Enrollment*

Prior studies have shown that teachers tend to move from schools with high minority enrollment to schools with low minority enrollment.<sup>20</sup> In order to analyze the relationship between the percentage of minority students and teacher turnover, we divided schools into four categories:

- Low Minority (less than 25% Minority students)
- Medium Low Minority (between 25% and 50% Minority students)
- Medium High Minority (between 50% and 75% Minority students)
- High Minority (more than 75% Minority students)

Minority was defined as all students except those categorized as White (Asian, African American, Hispanic, Native American, and other). A breakdown of the number of schools in each category can be found in Table S-11.<sup>21</sup>

Table S-11: Schools by % of Minority Students, 2002-03

<sup>20</sup> Hanushek, E., Kain, J., and Rivkin, S. (2004). Why Public Schools Lose Teachers. *Journal of Human Resources* 39(2), p. 349.

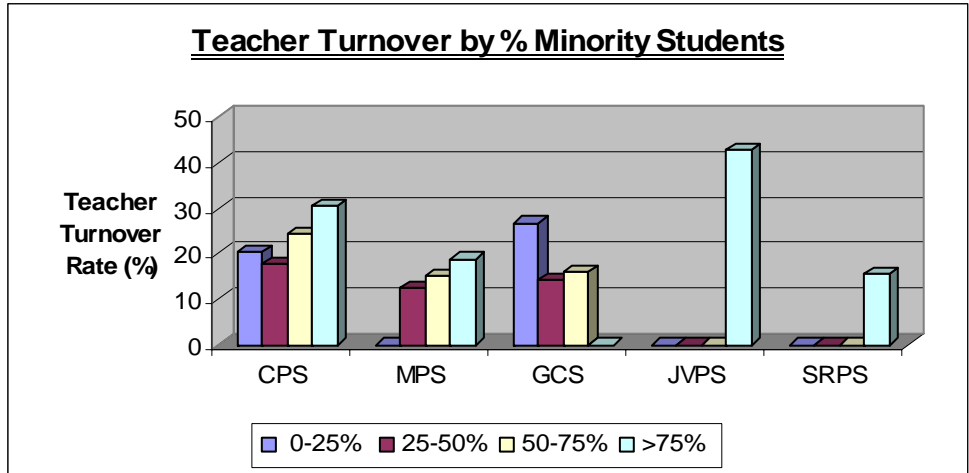
<sup>21</sup> In each of the rural districts, schools were concentrated in only one category.

<b>Districts</b>	<b>Minority 0-25%</b>	<b>Minority 25-50%</b>	<b>Minority 50-75%</b>	<b>Minority &gt;75%</b>
<b>CPS</b>	6	19	49	502
<b>MPS</b>	1	18	28	120
<b>GCS</b>	2	6	6	-
<b>JVPS</b>	-	-	-	3
<b>SRPS</b>	-	-	-	5

In the urban districts, the teacher turnover was significantly higher in High Minority schools than in Low Minority schools. In CPS, teachers in a High Minority school were almost twice as likely to leave as teachers in Medium Low Minority schools (30.6% versus 17.6%). The Low Minority schools did have a higher turnover rate than the Medium Minority schools in both CPS and GCS. This may be due to the construction of the categories, which resulted in only a few observations in the Low Minority category.

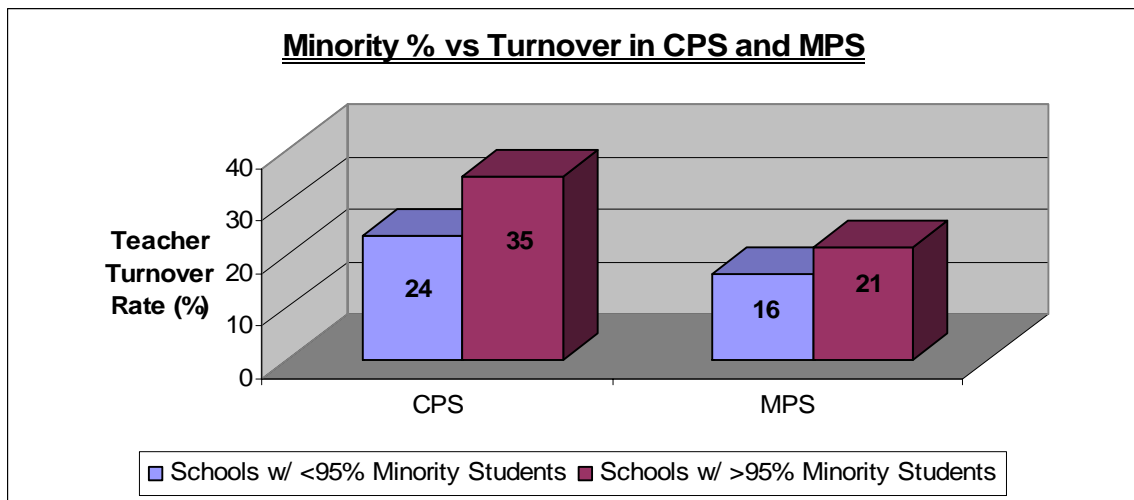
Table S-12: Teacher Turnover Rate in Schools with Varying Levels of Minority Students

<b>Districts</b>	<b>Minority 0-25%</b>	<b>Minority 25-50%</b>	<b>Minority 50-75%</b>	<b>Minority &gt;75%</b>
<b>CPS</b>	20.4	17.6	24.5	30.6
<b>MPS</b>	0	12.5	15	18.8
<b>GCS</b>	26.8	14.4	16.1	-
<b>JVPS</b>	-	-	-	42.9
<b>SRPS</b>	-	-	-	15.5



The four broad categories can obscure the relationship between the percentage of minority students and the teacher turnover in a school. This is especially true in the urban districts, where almost all of the schools had a high percentage of minority students. When CPS and MPS schools were divided into two categories (either more or less than 95% minority students), the relationship is clear: the schools with the highest percentage of minority students lose teachers at a higher rate than all other schools (see Figure S-1).

Figure S-1: Further Breakdown of CPS and MPS Schools by % Minority Students



*School Size*

The five districts submitted data on the student enrollment at each school. Schools were then divided into four categories based on student enrollment:

- Small (below 250 students if elementary or combination, below 500 if middle, and below 1,000 if secondary)
- Medium Small (250-499 students if elementary or combination, 500-749 if middle, and 1000-1499 if secondary)
- Medium Large (500-749 if elementary or combination, 759-999 if middle, and 1500-1999 if secondary)
- Large (750 or higher if elementary or combination, 1,000 or higher if middle, and 2,000 or higher if secondary)

A breakdown of the number of schools in each category can be found in Table S-13.

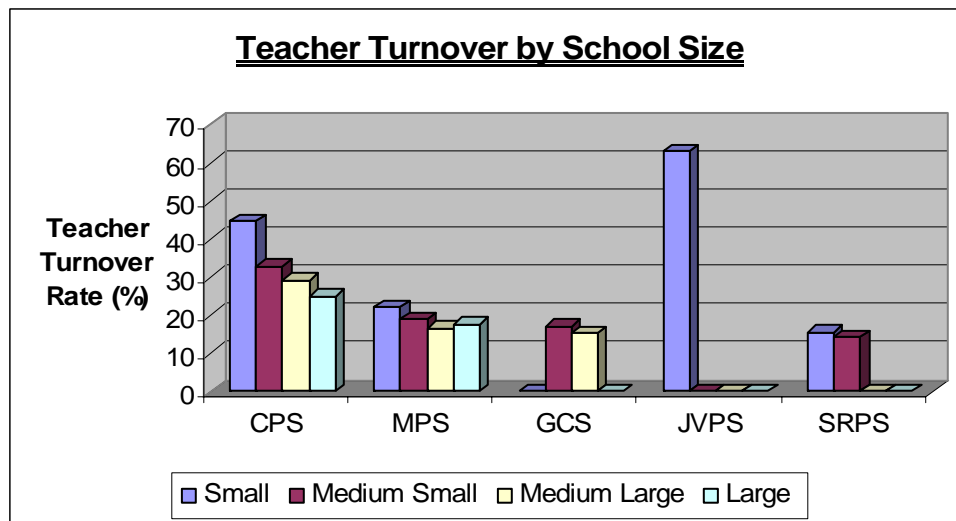
Table S-13: Schools by Student Enrollment, 2002-03

	<b>Small</b>	<b>Medium Small</b>	<b>Medium Large</b>	<b>Large</b>	<b>Missing</b>
<b>CPS</b>	57	145	169	182	24
<b>MPS</b>	19	67	40	5	36
<b>GCS</b>	-	9	5	-	-
<b>JVPS</b>	3	-	-	-	-
<b>SRPS</b>	4	1	-	-	-

Previous studies and reports (SECTQ and Ingersoll) have found that teacher turnover was higher at smaller schools. We found this same relationship in the two urban districts. In MPS, Small schools had higher teacher turnover (22%) than Large schools (17.6%). In CPS, Small schools had significantly higher turnover (44.6%) than Large schools (25%).

Table S-14: Teacher Turnover Rate by School Size

Districts	Small	Medium Small	Medium Large	Large
CPS	44.6	33	29.2	25
MPS	22	19	16.6	17.6
GCS	-	17.2	15.4	-
JVPS	63	-	-	-
SRPS	15.7	14.3	-	-



This finding raises concern over the ability of small schools to retain teachers and questions as to why teachers leave small schools at a higher rate. The relationship between school size and teacher turnover warrants further study in light of current policy initiatives around small schools.

### *School Performance*

One of the main hypotheses of this study, based on earlier research done by SECTQ, was that higher performing schools have lower levels of teacher turnover. In order to test this hypothesis, the two urban districts and the countywide district reported the percentage of students proficient in reading and math for each school. These percentages were then added together to create a performance score for each school. For example, a school with 60% of students proficient in reading and 70% of students

proficient in math would have a performance score of 130. The schools were then divided into three categories based on performance scores:

- Low (16<sup>th</sup> percentile or below within the district)
- Medium (Between the 16<sup>th</sup> and 84<sup>th</sup> percentile within the district)
- High (84<sup>th</sup> percentile or above within the district)

A breakdown of the schools by performance score can be found in Table S-15.

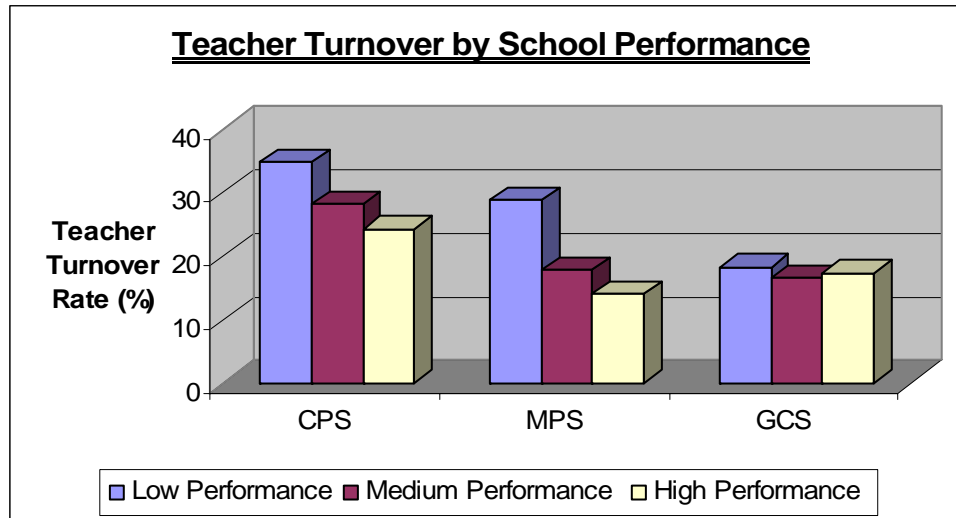
Table S-15: Number of Schools by Student Performance, 2002-03

<b>Districts</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Missing</b>
<b>CPS</b>	91	383	90	13
<b>MPS</b>	14	119	34	-
<b>GCS</b>	2	8	3	1
<b>JVPS</b>	-	-	-	3
<b>SRPS</b>	-	-	-	5

In the fourteen GCS schools, teacher turnover was fairly consistent across all levels of school performance. When comparing high and low performing schools in the two urban districts, teacher turnover was lower in high performing schools. In CPS, the low performing schools had a turnover rate 1.44 times the turnover rate in high performing schools. In MPS, teacher turnover in low performing schools was double the teacher turnover in high performing schools.

Table S-16: Teacher Turnover Rate by School Performance

	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>CPS</b>	34.8	28.2	24.2
<b>MPS</b>	28.8	17.8	14.1
<b>GCS</b>	18.2	16.6	17.3



### **Summary**

The school data reported by the five school districts allowed for an analysis of the impact of school characteristics on the rate of teacher turnover. Some characteristics, such as the percentage of students with limited English proficiency and the percentage of special education students, did not show a relationship to teacher turnover. Other characteristics, such as the percentage of students receiving free or reduced lunch, the percentage of minority students, and the performance of the school, were correlated with the rate of teacher turnover. This result indicates that high poverty, high minority, and low performing schools lose a higher percentage of their teachers than other schools. The multivariate analysis examines how the school and teacher variables interact with each other and with the rate of teacher turnover.

### **Multivariate Analysis of Turnover Rates**

For our multivariate analysis of the data, we chose Ordinary Least Squares (OLS) and Logistic Regressions to estimate the statistical relationship between 59 variables and teacher turnover.<sup>22</sup> All but one of the 59 independent variables were the same categorical

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<sup>22</sup> We choose two alternatives in order to balance known limitations in the two estimators: namely, inefficiency in OLS and the bias in Logistic Regression.

variables presented earlier in the bivariate analysis.<sup>23</sup> Although there were often notable differences among districts, our statistically significant findings (at a .10 level of significance) were that turnover probabilities were higher for math teachers, but not for science or special education teachers. Turnover probabilities were higher for teachers with less than five, and more than 20, years of experience, and for teachers in their 20s, 30s, 50s and 60s. Turnover probabilities were higher for teachers who taught in schools with high minority populations, but only in the urban school districts. Turnover probabilities were also higher for teachers in schools with low academic performance and for those with high student turnover during the year. They were lower in secondary schools, higher in small schools, and lower in schools with low principal turnover. Surprisingly, we found no evidence that teacher turnover was higher in high poverty schools, even though our bivariate analysis had contained some evidence of such an association. We also found that schools with higher percentages of special education and limited English proficiency students were less likely than others to experience teacher turnover.

### **Ordinary Least Squares (OLS) and Logistic Regressions**

Bivariate analysis of the teacher and school variables reveals associations with turnover rates that may change when multiple sets of teacher and school variables are considered at the same time in a single multivariate analysis. The advantage of conducting such an analysis is that it permits a researcher to consider the effect of individual variables on turnover rates while holding the effects of other variables constant. Multivariate analysis thus improves the researcher's ability to isolate and clarify the effects of individual variables. The "dependent" variable is dichotomous, i.e. set to "0" or "1" depending on whether a teacher moved or left his or her teaching position at a school between 2002-2003 and 2003-2004. The "independent" variables are the teacher and school variables. The dependent variable has a value of '1' for teachers who left, and a value of '0' for those who remained teaching at the same school for both study years.

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<sup>23</sup> The one addition was "racial concordance", which measures the probability a teacher will turn over if the teacher's race/ethnicity matches that of the school's largest racial/ethnic group.

Thus, both the OLS and the Logistic regression estimate the probability that a teacher will leave or move from the school in which he or she was employed in 2002-03.

In order to allow for the likelihood that these multivariate relationships vary across districts and also to take into account the absence of data on some variables in each district, we have performed regression analysis on each of the districts separately. An advantage of this approach is that it allows us to consider the effects of all variables for which districts were able to provide solid data. It also prevents the data from the two larger school districts from unduly influencing the estimation of variable effects (98% of the teachers in the study were employed by the two large urban districts). Finally, it permits us to make comparisons across the very different districts that participated in the study.

In our original data collection from districts, several “independent variables” were first collected as continuous variables and then converted to categorical variables in order to simplify the presentation of bivariate tables and graphs. An example of this is the variable birth date, which could be expressed either as a continuous variable – age – or as a set of age categories, such as “younger than 30”, “30 but younger than 40”, etc. We entered these variables in our regressions as age categories in order to be able to compare their effects in bivariate and multivariate analyses. We did it also to allow for the possibility that the relationship between turnover and the continuous variable is not a simple linear one throughout the range of data on the independent variable, something we think is more likely than not with certain variables (e.g., teacher age, years of teaching experience, percent of students on Free and Reduced Lunch program). Another advantage to using categorical variables is that interpretation of regression coefficients, i.e. the effects of the variables, is often simpler and more intuitive than in their continuous form. A disadvantage of representing these variables as categorical variables (instead of continuous variables) is that they consume additional “degrees of freedom” that may be needed to find statistically significant relationships between turnover and each variable. We think this problem is negligible for all districts except the two smallest districts whose data have been combined to avoid the problem.<sup>24</sup>

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<sup>24</sup> The two smallest districts were located in the same state and thus bear many similarities.

Readers should be aware that for purely statistical reasons, categorical variables used in regression must be interpreted against a “norm” or reference group. Thus, the effect on turnover of being “younger than 30 years old” is an amount that is relative to the amount associated with being in the “norm” or reference group. The choice of the “norm” or reference group is purely a matter of convenience. For the analyses that follow, we explain the reference group category for each independent variable to enable readers to interpret the findings.

Finally, it should be noted that the unit of analysis in each of the multiple regression equations estimated in this study is the **individual teacher** (and his or her action to move or leave) and not a **group of teachers** (and the percentage of teachers who move or leave). This means that the data values of all school variables were the same for each of the teachers employed by the school. This does not affect the interpretation of the school effects or teacher effects. Table R-1 below presents the list of the variables used in each of the regressions.

Table R-1: Turnover Rate Regression Variables

<u>Variable</u>	<u>Categories</u>	<u>Norm/ Reference Category</u>	<u>District(s) Omitted from the Analysis</u>
<i>Teacher Variables</i>			
Gender	Male, Female	Female	
Age	<30, 30-39, 40-49,50-59,≥60	40-49	
Race/Ethnicity	African/American, American Indian, Asian/Pacific Islander, Hispanic, Caucasian	Caucasian	
Highest Earned Degree	Masters or Above, Baccalaureate	Baccalaureate	
Teaching Field	Life/Biol. Sc., Phys./Earth Sc., Math, Soc. Sc., English/Lang. Arts, Foreign Lang., Sp. Ed., Reading, Fine Arts/Music, Health/PE, Voc. Ed., Elem Ed., “Other”	Elem. Ed.	
Total Years Teaching Experience	0, 1, 2, 3, 4-5, 6-10, 11-20, >20	11-20	
Relative Salary & Benefits	% of District Mean Salary and Benefits	N/A	

Teacher Mentoring Role	Mentor, Mentee, None	None	CPS, MPS, All
Does Teacher Have Own Classroom?	Yes, No	Yes	CPS, MPS, JVPS, SRPS, All
<i>School Variables</i>			
School Type	Elementary, Middle, Secondary	Elem.	
% in Free/Reduced Lunch Program	<50, 50<75, 75<95, 95 or more	<50	MPS, JVPS, SRPS
% with Limited English Proficiency	<5, 5<10, 10<30, 30 or more	<5	JVPS, SRPS
% in Special Ed programs	<5, 5<10, 10<30, 30 or more	<5	JVPS, SRPS
Race/Ethnicity Concordance	Yes, No	No	
Pupil % Minority (non-Caucasian)	<50, 50<75, 75<95, 95+	<50	
School size	Small, Medium Small, Medium Large, Large	Small	JVPS, SRPS, GCS
Principal Turnover	High, Medium, Low	High	CPS, GCS, All
Student Academic Performance	Low, Medium, High	High	JVPS, SRPS
Student Stability Rate	<70%, 70-90, 90+	95+	CPS, JVPS, SRPS, GCS, All
Attendance Rate	<85, 85-95, 95+	95+	CPS, GCS, All

As Table R-1 reveals, each district regression contained nine generic teacher variables, one of which was continuous (relative salary and benefits) and the rest categorical, and 11 school variables, all of which were categorical. Not all variables were available for each district; the last column in Table R-1 shows which districts were missing any of the 20 variables used in the study. Counting all of the categorical variables separately, the regressions could contain a maximum of 59 variables.

Not all of the variables collected on teachers and schools could be included in the regression analysis. Variables with no variation in data values, those with mostly missing values, and those with erroneous values were deleted because they could not contribute to

the statistical “explanatory power” of the regressions.<sup>25</sup> An example of a variable with no variation in its values was the one that indicated whether a teacher was a full-time or part-time employee of the district (all teachers were coded as full-time employees in each district). An example of a variable with obviously erroneous values was the one that indicated whether a teacher met the NCLB standard to be “highly qualified” in 2002-03 (the districts reported that virtually all of the teachers met the standard). A variable with mostly missing values was the student stability rate – an estimate of the percentage of students who remained in school for the rest of the school year following their initial enrollment. Only one district was able to report on this variable.

### **Partial Effects**

The coefficients that are presented in the tables that follow represent the partial effects of changing each independent variable by one unit while holding all other independent variables constant. Since all but one of the independent variables used in the regressions are categorical, they necessarily vary by one unit, depending on whether a teacher falls into that category. Thus the partial effects may be interpreted as the change in the probability of “turning over” given that a teacher is in the relevant category—all other variables being held constant. The probability of “turning over” refers to individual outcomes, not to a district’s overall turnover rate. The partial effects are always relative to the “norm” or “reference” group for the generic variable. For example, a coefficient equal to +.03 for the variable “Age<30” would indicate that a teacher who is less than 30 years old, is 3 percentage points *more likely* to turn over than a teacher who is in his or her 40s (the norm or reference group) – all other variables being equal.

Similarly, a coefficient equal to +.05 for the variable “Performance Low” would indicate that a teacher who worked in a school in which students’ academic performance on state tests was low would be 5 percentage points more likely to turn over in his or her position than a teacher who worked in a school whose students’ academic performance on state tests was high (the norm or reference group) – all other things being equal. The

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<sup>25</sup> The loss of variables with missing, erroneous, and identical values caused the number of teacher observations used in district regressions to be lower than the counts used in some of the aforementioned bivariate analyses and lower still than the counts of teachers in the original data submissions from the districts.

reader is reminded here that the choice of reference groups is arbitrary: had they been reversed for school performance, a value of  $-.05$  would indicate that teachers in high performing schools are 5% *less likely* to turn over than teachers in a low performing school. Keep in mind that these probabilities are about teachers in specific groups, not the overall rate of turnover for a school or a district.

Finally, the partial effects of all variables in logistic regressions are evaluated at the mean turnover rate for all teachers, and the estimated partial effect is the product of this turnover rate, the complement of the turnover rate, and the estimated coefficient for the variable in the logistic regression. The products of the turnover rates and their complements are shown in Table R-1. Partial effects are shown in succeeding tables.

## **Results**

With 59 independent variables to consider in estimating the probability of teacher turnover, we have chosen, for the sake of manageability, to present our results in clusters of related independent variables. For each of five clusters, we present the partial effects from the OLS and Logistic regressions for each of the four districts. Only partial effects that were statistically significant (at the  $.10$  level) are presented since, by definition, other partial effects cannot be judged to be different from zero. Thus, the tables that follow present our findings on the variables that appear to have influenced teachers' turnover decisions in each district. The independent variables in each cluster are:

- Teaching field variables (Table R-2);
- Age, work experience, and highest earned degrees of teachers (Table R-3);
- Race/ethnicity and gender of the teacher and the percent minority of the student body at the school (Table R-4);
- School characteristics, including school size and type, academic performance of students at the school, student attendance rate, student stability rate, the proportions of students with limited English deficiency or special education needs, and the level of principal turnover at the school (Table R-5); and

- Other independent variables including whether the teacher served as a mentor or mentee in 2002-03, whether the teacher had his or her own classroom, and the teacher's relative compensation (Table R-6).

We turn first to the results on the teaching field variables.

### *Teaching Fields*

Recall that the teaching field variables are 13 generic categories (including “other”) to which districts were asked to cross-walk their state-specific licensure and teaching assignment codes. In addition, major field of study data were also cross-walked into the same categories. The data collected from the districts had major omissions: the urban districts were not able to provide teaching assignment data; licensure fields were disproportionately reported as being either elementary or “other” in our largest school district and were frequently missing in the other districts; and major field data were often missing. We therefore created a composite measure of teaching field in which the teacher was assumed to have a field if he or she had a licensure area, teaching assignment or major field that had been cross-walked to our generic field. While this approach helped to address the problem of missing data, it did not yield a single unique teaching field for each teacher (on average, each teacher had roughly two fields identified by this method), nor did it assure that the field identified was accurate and current, or that the teacher was actually teaching in that field during the 2002-03 year. It did, however, allow us to address analytically the question of whether a teacher with some expertise in a field was more or less likely to turn over. We expected to find that teachers in shortage areas such as math, the sciences, and special education were more likely to turn over. Our results are reported in Table R-2.

The data seem to confirm that mathematics was a significantly higher turnover field in three of the four districts. Teachers with expertise in mathematics were 4.2 to 29.3 percentage points more likely to leave their positions than were teachers with expertise in elementary education (the reference field). The results were not uniform, however. Milwaukee math teachers, by contrast, were roughly six percentage points less

likely to leave their positions than were elementary education teachers. It is not clear what might account for this difference.

The data did not support the hypothesis that teachers with expertise in the sciences or special education were more likely to leave their positions. In no district did we find statistically significant evidence for this. However, Milwaukee data revealed that teachers with expertise in the social sciences, English/language arts, foreign languages and vocational education were all less likely to leave their positions than were teachers in elementary education. New Mexico data suggest that teachers in foreign languages or the arts were more likely to leave. For Chicago, it is difficult to come to any conclusion concerning the relationship between teaching field and teacher turnover because teaching field data was unavailable in most cases.

What do these data really tell us? It seems safe to conclude that mathematics is a field with higher than normal turnover (except in MPS). It seems clear that shortage areas are local, since the results varied so much across districts. It also seems clear that data quality problems – particularly the absence of teaching assignment data on so many teachers – prevented us from finding definitive patterns among the fields.

Table X2: Partial Effects of Statistically Significant (alpha=.10) Teaching Field Variables

Variable	<u>CPS</u>		<u>MPS</u>		<u>GCS</u>		<u>NM</u>	
	OLS	Logistic	OLS	Logistic	OLS	Logistic	OLS	Logistic
Life/Biol. Sci.								
Phys/Earth Sci.								
Math	0.042	0.044	-0.063	-0.067	0.116		0.293	
Social Sci.			-0.097	-0.107				
Eng./Lang. Arts			-0.060	-0.064				
Foreign Lang.			-0.110	-0.176			0.317	0.012
Special Ed.								
Reading			-0.062	-0.067				
Fine Arts/Music							0.472	
Health/PE	0.036	0.038						
Vocational Ed.			-0.101	-0.115				
Other Fields	0.028	0.032					0.272	

*Age, Work Experience, and Highest Earned Degree*

Teachers were sorted into age (20s, 30s, 40s, 50s, and 60s or older) and total teaching experience (0, 1, 2, 3, 4-5, 6-10, 10-20, and 20 or more) categories. Categories were chosen to account for the independent effects of age and experience, even though it is clear that the two measures are correlated. The single year categories for experience were chosen because other studies have shown that turnover is significantly higher in the early years. Our working hypothesis was that turnover would be higher in the first years of teaching; would taper off in mid-career; and would then move higher again in the later years as teachers approached retirement age. Some districts fit this pattern more closely than others.

Teachers were also sorted into two categories based on whether their highest earned degree was a baccalaureate or a more advanced degree such as a master’s, intermediate certificate, or doctorate. Our hypothesis was that teachers with advanced degrees, everything else equal, would be more mobile and thus more likely to turn over. For example, when teachers complete an advanced degree in a new field, they may be forced to move to another school or district where they can find a position in their new field. Also, when teachers advance in their professions by acquiring advanced degrees, they are better able to move to schools that are more affluent or have higher performing students, or to non-teaching jobs. An opposing hypothesis was that because teachers with advanced degrees are more expensive for school districts to hire, they might face a diminished ability to leave their current district, particularly when surrounding school districts are relatively poor. The results for the effects of teacher age, teaching experience, and advanced degrees are presented in Table R-3 below.

Table R-3: Partial Effects of Statistically Significant (alpha = .10) Teacher Age, Teaching Experience and Advanced Degrees Variables

Variable	<u>Chicago</u>		<u>Milwaukee</u>		<u>Granville</u>		<u>New Mexico</u>	
	OLS	Logistic	OLS	Logistic	OLS	Logistic	OLS	Logistic
Age <30	0.051	0.053						
Age 30-39	0.070	0.073		0.032				
Age 50-59	-0.063	-0.077	0.062	0.065				
Age >60	0.097	0.096	0.169	0.150				
Exp = 0	0.167	0.163	0.118	0.100	0.581	0.636		

Exp = 1	0.097	0.102			0.340	0.434	0.516	
Exp = 2	0.065	0.072			0.267	0.360		
Exp = 3	0.064	0.072			0.414	0.503		
Exp = 4,5	0.047	0.055			0.322	0.447		
Exp = 6-10						0.198		
Exp = >20	0.068	0.080						
Advanced Degree	0.028	0.031						

Again, the variation among districts is evident. We consider first the influence of age. Chicago teachers appear to fit our hypothesis well. Teachers in their 20's and 30s were five and seven percentage points, respectively, more likely to turn over than teachers in their 40s (mid-career). Teachers in their 50s, by contrast, were six to seven percentage points less likely to turn over than their mid-career counterparts, suggesting that the modal retirement age in Chicago was in the 60s, where indeed teachers were almost 10 percentage points more likely to leave than mid-career teachers. Milwaukee teachers showed a similar pattern except that those in their 50s showed a higher, not lower, probability of turnover than those in their 40s. Also, Milwaukee teachers in their 20s were not more likely to turn over. Interestingly, age did not appear to be a significant factor in the turnover decisions of teachers in the smaller rural districts, a result that may be a statistical artifact of having too few observations to tease out the independent affects of age and experience.

In the rural districts and in Chicago, the influence of years of teaching experience was most consistent with our hypotheses. Teachers in their first year of teaching (experience = 0) were 10 to 64 percentage points more likely to leave than were those with 10 to 20 years of experience (the reference group for the experience variables). In addition, the pattern of the partial effects in all districts suggests that turnover probabilities diminish as years of experience increase, particularly when years of experience go beyond five years. The higher probabilities of turnover for teachers in Chicago with 20 or more years of experience could reflect retirement decisions.

Finally, we note that only teachers with advanced degrees in Chicago were more likely to turn over than those with baccalaureate degrees. The partial effect was only two to three percentage points, but it was consistent with our hypothesis about this variable.

*Teacher Race/Ethnicity and Gender and Schools' Minority and Poverty Populations*

In federal and state data collections involving race/ethnicity of teachers and students, individuals are assigned to one of the following categories: Black/African-American, Asian American/Pacific Islander, Hispanic, Native American, and White/Caucasian. Our data collection included the race/ethnicity of the teacher and the race/ethnicity breakdowns of each school's enrollment. It also included the percentage of the students at each school that participated in the free or reduced-price school lunch (FRL) program. This percentage was our measure of school poverty. The regressions entered the teacher's race/ethnicity as one of four categorical variables (reference group was White/Caucasian); the student body's race/ethnicity (the percent non-white) as categorical variables, and the percentage of FRL participants as categorical variables (see Table R-1). The racial composition and poverty status of the student bodies varied significantly across districts. In most Chicago and Milwaukee schools, the majority race was Black/African-American; in Granville County schools it was White/Caucasian; in Jemez Valley schools it was Native American; in Santa Rosa schools it was Hispanic. Many Chicago and Milwaukee schools exceeded 95 percent non-white and 95 percent FRL participants. Few Asian American/Pacific Islanders were enrolled in any of our study districts. Therefore, percent minority at a school largely meant the percentage of enrolled students who were African-American, Native American, or Hispanic.

Given these variations in school populations, we chose our school minority categories in a way that allowed us to test the hypotheses that teacher turnover was highest in schools that were heavily minority or high poverty. We chose the category "below 50%" as our reference group and we defined groups of minority and FRL students as 50-75%, 75-95%, and 95% or higher. These categories provided a fairly balanced distribution of schools among categories in Chicago and Milwaukee, but were less balanced in the case of the New Mexico districts, and not at all appropriate for the schools in Granville County. Therefore, the Granville County schools were assigned to the following categories: below 25 percent minority, 25-50, and 50-75, since no schools exceeded 75 percent minority. The reference group was the "<25" group. The same categories were used for their percentages of FRL students. In contrast to the Granville

County schools, the New Mexico districts had no schools in the bottom two minority and FRL categories. These gaps limited our ability to determine the effects of these variables in the rural districts because there was just too little variation among the schools. These gaps are apparent in the results that are presented in Table R-4.

Our hypotheses about the effects of these variables were: 1) minority-race teachers and male teachers may be more heavily recruited and therefore more tempted to leave their positions than are majority-race and/or female teachers; 2) teachers of all race/ethnicities are more likely to leave positions at schools that have high populations of FRL and minority students. As a corollary to these two, we attempted to test a third hypothesis that a teacher is more likely to be retained at a school in which the race/ethnicity of the majority of students is the same as the teacher's. We tested this third hypothesis by creating a categorical variable ("racial concordance") that was equal to one when the teacher's race/ethnicity matched that of the school's largest racial/ethnic group (zero otherwise).

**Table R-4: Partial Effects of Teacher Race/Ethnicity and Gender and Schools' Percentage Minority and Percentage Free and Reduced-Price Lunch (FRL)**

Variable	Chicago		Granville		Milwaukee		New Mexico	
	OLS	Logistic	OLS	Logistic	OLS	Logistic	OLS	Logistic
Male	0.024	0.026						
African American							N/A	N/A
Asian American					N/A	N/A		
Native American					N/A	N/A		
Hispanic	0.024	0.027			N/A	N/A		
Pct. Min 25<50	N/A	N/A	N/A	N/A	-0.185		N/A	N/A
Pct. Min 50<75	0.036	0.051			-0.320	-0.419	N/A	N/A
Pct. Min 75<95	0.039	0.055	0.063	0.064	N/A	N/A	N/A	N/A
Pct. Min 95 +	0.075	0.096	0.101	0.098	N/A	N/A	-0.803	
Pct. FRL 50<75	0.042	0.044				0.341	N/A	N/A
Pct. FRL 75<95					N/A	N/A	N/A	N/A
Pct. FRL 95 +					N/A	N/A	N/A	N/A
Racial Concordance	-0.036	-0.040						

The partial effects in Table X4 show mixed support for our hypotheses. In the Chicago data, there is evidence that male and Hispanic teachers leave their position with higher probability than their reference groups. Similarly, the Chicago data suggest that teachers in schools with higher minority population also leave at higher rates, and the effects are proportional to the percentage of minority students at the school. Milwaukee showed a similar, although weaker, pattern in its data. Finally, Chicago data suggest that racial concordance is associated with a 3.6 percentage point decrease in the probability of turnover.

On the other hand, teachers in Granville County and the New Mexico school districts appear to follow a different pattern of decreasing turnover rates in schools that have higher minority populations. These results may be statistical anomalies that result from too few observations on schools (a total of 22 schools in the rural districts) and too little variation within district in the categories of minority percentages. Even so, the results are consistent with the bivariate data presented earlier.

Finally, the data present no support for the hypothesis that teacher turnover is significantly higher at high poverty schools. This contrasts somewhat with the bivariate analysis presented earlier.

### *School Variables*

Our data collection included variables on some standard school variables (size<sup>26</sup> and level) and some customized school variables that included:

- Academic performance of students on State tests,
- Student attendance rate and student stability rate (following the NCLB definitions),
- Proportions of students with limited English Proficiency (LEP) or special education needs (SPED), and

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<sup>26</sup> School size categories: elementary schools were small, medium small, medium large and large according to whether their enrollments were below 250, 250-499, 500-749, 750 and higher; middle and junior high schools were small, medium small, medium large and large according to whether their enrollments were below 500, 500-749, 750-999, 1000 or higher; and secondary schools were small, medium small, medium large and large according to whether their enrollments were below 1000, 1000-1499, 1500-1999, 2000 or higher.

- Level of principal turnover at the school.<sup>27</sup>

We use “N/A” in Table R-5 to indicate when a school district was not able to provide data on a customized variable or when there was insufficient variation in data values to include a variable in the regression. An example of the latter is the school size variable for Granville County: the district data set contained no large or small schools.

In terms of the standard variables of school size and school level, we were not sure what impact they would have on teacher turnover. Among the customized variables, we hypothesized that teachers in schools with large populations of LEP or SPED students would be more likely to turnover because such students can be more challenging to teach in mainstreamed settings. We also expected that teachers in relatively low performing schools would be more likely to turnover. Finally, we hypothesized that teachers who taught in schools with unstable numbers of students, either by virtue of low attendance rates among a stable population of students or high transfer rates in and out (measured by our student stability rate), would also be more likely to turnover.

We should note that our school variables are only proxies for working conditions faced by individual teachers because they are school-level data and not classroom-level data. This is an important point to keep in mind as one considers the partial effects shown in Table R-5 below. For example, a school with high percentages of LEP or SPED students may teach more of these students in separate classes, and fewer in mainstreamed classes. The school may be able to hire more bilingual and special education teachers to offer specialized instruction. For most regular classroom teachers at such a school, the challenge of teaching students with special learning needs may actually be lessened rather than increased, and the relationship to teacher turnover may be negative rather than positive. Interestingly, the data on teachers in Milwaukee and Chicago display these patterns.

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<sup>27</sup> Principal turnover: low if the district had a principal who has served at least three years and if the district had no more than two principals during the last ten years; high if the principal had served less than two years and if the district had had at least four principals over the last ten years; and medium for other combinations. Only Milwaukee and the New Mexico districts were able to provide the data on this variable for most of their schools.

Table R-5: Partial Effects of School Variables (statistically significant at the .10 level)

Variable	Chicago PS		Milwaukee PS		Granville County		New Mexico	
	OLS	Logistic	OLS	Logistic	OLS	Logistic	OLS	Logistic
School Size = MS		-0.062			N/A	N/A		
School Size = ML		-0.089			N/A	N/A		
School Size = L		-0.129			N/A	N/A		
Middle/Jr. High						0.286		
Secondary	-0.065	-0.070	-0.062	-0.132	0.230	0.306	-0.529	
Pct. LEP 5<10	-0.048	-0.050				0.285	N/A	N/A
Pct. LEP10<30	-0.061	-0.064			N/A	N/A	N/A	N/A
Pct. LEP 30+	-0.062	-0.065	-0.037	-0.037	N/A	N/A	N/A	N/A
Pct. SPED 5<10							N/A	N/A
Pct.SPED10<30		-0.057						
Pct. SPED 30+	-0.155	-0.179			N/A	N/A		
Academic Performance = Low	0.064	0.067	0.076	0.057			N/A	N/A
Academic Performance = Medium							N/A	N/A
Attendance Rate = Low	N/A	N/A			N/A	N/A	N/A	N/A
Attendance Rate = Medium	N/A	N/A			N/A	N/A	N/A	N/A
Stability Rate = Low	N/A	N/A	0.062	0.059	N/A	N/A	N/A	N/A
Stability Rate = Medium	N/A	N/A			N/A	N/A	N/A	N/A
Principal Turnover = Low	N/A	N/A		-0.045	N/A	N/A		
Principal Turnover = Medium	N/A	N/A	-0.049	-0.048	N/A	N/A		

Turning to the results in Table R-5 we find that the school size partial effects for Chicago teachers indicate that those in small schools are more likely to leave their positions than are those in larger schools (by roughly six to 13 percent). This finding is consistent with the SECTQ study referenced earlier, and also consistent with the non-significant partial effects (not shown) in Milwaukee. Concerning the impact of school level, the data indicate that turnover is lower in secondary schools by roughly five to

seven percentage points in Milwaukee and Chicago public schools, but higher in the secondary schools of Granville County, a finding that may have more to do the county's proximity to the rapidly growing Wake County schools (Raleigh and surrounding towns) than to conditions in Granville County. By contrast, Granville's middle school teachers are more likely to leave their positions, even though teachers in the other districts were not.

One of our more puzzling findings was that schools with higher percentages of LEP students had lower turnover in the urban districts. In CPS, schools with higher percentages of SPED students also had lower turnover. These results contradict our hypothesis that high percentages of LEP and SPED students would create challenges and lead to high teacher turnover. There are many possible explanations for these results, from the possibility that LEP and SPED students help retain teachers to the problematic matching of school-level characteristics with individual teacher decisions. Further study is needed to look more closely at the relationship between LEP and SPED students and teacher turnover.

We had limited data on which to estimate the partial effects of student stability, attendance rates, and the extent of principal turnover. Despite this limitation, the effects from the Milwaukee schools were largely what we had hypothesized. MPS schools with low rates of student stability were six percentage points more likely to lose teachers than were those with high rates. MPS attendance rates, by contrast, appear not to have influenced teacher turnover rates, but principal turnover was a significant factor and in the direction that we hypothesized. Our data suggest that MPS schools that can stabilize principal leadership can expect to reduce teacher turnover by roughly five percentage points.

Finally, we observe that schools with low academic performance on State tests have higher rates of teacher turnover by six to seven percentage points per year, everything else equal. This result applies to teachers in the Milwaukee and Chicago Public Schools, about 98% of our sample. The finding has particular significance because our ranking of schools was done in districts that were large enough to validate our ranking procedure.

### *Remaining Variables Including Relative Compensation*

Our data collection included three other independent variables of interest: 1) whether the teacher served as a mentor or mentee in 2002-03; 2) whether the teacher had his or her own classroom; and 3) the teacher's total monetary compensation. Unfortunately, only Granville County was able to provide data on the first two variables, and Milwaukee Public Schools provided salary and fringe benefit data that appeared "high" in comparison to the other districts. We report below on our results for these three variables.

Our hypothesis about the first two variables was that mentor teachers, because of their heightened level of engagement, and mentee teachers, because of their heightened level of support, would be less likely to leave their positions than other teachers. Similarly, we hypothesized that teachers who had their own classrooms, rather than only having "art on the cart" space, would be more likely to leave their positions. We found no support for either hypothesis in our regressions on Granville County teachers.

Our hypothesis about teacher compensation was that higher levels of compensation, everything else equal, would be associated with lower levels of turnover. To test this hypothesis, we considered adjusting compensation figures for differences in the cost of living in each district, but given the large sizes and similar geographic and economic settings of the Milwaukee and Chicago school districts, we decided against this step. An additional problem needed to be overcome: the data from Milwaukee showed an average compensation level of more than \$70,000, a figure that was \$20,000 more than the average in any of our other districts (the large difference was probably due to the way Milwaukee calculated the value of its fringe benefits – as 62% of salary – a figure that seemed high). In order to express our compensation figures on a common scale, we chose to express salary and compensation as a percentage of the district average. By so doing, we sought to adjust for both the differences in the costs of living and differences in the way that benefits were created. Our relative compensation figures were expressed as percentages with values such as 10% or 110% of the district average. Since the variable expressed the compensation figure as a percentage of the district's mean compensation, the partial effect is interpreted as the change in the probability of turnover given a one-percentage point change in relative compensation (see Table R-6).

Table R-6: One Percent of Mean Compensation and Turnover Rates by District

District	One % of Mean Compensation	District Turnover Rate	Product: Rate * Complement
CPS	\$500	.30	.21
MPS	\$710	.17	.14
GCS	\$475	.17	.14
NM	\$410	.27	.20

The partial effects of relative compensation were totally mixed. Milwaukee and the New Mexico school districts showed no significant relationship between turnover probability and relative compensation. In Chicago, the partial effects in the OLS and Logistic regressions were negative, as expected, and suggested that an increase in compensation would lower the probability of leaving by .04 or .05 percentage points. Put differently, it would take an increase of \$10,000 to increase the probability of staying by one percentage point. In Granville County, however, increases in compensation were associated with an increase in the probability of turnover—an increase of \$950 would increase the probability of turnover by one percentage point. Our only explanation for this counterintuitive effect is that teachers with above average compensation in Granville County may have been coaches and Nationally Board certified teachers, both of whom were more marketable than regular teachers and thus more likely to leave their positions.

### Summary

The clearest implication of the multiple regression analysis is that the “turnover story” varies greatly across districts. The only variable that had a statistically significant impact across all five districts was teacher experience. Teachers with little experience (zero or one year) were much more likely to turnover. Several other variables had consistent effects across the two large urban districts. As expected, urban schools with high percentages of minority students had higher levels of turnover, as did schools with low academic performance. Unexpectedly, urban schools with higher percentages of LEP students had lower levels of turnover. In general, the results suggest that urban school districts should focus retention efforts on new teachers in high minority and low performing schools.

The variation of the results across districts points to the need for districts to track and analyze teacher turnover and important teacher and school variables. While the turnover of science and special education teachers may be a problem nationally, science and special education teachers did not leave the five study districts at a higher rate than elementary school teachers. Granville County is an example of a district that can use analyses of local data to target interventions. The data indicate that teacher experience was a major factor in teacher turnover and that teaching field was not a factor at all. GCS should focus retention efforts on teachers in their first year, regardless of teaching field. Basing interventions on national data may lead a district to attack a problem it does not have or to ignore a local factor that is key to retaining teachers.

### **Costs**

Districts were asked to measure costs at the district and the school level that could then be tied to the teacher turnover data. At both the district and school level, districts attempted to collect costs in eight categories:

- Recruitment
- Hiring
- Administrative Processing
- Training for First-Time Teachers (Induction)
- Training for New Hires (Orientation)
- Training for All Teachers (Professional Development)
- Learning Curve
- Transfer

These categories were designed for two reasons: to help districts identify costs tied to turnover and to assist with the allocation of costs. For example, all new teachers in a school participated in orientation activities. However, only first-time teachers participated in induction activities. Therefore, training costs for first-time teachers (induction) were allocated based on the number of leavers in a district. Training costs for

new hires (orientation) were allocated based on the number of turnovers in a district. A catchall category for training costs would not have allowed for this type of allocation.

Such a separation was also made in terms of administrative processing. The Transfer category was created to capture any costs, including administrative processing, associated with movers. This meant that all of the costs in the Administrative Processing category would be related to recruiting, hiring, and placing teachers, and could be allocated to leavers. With these categories, the cost of movers was the sum of Training for New Hires and Transfer costs. The cost of leavers was the sum of the remaining five categories (as mentioned earlier, Learning Curve costs could not be calculated). For each district, we report a total cost of turnover, a cost per leaver, and a cost per mover. Specific costs per mover and leaver, rather than a cost per turnover, provide a more nuanced look at district costs. Because more money is spent on leavers than on movers, an overall cost per turnover under-represents the cost of leavers and over-represents the cost of movers.

In addition to collecting district-level costs, districts were also asked to examine *school-level costs* in four focus schools. The focus schools represented a sample and were included to test the feasibility of collecting school-level turnover costs. At the school level, leavers and movers are one in the same. Whether a teacher leaves the district or moves within the district, the teacher is a leaver from the perspective of the school. Thus, we report a cost of turnover and a cost per turnover for the focus schools.

At both the district and school level, collecting cost data proved to be difficult, and the problems had varying causes. Two of the five districts were able to report school cost information for their focus schools—as noted below in Table C-1 (JVPS is such a small school district, with three schools at one site, that it did not have separate school and district costs). One of these two provided complete district-level cost information.

Table C-1: District and School Cost Reporting Capacity

	<b><u>District Cost Reporting</u></b>	<b><u>Focus School Cost Reporting</u></b>
<b>CPS</b>	Partial	Partial
<b>MPS</b>	Partial	Complete
<b>GCS</b>	Complete	Complete
<b>JVPS</b>	Complete	N/A
<b>SRPS</b>	None	None

Before examining the reported costs in relation to turnover, it is important to provide a clear sense of what each district was and was not able to report. We describe the status of cost data collection by district to make it clear to readers the data upon which our cost calculations and analyses were based. In addition, since the study is a feasibility pilot, we use this section to illustrate how district cost reporting either limits or augments the ability to paint a complete picture of teacher turnover costs.

As expected, the rural school districts had to collect the information by hand at the district and the school level. This process included surveys of district staff and school principals. By way of contrast, it was thought that the large databases in the urban districts would facilitate collection of cost information. Unfortunately, costs in the urban school districts were not documented in any systematic way. Unlike the rural districts, in which the small numbers of schools made it possible to hand collect data, the urban districts struggled to determine actual costs of teacher turnover. The costs were often spread across up to 50 different departments within the district. And instead of quantifying the time cost of a few employees, as in the rural districts, the urban districts were faced with the task of quantifying the time costs of hundreds of employees. Such accounting is possible but would require a concerted effort by district leaders to track costs and improved data systems.

District data systems lacked the ability to produce all the information needed to calculate the cost of teacher turnover. Existing district financial management systems could not generate the requested cost information. In the large urban districts, the existence of data silos was a substantial obstacle. These systems were designed to collect data for specific purposes, such as payroll, retirement, and school and classroom assignments.<sup>28</sup> These different purposes often distorted the data, and the silos were often incompatible.

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<sup>28</sup> For example, districts maintain information on teacher years of experience for payroll purposes. In MPS, teachers achieve the highest level of pay at 16 years of experience. Therefore, the data system stops counting years of experience at this point: no teacher in this system is on record as having more than 16 years of experience. This variance between stored data and actual teacher experience impacts any research on the turnover of veteran teachers, and it complicates any attempt to calculate the average experience of teachers in a school.

## Results

To determine the cost of teacher turnover, a school district needs to be able to collect and *connect* teacher, school, and cost information. From the school and teacher information, the rate of teacher turnover is calculated for the school district and for each school. The turnover rate is then used to allocate costs reported by the district. The end goal is to determine the cost to the district for each teacher who leaves the classroom.

### CPS

CPS was unable to collect complete cost data at the district or the school level. The size and complexity of the district, along with the absence of a cost accounting system, limited our analysis of the costs of teacher turnover in this district. For example, professional development is provided by more than 40 departments within the district central office. Schools are given a lump sum to spend on professional development. Principals purchase professional development services from among the district providers as well as from local groups and private vendors. At the present time, there is no cost center allocation system that allows the district to identify these costs per school for each of the 40 PD programs, nor is the district able to aggregate total costs at the school or district level across all the PD programs. The Department of Human Resources is attempting to implement a system that tracks professional development costs. In the meantime, the district could only provide an estimate.

In other areas, such as administrative processing, collecting information about costs was also difficult. As opposed to GCS, which may have one or two people working on teacher recruitment, CPS has many people. The district had never been asked to measure administrative processing costs related to teacher turnover and does not have a system in place to do so.

Table C-2: CPS District Costs of Turnover

<b><u>District Costs</u></b>	<b><u>Total Costs</u></b>	<b><u>Cost Per Leaver</u></b>	<b><u>Cost Per Mover</u></b>
<b>Recruitment</b>	\$828,403.00	\$171.02	-----
<b>Hiring</b>	\$340,000.00	\$70.19	-----
<b>Administrative Processing</b>	\$137,500.00	\$28.39	-----

<b>Training for First-Time Teachers</b>	\$2,968,600.00	\$612.84	-----
<b>Training for New Hires</b>	\$0.00	\$0.00	\$0.00
<b>Training for All Teachers</b>	\$41,747,917.12	\$8,618.48	\$0.00
<b>Transfer</b>	\$259,239.34	-----	\$93.08
<b>All Turnover Activities</b>	\$46,281,659.46	\$9,500.92	\$93.08

The result is that CPS does not have sound estimates of how much money it is spending on recruiting, hiring, and training new teachers. Professional development, or “Training for All Teachers”, was the only area that CPS was able to provide a reasonable estimate of district spending. This process was aided by an earlier project that examined professional development spending.

Based almost solely on the professional development spending in the district, teacher turnover cost CPS a total of \$46,281,659. With 4,844 leavers and a total leaver cost of \$46,022,420, the district cost per leaver was \$9,501. With 2,785 movers and a total mover cost of \$259,239, the district cost per mover was \$93.08.

The CPS district-level cost per leaver of \$9,501. This figure includes the reported district cost of recruiting, hiring, processing, and training new teachers, but does not include costs at the school level. CPS was unable to report any school-level costs. In MPS, the average cost per leaver was \$8,371. School-level costs include costs connected with the interview and hiring process, orientation costs for new teachers, and school-level mentoring or induction expenditures. These expenses were in addition to district-level expenditures and did not duplicate or double-count any cost items. Assuming that the CPS school costs of turnover were comparable to those found in MPS, the total CPS cost per leaver at the school and district level was estimated to be \$17,872. With 4,844 teachers leaving the district, the CPS cost of leavers was \$86,571,968.

More complete information on recruitment, hiring, administrative processing, and transfer spending is necessary in order to produce a more accurate estimate. At the time of this study, the district did not appear to have the capacity to provide such information and thus could not make policy decisions, or evaluate the impact of decisions, based on cost effectiveness. The state of the district’s data systems, along with the absence of an

effective accounting system related to turnover, inhibited efforts to accurately calculate the full cost of teacher turnover.

MPS

When first contacted, the MPS Department of Human Resources was able to report on staff time dedicated to replacing teachers. However, the reporting did not include any calculation of staff time spent on professional development. Also, the district was unable to report any “other than personnel” costs for recruiting, hiring, processing, or training teachers. For MPS, these costs apparently were spread among the budgets of multiple departments and were not regularly tracked. The absence of other than personnel (OTP) costs is a significant omission.

Table C-3: MPS District Costs of Turnover

<b><u>District Costs</u></b>	<b><u>Total Costs</u></b>	<b><u>Cost Per Leaver</u></b>	<b><u>Cost Per Mover</u></b>
<b>Recruitment</b>	\$380,662.70	\$534.64	-----
<b>Hiring</b>	\$0.00	\$0.00	-----
<b>Administrative Processing</b>	\$226,152.00	\$317.63	-----
<b>Training for First-Time Teachers</b>	\$4,028.00	\$5.66	-----
<b>Training for New Hires</b>	\$3,800.00	\$3.55	\$3.55
<b>Training for All Teachers</b>	Unavailable	Unavailable	Unavailable
<b>Transfer</b>	\$59,187.10	-----	164.87
<b>All Turnover Activities</b>	\$673,829.80	\$861.48	\$168.41

Because of these omissions, the calculated district costs of turnover were \$673,830, the cost per leaver was \$861, and the cost per mover was \$168. When ratios from GCS’s cost reporting were applied, it was evident that the MPS omissions had a significant impact on the calculation of the cost of teacher turnover. In the categories of recruitment, hiring, administrative processing, and training new and first-time teachers, MPS reported no OTP costs while GCS reported significant OTP costs. In fact, OTP

costs accounted for more than 75% of GCS total turnover costs in these categories. The costs included such expenditures as:

- Advertising;
- Reference checks;
- Testing reimbursement; and
- Recruiting trip costs such as airfare, rental cars, and registration fees.

Using MPS personnel costs and ratios from GCS cost reporting, the MPS cost per leaver more than tripled. When the absence of OTP costs was combined with the absence of any costs for hiring or professional development, it is clear that the cost per leaver in MPS is significantly higher than \$861.

Participating districts, especially MPS and CPS, found it difficult to divide turnover costs into the seven cost categories. In a district like MPS, one person was in charge of recruiting, hiring, and training speech and school psychologists; breaking this salary into distinct cost categories proved challenging. In addition, grants received by the district often stretched across several of the cost categories. In an attempt to ascertain a more accurate MPS cost of teacher turnover, we requested a line item breakdown of spending on turnover-related activities. The district reported spending \$2,274,754 on recruiting, hiring, and supporting new teachers. The district reported spending \$23,080,000 on teacher training.<sup>29</sup> Based on these costs and the number of teacher leavers, the MPS cost per leaver equals \$6,954.

In addition to the district costs, schools expend resources in order to replace departing teachers. Through a partnership with the Wisconsin Center for Education Research (WCER), eight MPS schools reported costs related to teacher turnover. Anthony Milanowski of WCER conducted surveys of eight MPS principals (2 high schools, 2 middle schools, and 4 elementary of K-8 schools). The principals were asked to estimate the number of hours involved in replacing teachers. These hours were then

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<sup>29</sup> Discussions with Rob Baxter, MPS Department of Human Resources, April-May 2007.

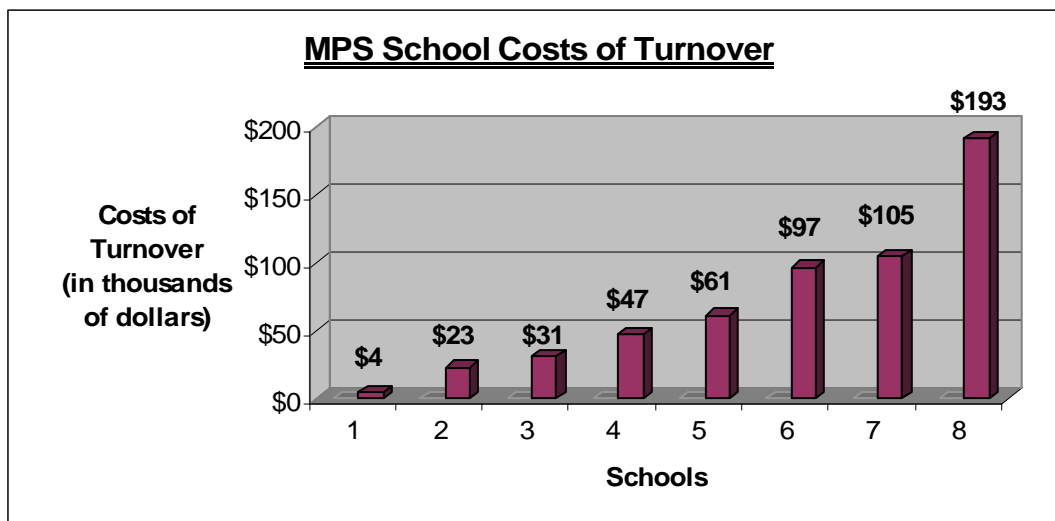
multiplied by the average hourly rates<sup>30</sup> (including fringe benefits) for those employees involved in replacing teachers.

**Table C-4: MPS Cumulative Turnover Costs at 8 Focus Schools**

<b>School Costs</b>	<b>Total Costs</b>	<b>Cost Per Turnover</b>
<b>Recruitment</b>	\$37,277.00	\$556.37
<b>Hiring</b>	\$0.00	\$0.00
<b>Administrative Processing</b>	\$131,965.00	\$1,969.63
<b>Training for First-Time Teachers</b>	\$326,272.00	\$4,869.73
<b>Training for New Hires</b>	\$56,699.00	\$846.25
<b>Training for All Teachers</b>	\$8,643.72	\$129.01
<b>All Turnover Activities</b>	\$560,856.72	\$8,371.00

Across the eight schools, the total cost of teacher turnover was \$560,857 and the cost per turnover was \$8,371. In terms of total turnover costs at each school, the costs varied from a low of \$3,869 to a high of almost \$192,776.

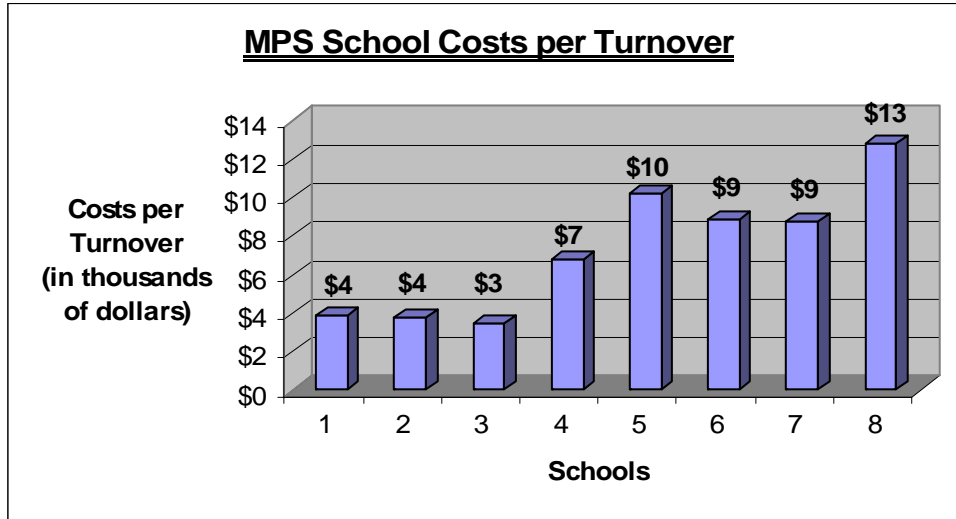
**Figure C-1: MPS Costs of Turnover at 8 Focus Schools**



<sup>30</sup> Average hourly rates were provided by the MPS Department of Human Resources.

The costs per turnover in the eight MPS schools also varied greatly, from a low of \$3,869 per turnover to a high of \$12,852 per turnover.

Figure C-2: MPS Costs per Turnover at 8 Focus Schools



When the average school cost per turnover is added to the district cost per leaver, each teacher leaver cost MPS an average of \$15,325. When the average cost per leaver is applied to the entire district, the 712 teacher leavers cost MPS \$10,911,400 in school and district costs.

In terms of MPS school costs, School 7 and School 8 make for an interesting comparison because they are fairly similar in size (School 7 has 87 teachers and School 8 has 72 teachers) but very different in terms of the cost of turnover. School 8 spends almost twice as much on turnover as School 7, even though School 8 has fewer teachers (see Table C-5).

Table C-5: Comparison of Schools 7 and 8 in MPS

	<u>School 7</u>		<u>School 8</u>	
	Total Costs	Cost Per Turnover	Total Costs	Cost Per Turnover
<b>Recruitment</b>	\$2,076.00	\$173.00	\$2,505.00	\$167.00
<b>Hiring</b>	\$0.00	\$0.00	\$0.00	\$0.00

<b>Administrative Processing</b>	\$7,464.00	\$622.00	\$25,305.00	\$1,687.00
<b>Training for First-Time Teachers</b>	\$76,812.00	\$6,401.00	\$163,725.00	\$10,915.00
<b>Training for New Hires</b>	\$18,720.00	\$1,560.00	\$0.00	\$0.00
<b>Training for All Teachers</b>	\$185.40	\$15.45	\$1,240.65	\$82.71
<b>All Turnover Activities</b>	\$105,257.40	\$8,771.45	\$192,775.65	\$12,851.71
<b>Total Teachers</b>	86		72	
<b>Total Turnover</b>	12		15	
<b>Turnover Rate</b>	14%		21%	

*Why does teacher turnover carry a higher cost for School 8?* The first reason is that School 8 has higher turnover. School 8 lost 21% of its teachers between 2002-03 and 2003-04. If School 8 reduced teacher turnover to equal the rate at School 7 (14%), School 8 would spend about \$64,000 less on teacher turnover, cutting its losses by one third.

The relatively large investments in training for first-time teachers and administrative processing also contributed to School 8's high cost of teacher turnover. It is possible that School 8 is administratively inefficient or that the school operates a relatively expensive and ineffective mentoring program. Accurate annual turnover and cost data allows School 8 to compare its costs and turnover with the costs and turnover of other MPS schools.

### GCS

GCS was able to report costs for the district and for four focus schools. Of all the districts, GCS took the closest look at actual time and money spent to recruit, hire, and train new teachers. In the district office, employees estimated the amount of time spent on turnover-related activities. GCS also analyzed the amount of money spent on OTP costs such as background checks and assistance with day care expenses. At the school level, GCS asked four schools to estimate the time and money that each dedicated to turnover-related activities. In all of this work, the district personnel were guided by the data collection protocol developed collaboratively by NCTAF and the five districts.

GCS spent a total of \$502,959 on teacher turnover. This cost includes recruiting, hiring, and training replacements for teachers who left the district between 2002-03 and 2003-04 (Figure C-8 summarizes the GCS cost information).

Table C-6: GCS Costs of Turnover

<b><u>District Costs</u></b>	<b><u>Total Costs</u></b>	<b><u>Cost Per Leaver</u></b>	<b><u>Cost Per Mover</u></b>
<b>Recruitment</b>	\$124,465.79	\$1,575.52	-----
<b>Hiring</b>	\$170,444.34	\$2,157.52	-----
<b>Administrative Processing</b>	\$53,976.90	\$683.25	-----
<b>Training for First-Time Teachers</b>	\$16,843.47	\$213.21	-----
<b>Training for New Hires</b>	\$96,147.34	\$1,092.58	\$1,092.58
<b>Training for All Teachers</b>	\$40,381.63	\$511.16	-----
<b>Transfer</b>	\$700.00	-----	\$77.78
<b>All Turnover Activities</b>	\$502,959.17	\$6,233.24	\$1,170.36

With 79 leavers and a total leaver cost of \$492,426, the district cost per leaver was \$6,233. The 9 movers and total mover costs of \$10,533 resulted in a cost per mover of \$1,170. These costs do not include state costs or school-level costs. As Figure C-8 shows, most of the cost of turnover was due to teachers leaving the district, rather than teachers moving from one school to another within the district. The brunt of the costs of movers appears to be incurred at the school level, where a mover must be oriented to his/her new position and a new file must be established.

Figure C-3: Focus School Costs of Turnover in GCS

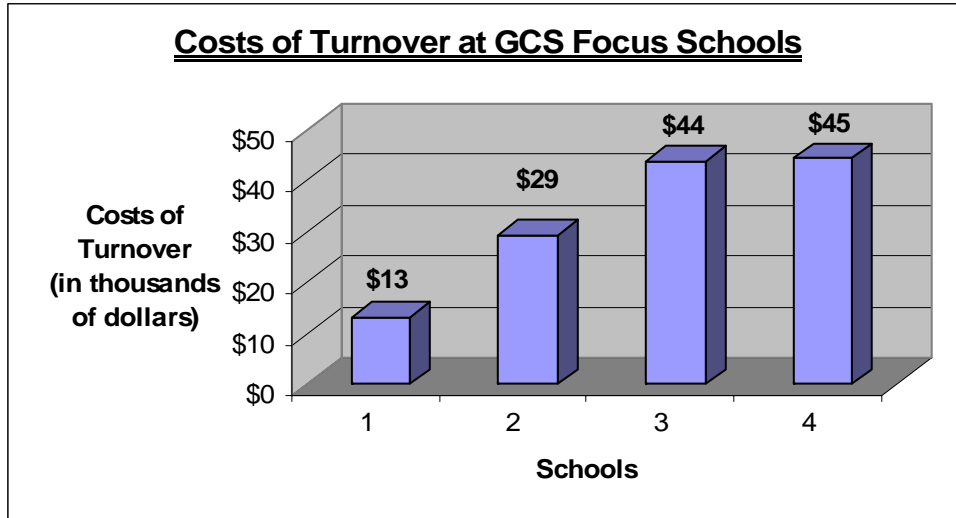
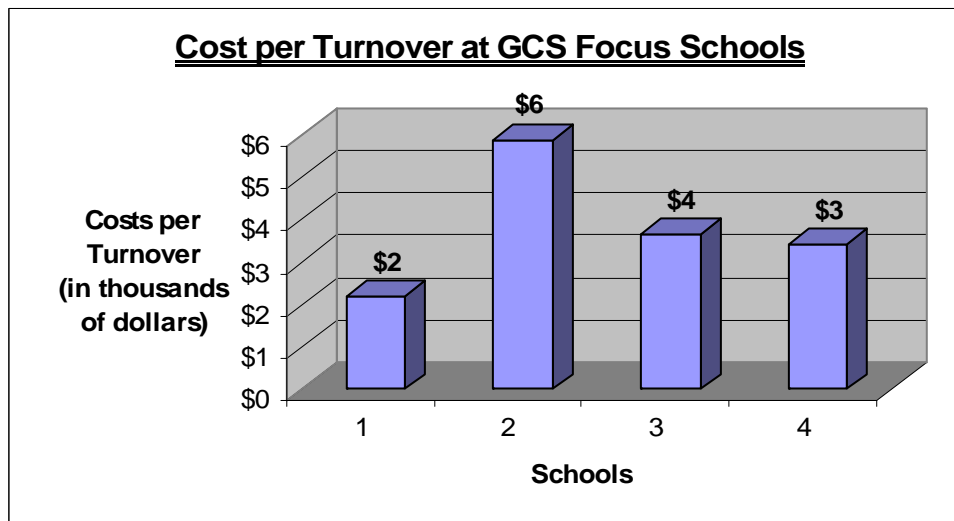


Figure C-4: Focus School Cost per Turnover in GCS



School-level turnover costs in the four GCS focus schools ranged from \$13,108 to \$44,558 (Figure C-3). Interestingly, School 2 had a significantly higher per turnover cost, but a significantly lower total cost of turnover, than School 4. This is due to the fact that School 2’s turnover rate was 13%, while the turnover rate at Schools 4 was 22%. School 2 spent twice as much per teacher as School 4 on training new hires, which may explain why fewer teachers left School 2 (see Table C-7).

Table C-7: Costs per Turnover at Schools 2 and 4

	<b>School 2</b>	<b>School 4</b>
<b>Recruitment</b>	\$628.50	\$553.92
<b>Hiring</b>	\$0.00	\$0.00
<b>Administrative Processing</b>	\$0.00	\$0.00
<b>Training for First-Time Teachers</b>	\$359.22	\$264.48
<b>Training for New Hires</b>	\$4,572.57	\$2,346.89
<b>Training for All Teachers</b>	\$325.54	\$262.24
<b>All Turnover Activities</b>	\$5,885.82	\$3,427.53
<b>Teachers</b>	40	59
<b>Turnovers</b>	5	13
<b>Turnover Rate</b>	12.5%	22.0%

On average, the cost per leaver across the four GCS schools was \$3,642. If this school cost average is applied across all of the schools in the district and combined with the district-level cost per leaver, the cost per leaver (at the district and school level) equals \$9,875 (district cost = \$6,233; school cost = \$3,642). The total cost of leavers at the district and school level equals \$780,125.

JVPS

JVPS was able to report costs for the entire district. This information, like most of the teacher and school data, was collected by hand as opposed to being recovered from a database. The small size of the district, in particular the fact that all three schools and the district office are located at the same site, lent simplicity to the task of tracking recruitment, administrative processing, training, and transfer costs.

Using the cost information provided by JVPS, the total turnover cost to the district was \$71,124. With 16 leavers and a total leaver cost of \$69,853, the district cost per leaver was \$4,366. With 2 Movers and a total Mover cost of \$1,271, the district cost per mover was \$635 (Table C-7).

Table C-7: JVPS District Turnover Costs

<b>District Costs</b>	<b>Total Costs</b>	<b>Cost Per Leaver</b>	<b>Cost Per Mover</b>
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<b>Recruitment</b>	\$6,142.00	\$383.88	-----
<b>Hiring</b>	\$0.00	\$0.00	-----
<b>Administrative Processing</b>	\$9,863.00	\$616.44	-----
<b>Training for First-Time Teachers</b>	\$1,952.00	\$122.00	-----
<b>Training for New Hires</b>	\$7,665.00	\$425.83	\$425.83
<b>Training for All Teachers</b>	\$45,082.72	\$2,817.67	-----
<b>Transfer</b>	\$419.00	-----	\$209.50
<b>All Turnover Activities</b>	\$71,123.72	\$4,365.82	\$635.33

As with the other estimates, the JVPS estimate does not include lost productivity. The estimate is low compared to the other districts. This may be because the school and district level costs of turnover are one in the same in such a small district.

SRPS

Despite its small size, SR was unable to report any costs. The district staff was stretched thin, and state reporting requirements took precedence over the cost accounting component of the project.

**Analysis of Turnover Costs**

Costs of turnover can be easily misinterpreted. A high cost per turnover is not necessarily bad, and a low cost per turnover is not necessarily good. A district that invests heavily in teacher training and support will probably have a high cost per turnover – even when the investment lowers its overall turnover rate and, we hope, its total turnover costs. This is due to the fact that the investments in teaching quality add to the total costs of turnover while also reducing the number of turnovers. For example, District A invests \$100,000 in teacher training and loses five teachers each year for a cost per turnover of \$20,000. District B invests \$100,000 in teacher training and loses twenty teachers each year for a cost per turnover of \$5,000. Even though District A has a higher cost per turnover, the districts spend the same amount on turnover and District A has a higher

retention rate. The cost per turnover can not simply be compared from district to district without taking a closer look at the data behind the costs.

In addition to being misinterpreted, there are a number of complications with the calculation of turnover costs. We acknowledge and address some of these complications here.

### *Retirement*

The cost of teacher turnover due to retirement is viewed as an expected cost. Every school system has teachers that decide to retire, and this is not seen as a decision that can be influenced by policy. To a certain extent, this is true. However, teachers often decide to teach beyond retirement age. Others decide to retire early. Such decisions are influenced by working conditions, which are amenable to policy. This study does not differentiate between costs of teacher turnover based on teachers' reasons for leaving. This would be an area ripe for qualitative study.

### *Fixed Costs*

Fixed costs are expenses whose total does not change in proportion to the activity of a business. For example, a school district must pay rent and utility bills irrespective of the amount of teacher turnover. By examining specific programs and activities in the various cost categories, we have attempted to focus on costs that are not fixed, but are likely to vary according to numbers of teachers who must be recruited, trained, or placed. Many costs only seem fixed because human resource departments are not agile enough to adjust spending based on decreases in teacher turnover. For instance, a school district with 2,000 teacher leavers might need 10 full-time recruiters to fill the open positions. If the district was able to decrease the number of leavers to 1,000, the district could theoretically fill the open positions with five recruiters. Such an adjustment in personnel, and the subsequent cost savings, relies on certain flexibility in the district.

### *Teacher Salary Differential*

The difference in salary between a departing teacher and the replacement teacher was not included in our analysis. Milanowski and his colleagues did take these

differentials into account in their study of Milwaukee teacher turnover.<sup>31</sup> They also made estimates of the “learning curve loss” resulting from turnover, finding that these estimated costs, when combined with the cost elements in our study, outweighed any savings from teacher salary differentials.

The potential savings from the salary differential between a veteran departing teacher and a beginning replacement teacher are substantial. However, the nature of the data provided by participating school districts did not allow us to calculate the difference between the salaries of departing and replacement teachers. It appears that the savings from salary differential may be limited for two reasons:

- Beginning teachers leave before they reach the higher salary levels that would create a salary differential large enough to offset the other costs of loss and replacement. The higher turnover rates of relatively new and inexperienced teachers suggest that in high turnover districts and schools, there often is a narrow gap between compensation for leavers and their replacements.
- Veteran teachers are not always replaced by beginning teachers. Replacement teachers could be as high on the salary scale as the departing teachers. District transfer policies, generally governed by seniority, muddy the waters when it comes to generalizing about the salary savings implications of turnover.

In addition, salary differential in the five study districts only impacts the district’s bottom line.<sup>32</sup> Because of salary averaging, individual schools do not save money by limiting teacher salaries.

### *Teacher Productivity*

Unfortunately, no measure of teacher productivity was available in the five districts. The data systems did not connect teachers with their students, which would have

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<sup>31</sup> Milanowski, A. and Odden, A. (2007), pp. 10-11.

<sup>32</sup> Roza, M., and Hill, P. (2004). How within district spending inequities help some schools to fail. In Dianne Ravitch (Ed.), *Brookings Papers on Education Policy: 2004*. Washington, DC: Brookings Institution Press.

allowed a comparison of the value added by departing and replacement teachers. A recent cost-benefit study of an induction program found that the estimated cost savings from increased teacher productivity far outweighed the cost savings from reduced teacher turnover.<sup>33</sup> Increased teacher productivity resulted in 47 percent of the total cost savings associated with the induction program, while reduced teacher turnover only accounted for 17 percent of the cost savings. This finding suggests that teacher productivity is a substantial factor in calculations of the cost of turnover.

### *Productive Turnover*

Some teacher turnover is beneficial. Schools that are able to replace a poor teacher with an effective teacher will increase teacher productivity. Schools also want to avoid becoming stagnant environments immune to fresh ideas and approaches. Most businesses aim to maintain a healthy level of turnover. High performing schools in the five districts appear to have achieved a relatively healthy level of teacher turnover. In the low performing, high poverty, and high minority schools, replacing large portions of the teacher workforce each year appears to be both a symptom and one of the many causes of poor working conditions. Only when teacher and student data are linked can the relative cost-benefit calculus of particular incidents of teacher turnover be evaluated.

### **Cost Implications**

In the district that reported the most robust cost figures (GCS), the district cost per leaver amounted to:

- \$6,233 (district costs only)
- \$3,642 (school costs only)
- \$9,875 (district and school costs)

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<sup>33</sup> Villar, A. and Strong, M. (2007). *Is Mentoring Worth the Money? A Benefit-Cost Analysis and Five-year Rate of Return of a Comprehensive Mentoring Program for Beginning Teachers*, p. 35.

The district cost and the district plus school cost are within the range of Shockley et al.’s findings in two Florida districts (one district spent \$4,000 per turnover and the other district spent \$12,000 per turnover). The district plus school cost per leaver is similar to the oft-cited Department of Labor estimate.<sup>34</sup> The Department of Labor estimates that attrition costs an employer 30% of the leaving employee’s salary (30% of the average GCS salary was \$10,740 in 2002-03). It is important to remember that our cost estimates leave out several important factors such as costs at the state and federal level; the costs of multiple turnovers of a teaching position in one year; and the costs of lost productivity.

Despite these omissions, the district cost estimates provide education leaders with a starting point for examining investments in teacher retention. GCS lost 79 of its 533 teachers (14.8%) between the 2002-03 and 2003-04 school years. Based on the cost estimates, the cost of this turnover at the district and school levels was \$780,125. In an effort to increase retention, GCS might decide to invest \$100,000 in an induction program. Table C-13 below illustrates the scenarios that might result.

The hypothetical district investment in an induction program must be added to the total cost of turnover, but may be offset by cost savings from an increase in retention. Smith and Ingersoll (2004) demonstrate the effects of various forms of induction on new teacher retention. The most well-developed induction program is associated with a 50% decline in new teacher turnover, according to Smith and Ingersoll.<sup>35</sup> With a \$100,000 investment in induction and a 50% reduction in new teacher leavers, the total cost of leavers would rise to \$179,000 and the cost per turnover would rise to \$22,375 (Table C-8).

**Table C-8: Investments in Retention and Costs of Turnover**

	<b><u>Cost of New Teacher Leavers (School and District)</u></b>	<b><u>New Teacher Leavers</u></b>	<b><u>Cost per Leaver (School and District)</u></b>
<b>Currently</b>	\$158,000	16	\$9,875
<b>\$100,000 investment;</b>	\$179,000	8	\$22,375

<sup>34</sup> Alliance for Excellent Education (2005). *Teacher Attrition: A Costly Loss to the Nation and to the States*, p. 6.

<sup>35</sup> Ingersoll, R. & Smith, T. (2004). *What are the effects of induction and mentoring on beginning teacher turnover?*, p. 705.

<b>50% reduction in new teacher leavers</b>			
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With a 50% reduction in new teacher leavers, the district would spend a total of \$21,000. In return, the district would have a \$100,000 induction program, a more stable workforce, and increased student learning (research shows that new teachers who participate in an induction program are more effective than new teachers who do not).<sup>36</sup>

As this analysis illustrates, the benefits of calculating the costs of turnover extend beyond determining costs and possible interventions. The annual calculation of turnover and costs allows a school district to evaluate the impact of interventions. If an induction program did not lessen turnover, the district could reinvest the money in bonuses for high turnover fields and then measure the impact of the bonuses.

It is also important to keep in mind that our cost calculations are based upon one year of data and would be more meaningful if based upon trend data. When using one year of data, fluctuations in turnover and costs could lead to unsound investments. However, the cost data indicate that a sound investment in teacher retention, in addition to increasing workforce stability and giving teachers a chance to develop professionally, can pay for itself through cost savings.

In the Chicago Public Schools, the cost per leaver at the school and district level totaled \$17,872. With 4,844 teachers leaving the district, the CPS costs of leavers was \$86,571,968. How could CPS invest in teacher retention, and what impact would this investment have on the costs of turnover in the district? CPS could implement a high-quality induction program for new teachers in the highest turnover schools; 119 schools had teacher turnover equal to or greater than 40%. On average, these schools were forced to replace more than half of their teachers, and this churn was just one of the challenges they faced. The highest turnover schools had higher percentages of free and reduced lunch and minority students, and lower school performance (Table C-8).

Table C-8: Highest Turnover CPS Schools vs. All CPS Schools

	<b>Teacher</b>	<b>School</b>	<b>FRL</b>	<b>Minority</b>
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<sup>36</sup> Villar, A. (2004). *Measuring the Benefits and Costs of Mentor-Based Induction: A Value-Added Assessment of New Teacher Effectiveness Linked to Student Achievement*, p. 36.

	<b>Turnover Rate</b>	<b>Performance (out of 200)</b>	<b>Students</b>	<b>Student Population</b>
<b>Highest Turnover Schools</b>	52%	64	88%	98%
<b>All CPS Schools</b>	30%	82	84%	91%

In the fall of 2002, the 119 highest turnover schools hired 448 teachers with no prior teaching experience. In the summer of 2003, 218 of these teachers left CPS at a cost to the district of \$3,896,096. In an attempt to increase retention of new teachers, CPS could implement a high quality induction program in its 119 highest turnover schools. The estimated cost per year of a high quality induction program is \$6,000 per teacher per year. The total cost of implementing a high quality induction program for the 448 teachers with no prior experience would be \$2,688,000 in the first year. The most well-developed induction program is associated with a 50% decline in new teacher turnover.<sup>37</sup> If the CPS induction program cut new teacher turnover in half in the highest turnover schools, the schools and the district would spend \$4,636,048 on new teacher turnover in the 119 schools, including the cost of the induction program. Implementing a comprehensive induction program in these schools would only cost the district \$750,000 more than it is currently spending on teacher turnover due to the increase in teacher retention.

### **Lessons Learned**

Through our work with the five school districts, several things have become clear:

1. *Turnover costs can be identified, aggregated, and analyzed, but current school district data systems make this process a difficult one.* Our experience is that district commitment to collecting and reporting teacher turnover costs must start with an acknowledgement that the yearly churn of teachers hurts a school district's bottom line in two ways: higher costs and lower student achievement. Such an acknowledgement is needed to garner the commitment necessary to determine the costs of teacher turnover. Currently, the costs are hidden in mounds of teacher, school, and costs data. Instead of

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<sup>37</sup> Ingersoll, R. & Smith, T. (2004), *What are the effects of induction and mentoring on beginning teacher turnover?*, p. 705.

acting as facilitators, data systems often stand as a formative obstacle to mining the data for answers. Without new data systems that break down the silos of the old systems, calculating the cost of teacher turnover will require the cooperation of district leaders across departments. Moving forward in this regard is fundamentally a policy question, not a technical one.

New data systems hold the promise of integrated and easily accessible data. Such data could, with proper analysis, allow districts to allocate resources based on specific costs and benefits. However, these systems will only be able to integrate the data that districts collect. To manage teacher turnover and its costs, districts must ensure that key data is collected, such as:

- Subject area(s) taught
- Licensure areas
- The school assignment of each teacher each year
- Teacher experience (overall and at the current school)
- The cost of recruiting, hiring, and placing a teacher
- The cost of orientation, mentoring, induction, and professional development
- The cost of turnover at several focus schools

Combined with data on school characteristics, this data will enable districts to pinpoint areas of high turnover and to implement and evaluate cost effective interventions.

***2. When a teacher leaves a district, the costs of recruiting, hiring, and training a replacement teacher are substantial.*** In GCS, the school and district costs per turnover totaled over \$9,000. In MPS, each turnover cost a school an average of over \$8,000. In CPS, each leaver cost the district over \$8,000 in professional development resources alone. Based on what the district did report in terms of professional development, and accounting for the missing CPS data with costs reported by GCS, the CPS district-level cost per leaver was \$13,650. When school costs were added to the district-level costs, the CPS cost of teacher turnover was estimated to be between \$76 and \$128 million per year.

Due to limitations of the study and the district data systems, these calculations do not take into account what may be the largest cost of teacher turnover: lost productivity. Despite this omission, it is clear that thousands of dollars walk out the door each time a teacher leaves a district.

**3. *Teachers walk out of certain doors at higher rates.*** More teachers walk out of the doors of schools that have high poverty, high minority, and/or low performing student populations. These factors were correlated with high teacher turnover in both of the urban school districts.

**4. *The correlation of these factors with high teacher turnover means that low performing, high minority, and high poverty schools spend more money on teacher turnover than high performing, low minority, and low poverty schools.*** For example, low performing schools in MPS had twice the turnover rate as high performing schools. With an average school cost per turnover of over \$8,000, low performing schools are spending much needed resources on replacing and retraining teachers. In two schools of 55 teachers each (the average school size in MPS), a low performing school would spend \$67,000 more than a high performing school. This difference in cost is substantial, especially considering additional district costs and the impact of high turnover on student achievement.

The data reported by the district allowed for the aforementioned key findings, and the data collection process allowed districts to take a closer look at teacher turnover and its costs. Participating districts took a close look at how many teachers were leaving, which teachers were leaving, and from which schools they were leaving. GCS was surprised to find that more than a third of new teachers left after one year. The district had worked hard to recruit, hire, place, and support these new teachers, only to see a third walk out the door and create new vacancies that needed to be filled. GCS also discovered many hidden costs associated with teacher turnover. Prior to the data collection process, the district equated the cost of teacher turnover with its recruitment budget. Upon closer examination, the cost of social events for new hires, reference checks, and mentor

training were all driven by the churn of teacher turnover. Even the recruitment budget failed to account for all of the recruitment-related costs associated with teacher turnover. Recruitment fairs cost more than paying for a table and driving to the fair. These events required planning time from administrators and substitutes to cover for the teachers that attended the fairs. A closer, more nuanced look at both turnover and its costs provided GCS with a deeper understanding of the scope and consequences of teacher turnover.

## **Recommendations**

Based on our findings, we recommend that districts and states take the following actions:

### **1. Track teacher turnover and its costs annually**

Prior to this project, none of the five participating school districts tracked teacher turnover and its costs. The data collected by the districts allowed for analysis of which teachers were leaving, from where teachers were leaving, and how much money was walking out the door each time a teacher left. However, this data only provided a snapshot of the teacher turnover and cost situation in each district. In order to make informed decisions, districts and states need to analyze trends in the data over time. By tracking teachers and costs year by year, school leaders and policymakers will be able to determine where to invest in teacher retention, how much to invest, and the impact of these investments.

### **2. Upgrade district data systems**

Districts collect an overwhelming amount of data on teachers, schools, and students. Unfortunately, most of this data is not used to inform decisions that impact student learning. The data is underused for three reasons:

- Current data systems stand in the way of accurate and timely analysis.
- Districts do not collect the necessary data, and
- Districts and states do not invest enough resources into data-based decision making.

Data-based decision-making has become an effective method for improving classroom teaching; it will be as effective in improving district management of human resources. In order to facilitate data-based decision-making at the district level, data systems must:

- Examine the relationship between teacher and school characteristics and teacher turnover;
- Measure data over time in order to highlight trends;
- Take a comprehensive look at the data, rather than measuring a particular program; and
- Allow for data sharing across districts.

Such data systems, along with training in how to collect and analyze data, will allow education leaders to track and manage teacher turnover and its costs.

### **3. Invest in new teacher support and development**

Induction programs that focus on improving instruction and teacher effectiveness have been proven to increase retention and improve student achievement. In an analysis of national data, Ingersoll and Smith (2004) found that a comprehensive induction program cut the new teacher turnover rate in half. In a cost-benefit analysis of a high quality induction program, Villar and Strong (2007) reported that the students of new teachers who experienced strong induction “in general, achieve in patterns that mirror the achievement rates of students assigned to more experienced mid-career teachers.”<sup>38</sup> The costs of such programs will at least be partially offset by increases in teacher retention and subsequent decreases in the costs of turnover. It is very possible that a district could save money by investing in an effective induction program.

### **4. Target retention strategies at high-need schools**

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<sup>38</sup> Villar, A. and Strong, M. (2007). *Is Mentoring Worth the Money? A Benefit-Cost Analysis and Five-year Rate of Return of a Comprehensive Mentoring Program for Beginning Teachers*, p. 35.

Teachers leave high-need schools (high poverty, high minority, low performing) at damaging rates. The constant churn of the teaching staff in these schools costs a lot of money and hurts student learning. By directing retention strategies to high-need schools, districts and states can give these schools an opportunity to build a rich learning environment. Retention initiatives in these schools have the greatest potential for a high return on investment, both in terms of money and school performance.

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The full text of this paper is available through NCTAF's website: [www.nctaf.org](http://www.nctaf.org). The website also provides additional resources related to the cost of teacher turnover, including the Teacher Turnover Cost Calculator. Using the NCTAF Cost Calculator, educators and members of the public can estimate the dollars spent on teacher turnover for a specific school or school district anywhere in the country. The Calculator contains enough background information on this tool to enable school leaders to design and conduct their own detailed turnover cost analyses. NCTAF's Teacher Turnover Cost Calculator can be found at [www.nctaf.org](http://www.nctaf.org). At the site, NCTAF will host a Wiki for discussion and comparison of costs that have been calculated by users in communities around the country. We encourage you to use the Wiki to provide feedback on how to improve the calculator.

*Gary Barnes  
Edward Crowe  
Benjamin Schaefer*

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