

**Thought Question:** Why are novice teachers not only leaving teaching but now leaving during the school year?

**Research Article:** *Leaving School Early: An Examination of Novice Teachers' Within-and End-of-Year Turnover*

**Subject Area:** Novice teachers, teacher turnover

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### **Summary**

Keeping novice teachers in the profession is an ongoing challenge. By year three only 29%-54% (depending on the study) of new teachers teach in the same school in which they started. Examining the lack of longevity of novice teachers in teaching is not new, however, novice teachers leaving during a school year is becoming more common. Several patterns emerged in the research conducted in North Carolina indicating teachers who teach in low socioeconomic environments and with larger number of minority students experience a larger novice teacher turnover rate. Less effective teachers are more likely to leave teaching than those with strong classroom management skills. Teachers leaving within the year is cause for alarm due to the impact on students, learning process, the school community, and the teaching profession.

Enjoy the article! **And remember...** addressing the challenges of underserved schools to support novice teachers is critical to creating stable learning environments for students and teachers.

**Keywords:** Novice teachers, teacher turnover, end-of-year teacher turnover, within-year teacher turnover, student achievement

# Leaving School Early: An Examination of Novice Teachers’ Within- and End-of-Year Turnover

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*Most prior research measures teacher turnover as an annual event, but teachers actually leave their positions throughout the school year. We use data from North Carolina to measure teacher turnover monthly throughout the entire year and conduct an analysis of their persistence to examine the differences in early career teacher turnover. Annually, 6% of early career teachers turn over during the school year. Teachers trained in traditional, university-based programs are most likely to move schools, and alternate entry and out-of-state prepared teachers are more likely to leave teaching, both during and at the end of the school year. We discuss the implications within-year turnover has on creating disruptive learning environments, particularly in underserved schools.*

**KEYWORDS:** early career teachers, teacher effectiveness, teacher preparation, teacher turnover

## Introduction

Recent shifts in the teacher labor market have begun to have significant implications for teacher turnover, its patterns of associations with teacher

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and school characteristics, and its consequences. Teachers are less experienced than in the past and enter teaching through a variety of pathways, many eschewing the traditional 4-year education degree programs (Henry et al., 2014; Ingersoll, Merrill, & Stuckey, 2014; Peske, Liu, Johnson, Kauffman, & Kardos, 2001; Redding & Smith, 2016). In addition, many initially teach in segregated schools that serve high concentrations of severely economically disadvantaged students who these novice teachers may not have been prepared to engage, support, and teach (Clotfelter, Ladd, & Vigdor, 2005; Goldhaber, Quince, & Theobald, 2018; Lankford, Loeb, & Wyckoff, 2002). In addition, teacher turnover is on the rise (Ingersoll et al., 2014), and reports from school leaders suggest that it has begun to occur more and more frequently during the school year.

In this study, we begin to explore teacher turnover as a continuously occurring phenomena throughout the year, measuring turnover on a monthly rather than on an annual basis. Measuring and analyzing turnover on a monthly basis allows us to examine similarities and differences in the associations found in prior research that investigated turnover as an annual event. In this study, we extend research on teacher turnover by investigating the associations of teacher turnover with the characteristics of early career teachers who move schools or leave teaching, the characteristics of the schools that are most affected, and the effectiveness of the exiting teachers, which are the main variables that have been extensively explored in prior research on annual turnover (Papay, Bacher-Hicks, Page, & Marinell, 2017).

Prior to reporting on this research, we need to address the question, “Why investigate teacher turnover as a continuous phenomenon that occurs during and at the end of the school year?” We offer three main reasons for examining teachers’ employment status in this fashion. First, in other work, we show that 4.5% of teachers turn over during the school year, which amounts to 25% of the total volume of teacher turnover (Redding & Henry, 2018). Moreover, novice teachers are particularly likely to turn over (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2008; Smith & Ingersoll, 2004), and current research has not yet examined or, perhaps, fully accounted for the turnover of early career teachers during the school year. Changes in the magnitude of turnover, especially if this occurs more frequently during the school year for novice teachers, may change the ways in which teacher turnover is perceived and its implications for practice. Second, given the rates of within-year turnover, associations between teacher characteristics, teacher effectiveness, and school characteristics may be heightened or diminished when continuous teacher turnover is examined. These associations are the primary focus of the current study. Finally, examining a more comprehensive measure of teacher turnover opens up the possibility for examining the ways in which the timing of turnover may affect students, other teachers, and school operations differently.

Within-year turnover (1) significantly disrupts student learning when replacements, including short- and long-term substitutes, enter the classrooms; (2) forces students to adjust midyear to a different instructional pace and practices; and (3) disturbs ongoing relationships with students and collaboration with other teachers (Henry & Redding, 2018; Ronfeldt, Loeb, & Wyckoff, 2013). Thus, it seems likely that the direct, classroom effects of turnover during the school year is likely to be different from the effects of turnover that occurs at the end of the school year. Elsewhere, we show that students who lose a teacher during the school year have test score gains that are, on average, 7.5% of a standard deviation lower than students whose teachers remain in the school the entire year, while end-of-year turnover has little effect on student achievement (Henry & Redding, 2018). In addition to the direct effect of turnover on students and teachers, turnover during the school year raises awareness of recruiting, hiring, inducting, and integrating new teachers as an ongoing management concern that distracts school leaders throughout the year (Hornig, Klasik, & Loeb, 2010), rather than as an annual cycle of events. Whether the associations with teacher turnover measured on a comprehensive, monthly basis differ from those measured on an annual basis or not, beginning to examine them is important for both advancing educational research and informing practice about turnover.

In this article, we present an exploration guided by prior research findings concerning the turnover patterns for early career teachers, focusing on associations of both within- and end-of-year turnover rates with teacher entry pathway, level of effectiveness, and school characteristics, including working conditions. We measure teacher turnover monthly using detailed teacher employment data files from North Carolina and analyze the associations with turnover of different types and timing, asking the following questions:

*Research Question 1:* How does early career teacher turnover vary monthly for their first three years of teaching?

*Research Question 2:* Are the associations between turnover and teacher entry pathway, teacher characteristics, school demographics, and working conditions different for measures of end-of-year turnover and measures of monthly turnover?

*Research Question 3:* To what extent do the associations between type of turnover (within-year moving, within-year leaving, end-of-year moving, end-of-year leaving, and temporary return and exit) and teacher entry pathway, teacher characteristics, and school demographics and working conditions vary?

*Research Question 4:* What are the associations between type of turnover and teacher effectiveness?

Addressing Research Question 1 focuses attention on a descriptive analysis of monthly turnover. To address Research Question 2, we compare the associations between our key independent variables using data on end-of-

year turnover only, then using monthly turnover data to assess the similarities and differences of the associations. This will allow an assessment of the contributions of monthly data to understanding teacher turnover patterns. Research Question 3 invites a substantive probe of teacher turnover to see the associations of different types of turnover and the key independent variables. Finally, we add teacher effectiveness to the models to learn more about the timing and type of turnover of less effective teachers.

In the next section, we introduce our theoretical framework to explain the focus on early career teachers and differences that we expect in the associations of entry pathways, levels of teacher effectiveness, and school characteristics with teacher turnover.

### **Focusing on the Timing of Teacher Turnover**

In this section, we motivate a series of hypotheses related to the timing of early career teacher turnover, with additional discussion of the association between teacher entry pathway, teacher effectiveness, and school conditions and within- and end-of-year turnover. These hypotheses are summarized in Table 1.

#### **Early Career Teacher Turnover**

Our focus on early career teachers stems from the volume of early career teachers currently working in public schools and the high propensity to leave their initial schools (Ingersoll et al., 2014). In a recent study of turnover across 16 urban districts, Papay and colleagues (2017) report remarkably high turnover rates among teachers in their first 3 years, with the percentage of early career teachers to turn over ranging from 46% and 71%, depending on the district. Early career teacher turnover is attributable to both voluntary and involuntary departures. Although we are unable to distinguish between voluntary and involuntary turnover in this study, we describe both types of turnover as they help explain early career teachers' high levels of within- and end-of-year turnover. The vast majority of teachers who turn over appear to do so voluntarily, with only 8% to 14% of teachers who turned over reporting that their turnover was involuntary in recent years (Carver-Thomas & Darling-Hammond, 2017). Voluntary turnover includes transferring to a new school, leaving teaching as a result of a lack of satisfaction with or attachment to the job, and leaving teaching temporarily, perhaps for family or medical leave, and may occur within or at the end of the year.

When deciding to stay in their school or the profession, teachers are particularly responsive to the conditions of their school (Ingersoll, 2001; Ladd, 2011; Simon & Johnson, 2015). This relationship appears to be strongest for early career teachers as they adjust to a new school and develop their professional practice (Johnson & Birkeland, 2003; Simon & Johnson, 2015). The affective attachments that novice teachers form with staff and students in

Table 1

**Hypotheses of the Timing of Moving From a School or Leaving Teaching Across Teacher Experience and Entry Pathway, Teacher Effectiveness, and School Characteristics**

Teacher/School Characteristic	Hypothesis	Rationale
Experience	<ul style="list-style-type: none"> <li>• <i>Decline in moving and leaving, both within and at the end of the school year, with gains in experience</i></li> </ul>	<ul style="list-style-type: none"> <li>• Initial difficulty in adjusting to teaching that is overcome through on-the-job development</li> <li>• Seniority-based norms leave less experienced teachers (1) with more difficult teaching assignments, increasing the need for support from their school staff, and (2) a greater likelihood of being involuntarily transferred or laid off</li> </ul>
Entry Pathway In-state, traditional certification	<ul style="list-style-type: none"> <li>• <i>More likely to move schools within year or at the end of the year than other entry pathways</i></li> <li>• <i>Less likely than other entry pathways to leave teaching, particularly during the school year</i></li> </ul>	<ul style="list-style-type: none"> <li>• Completion of teaching preparation programs signals an expectation to remain in teaching. The completion of licensure requirements increases human capital in ways specific to teaching, likely reducing transfer to other professions but increasing employment opportunities at other schools</li> </ul>
Alternate entry	<ul style="list-style-type: none"> <li>• <i>Less likely than traditionally certified teachers to move schools</i></li> <li>• <i>Much more likely to leave teaching within and more likely at the end of the school year than traditionally certified teachers</i></li> </ul>	<ul style="list-style-type: none"> <li>• Lack of full credential limits employment opportunities at other schools</li> <li>• Less of a commitment to a career in teaching and less preservice training to help the new teacher adjust to the demands of the classroom</li> <li>• More likely to work in underserved schools with less supportive social conditions, which may result in less affective attachment</li> </ul>

*(continued)*

Table 1 (continued)

Teacher/School Characteristic	Hypothesis	Rationale
Teach For America	<ul style="list-style-type: none"> <li>• <i>Unlikely to move between schools</i></li> <li>• <i>Most likely to leave teaching at the end of their program commitment, with low within-year leaving</i></li> </ul>	<ul style="list-style-type: none"> <li>• Normative commitment to work in underserved schools suggests they would remain in their initial school placement</li> <li>• Less of a commitment to a career in teaching and less preservice training to help the new teacher adjust to the demands of the classroom</li> </ul>
Out-of-state prepared	<ul style="list-style-type: none"> <li>• <i>No difference from in-state prepared teachers in terms of moving between schools</i></li> </ul>	<ul style="list-style-type: none"> <li>• If an early career teacher knows they will not spend their career in the state, it would be most beneficial to transfer to their home state before investing additional time acquiring benefits that would not transfer to their home state</li> </ul>
Teacher effectiveness	<ul style="list-style-type: none"> <li>• <i>More likely to leave teaching within and at the end of the school year than traditionally certified teachers</i></li> <li>• <i>Less effective teachers, measured by value-added or principal observation scores will be more likely to leave teaching within and at the end of the year</i></li> </ul>	<ul style="list-style-type: none"> <li>• Less normative commitment to remain in an out-of-state school because of teachers' preference to work close to home</li> </ul>
Underserved schools	<ul style="list-style-type: none"> <li>• <i>Teachers in underserved schools will be more likely to move schools and leave teaching during the school year than at the end of the year</i></li> </ul>	<ul style="list-style-type: none"> <li>• Teachers who struggle to manage the classroom environment and deliver effective lessons to their students are at greater risk of exiting teaching, including during the school year</li> <li>• Move into schools with more positive working conditions and equivalent salary and benefits</li> <li>• When early career teachers work in underserved schools without positive working conditions, they likely experience lower quality induction supports, become more demoralized, and lack commitment to remain in the profession</li> </ul>

their first school may be reduced by the lack of support from school staff and the failure to be integrated into the preexisting professional and social culture of their school (Kardos & Johnson, 2007). Without these affective attachments, new teachers may find the decision to leave in the middle of the school year an easier decision to make, regardless of the impacts on their students. In addition, seniority-based norms often leave inexperienced teachers with assignments to more challenging students or a less desirable classroom (Clotfelter, Ladd, & Vigdor, 2007; Kalogrides & Loeb, 2013), both of which may also increase the likelihood of early career teacher turnover, particularly during the school year.

An additional form of voluntary turnover pertinent to within-year turnover is the temporary exit and return to teaching (Grissom & Reininger, 2012; Papay et al., 2017). This type of turnover includes family and medical leave, among other reasons, which occur at any point throughout the school year. Papay and colleagues (2017) argue that it is important to distinguish this from other types of teacher turnover, as it both reflects the accuracy with which turnover is measured and the degree to which districts must budget for temporarily replacing these teachers.

Involuntary transfer and dismissal are an additional type of turnover encountered by early career teachers, which can also occur during or at the end of the school year. Personnel decisions have historically been made on the basis of “Last In, First Out” policies, whereby seniority is the predominant factor in determining the teachers targeted for within-district transfer or dismissal (Goldhaber, Strunk, Brown, & Knight, 2016; Guarino, Santibañez, & Daley, 2006; Koski & Horng, 2007; Kraft, 2015). Involuntary within-year transfers may be in response to shifting student enrollment patterns that pressure administrators to transfer a novice teacher hired at one school to another school in the district. To the degree that moving schools within the district during the school year is driven by these seniority-based policies, we expect to show little relationship between interdistrict moves and observable teacher characteristics among our sample of early career teachers. The degree to which teacher dismissals occur during the school year is unclear from the existing literature. Given the timing of when teachers are notified about layoffs—often in the early spring (Goldhaber et al., 2016)—it is probable that the notification of impending layoffs late in the school year could prompt an early exit even before the year ends. Another possibility is that ratings from the recent implementation of state teacher evaluation systems that include value-added scores may not be available until after the following school year begins, which may increase dismissals during the school year for teachers with poor performance ratings. The high volume of turnover among early career teachers and the potential for higher volume of within-year turnover for these teachers underlie our focus on these teachers.

## **Entry Pathways**

New teachers are increasingly likely to have entered the profession outside of traditional, in-state university-based programs. For instance, in 2011–2012, 25% of early career teachers entered the profession through alternative entry programs, up from 13% in 1999–2000 (Redding & Smith, 2016). Entering teaching through an alternate entry program may signal lower expectations for a career in teaching. With less of an attachment to teaching as a long-term career, alternate entry teachers would be more likely to turn over not only at the end of the school year but during the school year as well. The higher risk of leaving teaching would be heightened to the extent to which alternate entry teachers have specialized skills—either from prior employment or studying a subject other than education during college—which could enhance their competitiveness in the labor market and result in higher paying employment opportunities outside of education. In addition, alternate entry teachers may be forced to exit teaching if they fail to meet the requirements for a professional educator's license.

Because of the dearth of preservice training, developing an affective attachment to their school may be particularly important for early career alternate entry teachers as they receive the bulk of their training once they begin teaching. As a result of the outsized role of induction supports, alternate entry teachers may be particularly sensitive to the social conditions of the school, possibly resulting in lower turnover rates when working in schools with positive social conditions. Yet alternate entry teachers tend to work in underserved schools with less supportive social conditions and may not receive these supports (Redding & Smith, 2016; Redding & Smith, *in press*). They also have to divide their professional time between teaching and coursework for attaining certification, which could minimize the affective attachment to their school. In general, we expect alternate entry teachers to turn over at higher rates not only at the end of year but during the school year as well.

However, some alternate entry teachers, especially Teach For America (TFA) corps members, may bring a social justice or public service orientation to teaching that emphasizes their role in enhancing students' life chances (Ronfeldt, Kwok, & Reiningger, 2016). This motivation may enhance these teachers' commitment to work in underresourced schools with traditionally underserved racial/ethnic groups, resulting in low rates of moving between schools or even leaving teaching during a 2- or 3-year period as part of a programmatic commitment. Besides this normative commitment, low rates of moving to another school could also be explained by alternate entry teachers' lack of full teaching credential, which could serve to limit their marketability and, therefore, their employment opportunities in other schools.

In addition, new teachers are increasingly mobile, with 21% of newly certified teacher being prepared in a different state from where they begin

teaching (U.S. Department of Education, 2016). Compared with other entry pathways, there is less research focused on turnover among out-of-state prepared teachers, although the existing research indicates that they turn over at higher rates compared with in-state prepared teachers (Bastian & Henry, 2015; Goldhaber & Cowan, 2014). Bastian and Henry (2015) find that 25% of the early career teachers from out-of-state programs exited North Carolina public schools within 5 years of beginning teaching, compared with only 13% of in-state prepared teachers. Goldhaber and Cowan (2014) report that teachers from Washington State are even more likely to exit the school system with 44% of out-of-state prepared teachers leaving by the end of their fifth year. Goldhaber, Grout, Holden, and Brown (2015) hypothesize that less experienced teachers will be the most likely to switch states because they face lower costs associated with interstate moves. These costs include additional seniority benefits that bring job protection and greater returns from pension plans. It is also possible that these teachers move from states that prepare more teachers than there are employment opportunities and that they may be more competitive for positions in the teacher surplus-producing states after they gain experience (Bastian & Henry, 2015).

Given the research that shows teachers' preference to work close to home (Boyd, Lankford, Loeb, & Wyckoff, 2005; Reiningger, 2012), we suspect out-of-state prepared teachers also have less of a normative commitment to remain in the out-of-state schools in which they begin teaching than in-state prepared teachers. Furthermore, teachers from out-of-state are likely to be unfamiliar with the state's educational environment, increasing the challenges faced by early career teachers and elevating their risk of turning over, both within and at the end of the school year. Finally, similar to alternate entry teachers, out-of-state prepared teachers increasingly fill shortages in high-poverty schools with high concentrations of students of color (Bastian & Henry, 2015), which may strain the formation of affective attachments if these schools also lack strong supportive conditions.

Compared with alternate entry and out-of-state prepared teachers, in-state, traditionally certified teachers turn over at the lowest rates (Bastian & Henry, 2015; Borman & Dowling, 2008; Redding & Smith, 2016). These low rates of exit from teaching both within and at the end of the school year are attributed to differences in expectations for a career in teaching, which can lead those who plan to spend their career as teachers to complete licensure requirements before entering teaching. In the process, the exposure to the knowledge and skills considered essential in the classroom can lead to greater confidence in their preparation when these teachers begin teaching (Darling-Hammond, Chung, & Frelow, 2002; Kee, 2012). In addition, by the time traditionally certified teachers enter the profession, they have already spent time as a student teacher, an experience which allows them to preview the job and determine whether teaching and, often, the school and district are a good fit (Ronfeldt, Reiningger, & Kwok, 2013). The

completion of licensure requirements through a traditional university-based preparation program may also increase human capital in ways specific to teaching, making it more difficult to earn comparable wages outside of education (Chingos & West, 2012; Podgursky, Monroe, & Watson, 2004). Greater attachment to a career in teaching and the preparation itself contribute to higher levels of persistence in the early years in the teaching profession, resulting in low within- and end-of-year leaving.

While traditionally prepared teachers may leave teaching during or at the end of the school year at low rates, we hypothesize that they will move schools at the end of the year at higher rates than teachers from other entry pathways. Certification from an in-state teacher preparation program might serve as a signal of quality for administrators who have also been prepared these programs, thereby increasing employment opportunities at other schools for these teachers.

### **Teacher Effectiveness**

A consistent finding in the research on the relationship between early career teacher effectiveness and turnover is that the least effective teachers are the most likely to exit the teaching profession (Goldhaber, Gross, & Player, 2011; Henry, Bastian, & Fortner, 2011; Henry, Fortner, & Bastian, 2012). Decisions, voluntary and involuntary, occur not only at the end of the school year but during the year as well. Whereas all new teachers face an adjustment period as they develop on the job, some new teachers may struggle to manage the classroom environment and to deliver effective lessons to their students and, as a result, exit teaching before their first year even ends. The increased availability of information on teacher performance, including principal observation and value-added scores, could serve as an additional mechanism driving both within- and end-of-year turnover. On receipt of information on performance, low-performing teachers could be more likely to exit teaching at the end of the school year, either by choice or the result of contract nonrenewal (Cullen, Koedel, & Parsons, 2016). As teachers often receive summative evaluation scores at the beginning of the following school year (Goldring et al., 2015) along with their value-added scores, which are the main source of poor performance, receipt of information about poor performance during the school year may spur higher rates of within-year leaving as well.

### **School Characteristics and Working Conditions**

One of the best established patterns in the research on the teacher labor market is that teachers disproportionately turn over from segregated schools with high concentrations of economically disadvantaged students (Hanushek, Kain, & Rivkin, 2004; Lankford et al., 2002). For instance, data from the Schools and Staffing Survey show an annual turnover rate of

10.5% in low-poverty schools compared with 15.2% in high-poverty schools (Ingersoll, 2001). We expect this asymmetric sorting to be particularly strong for early career teachers who increasingly fill roles in these underserved schools. We predict that early career teachers working in such schools will have the highest turnover rates, both during and at the end of the school year. In addition, secondary school teachers have been found to turn over at higher rates, although it is less clear the extent to which this might extend to within-year turnover (Borman & Dowling, 2008).

Economically disadvantaged and segregated schools also tend to have more difficult working conditions (Borman & Dowling, 2008; Guarino et al., 2006; Ingersoll, 2001). Research on working conditions has focused on social conditions such as school leadership or distributed leadership, the availability of adequate facilities and resources, supportive mentoring, and student discipline problems (Allensworth, Ponisciak, & Mazzeo, 2009; Boyd et al., 2011; Buckley, Schneider, & Shang, 2005; Grissom, 2011; Ingersoll, 2001; Johnson, Kraft, & Papay, 2012; Ladd, 2011; Schweig, 2014). When working in schools with high concentrations of economically disadvantaged or underrepresented minorities or poor working conditions, teachers may become increasingly demoralized and lack the commitment to remain in the profession, leaving teaching before the school year even ends. At the same time, high levels of within-year turnover could compromise the supports for new teachers if the teachers responsible for inducting novice teachers must shift their focus to multiple new teachers throughout the school year.

## **Research Design**

The main objectives for this study are (1) to accurately describe the timing of teachers' decisions to move to another school or leave teaching and (2) to compare differences in novice teachers' risk of turning over across different entry pathways, level of effectiveness, and school characteristics. This analysis of teacher turnover is distinctive for two reasons. First, most research on teacher turnover tends to describe annual turnover measures, particularly the research from the cross-sectional Schools and Staffing Survey. By only examining one year of data at a time, these models fail to examine the length of teachers' stays in their current school or the teaching profession. We follow three cohorts of early career teachers for 3 years, beginning with their entry into the profession. In North Carolina, teachers qualify for their professional teaching credential at the end of 3 years, and we include whether they return for their fourth year, which would indicate they have earned the credential. This sample and longitudinal data allow us to not only understand differences in turnover by entry pathway, teacher effectiveness, and school characteristics but also more thoroughly detail the employment trajectories of early career teachers.

Second, unlike other studies that conceptualize teacher turnover as occurring annually, we measure turnover during each month of the year and model it throughout the 3 years using survival analysis. An assumption in any survival analysis is that there is an underlying continuous time model (Allison, 2014). By examining turnover as occurring annually, researchers have made an implicit assumption that teachers have an equivalent risk of turning over at any point in the year. We are able to better model turnover as we come closer than previous studies to approximating the underlying continuous time model. Doing so enables us to uncover potentially meaningful variation in the timing of early career teacher turnover (Singer & Willett, 1991).

### **Study Sample**

The sample consists of teachers who entered teaching in 2009–2010, 2010–2011, or 2011–2012 in the state of North Carolina. We follow teachers each month of the school year for their first 3 years of teaching. We focus on teachers in their first 3 years as previous research shows that within- and end-of-year turnover is generally highest during teachers' first 3 years on the job (Redding & Henry, 2018). To build this longitudinal analysis file, we draw on monthly teacher pay files, which include detailed information about whether or not a teacher received a salary payment that month and, if so, the school in which they were employed. Across these cohorts, the analytic sample includes 13,665 unique teachers and 35,536 teacher-year observations. The sample size varies across years, as the number of new teachers to enter the profession dipped during the Great Recession. Cohorts 1 through 3 consist of 3,761, 4,767, and 5,137, first-year teachers, respectively.

### **Study Measures**

#### *Outcome Variables*

Teacher turnover is operationalized in two separate ways in this study. In the first set of analyses, teacher turnover is measured as a teacher's employment status in a given month. Separate variables document whether a teacher's exit from their school, resulted in (a) moving to a new school<sup>1</sup> or (b) leaving teaching in public schools in the state of North Carolina. These dichotomous variables are coded as 1 if the event was experienced in a particular month, given that it had not occurred earlier and 0 if the event had not been experienced in that month. It is important to note that we observe teachers for the length of a traditional school year, that is, for 10 months each year. We collapse the summer into a single month for the survival analysis. So if a teacher remained in the same school for the first 3 years of teaching and returned for their fourth year, they would be observed for a maximum of 30 months in that school. It is also important to note that these

outcomes are not mutually exclusive. Before estimating the risk of moving and leaving schools separately, to better understand the overall churn of new teachers, we combine these turnover measures to predict a teachers' exit from their first school.

In the second set of analysis, we coarsen the monthly turnover data, creating a categorical variable with five mutually exclusive turnover categories—within-year moving, end-of-year moving, within-year leaving, end-of-year leaving, and temporary exit and return—all in reference to teachers who stayed in the same school for their first 3 years of teaching. Temporary exit and return refers to teachers who left their schools during one school year and returned by the end of the next year. To ensure mutual exclusivity, this variable measures a teacher's first observed mobility. In Table 2, we report conditional means for the independent variables examined in this study, separated by the category of teacher turnover.

There are two limitations to our measure of turnover that should be noted. First, our data give no indication of whether or not the turnover was voluntary or involuntary. Second, we are only able to measure whether or not a teacher left teaching in public schools in North Carolina. That is, a teacher could have moved to a private school or out of state, and we would count them as a leaver.

### *Independent Variables of Interest*

A main independent variable of interest is teachers' entry pathway, which is separated into five mutually exclusive categories: in-state, traditional preparation; alternate entry; TFA; out-of-state preparation; and other preparation. Out-of-state prepared teachers could have been undergraduate prepared, graduate prepared, or only earned their licensure. The out-of-state licensure only group completed the requirements for a teacher licensure at an out-of-state institution. We also include an indicator that includes other institutions that were either unclassifiable or the teacher was a Visiting International Faculty. The reference group includes teachers who attended a traditional, university-based preparation program, either at the undergraduate or graduate level or earned their teaching license in North Carolina. We also control for a teacher's gender, race/ethnicity (Black, Hispanic, other race), and age in all models.

Teacher effectiveness is measured by their performance evaluation score and, for new teachers in tested subjects or grades, their EVAAS (Education Value-Added Assessment System) teacher value-added score. Both measures come from teachers' first year. We develop two measures from teachers' performance evaluations. First, we take the median score across the five standards on which teachers in North Carolina are evaluated. We then compare teachers whose median score was below proficient (either a 1 or 2) with teachers whose median score was a 3 ("Proficient") and those whose

*Table 2*  
**The Characteristics of Early Career Teachers and the Schools in Which They Teach, by Within- and End-of-Year Turnover**

Characteristics	Full Sample	Stayer	Within-Year Moving	End-of-Year Moving	Within-Year Leaving	End-of-Year Leaving	Temporary Exit and Return
<b>Teacher characteristics</b>							
Traditional in-state preparation	0.60	0.68	0.65	0.70	0.45	0.41	0.61
Alternate entry	0.11	0.09	0.11	0.09	0.14	0.14	0.12
Teach For America	0.04	0.01	0.01	0.02	0.03	0.11	0.01
Out-of-state prepared	0.22	0.19	0.18	0.17	0.32	0.30	0.20
Other	0.04	0.03	0.05	0.03	0.07	0.04	0.06
Female	0.79	0.80	0.82	0.79	0.76	0.74	0.84
Black	0.12	0.11	0.12	0.12	0.11	0.12	0.14
Hispanic	0.02	0.02	0.02	0.02	0.04	0.02	0.02
Other races	0.04	0.04	0.04	0.04	0.04	0.05	0.03
Age	28.17	27.86	29.39	27.47	30.65	27.62	32.87
<b>School characteristics</b>							
Underserved school index (std)	0.09	-0.04	0.12	0.13	0.17	0.22	0.19
Middle school	0.21	0.19	0.19	0.22	0.25	0.23	0.23
High school	0.46	0.43	0.51	0.41	0.68	0.47	0.44
City	0.38	0.37	0.34	0.37	0.38	0.42	0.43
Rural	0.44	0.45	0.47	0.44	0.43	0.40	0.42
Town	0.10	0.10	0.08	0.10	0.11	0.10	0.09
Distributed leadership (std)	-0.21	-0.13	-0.21	-0.21	-0.30	-0.32	-0.29
Principal leadership (std)	-0.27	-0.16	-0.25	-0.27	-0.43	-0.40	-0.37
Mentor influence (std)	-0.11	-0.05	-0.10	-0.11	-0.19	-0.19	-0.18
Facilities and resources (std)	-0.15	-0.06	-0.18	-0.15	-0.27	-0.27	-0.20

*(continued)*

**Table 2 (continued)**

Characteristics	Full Sample	Stayer	Within-Year Moving	End-of-Year Moving	Within-Year Leaving	End-of-Year Leaving	End-of-Year Leaving	Temporary Exit and Return
Teacher effectiveness								
Teacher value-added	-0.00	0.02	0.26	-0.02	-0.09	-0.02		0.06
Median evaluation score = 2 or less	0.09	0.07	0.09	0.07	0.11	0.14		0.11
Median evaluation score = 3	0.74	0.75	0.72	0.74	0.72	0.71		0.71
Median evaluation score = 4 or 5	0.18	0.18	0.20	0.19	0.17	0.15		0.18
Teacher/school observations	13,665	5,077	610	3,353	984	3,118		523
Value-added observations	2,026	742	58	539	97	557		33

*Note.* std = standard. Measures of teacher effectiveness are from teachers' first year.

median score was rated 4 or 5 (“Accomplished” or “Distinguished”). With the overwhelming majority of teachers rated proficient or above, we create an additional variable to indicate whether or not a teacher received any score below proficient. For value-added, the continuous score is used in some analyses, whereas in others, we separate it into quartiles and compare the lowest (Quartile 1) and highest (Quartile 4) performing teachers to teachers in the middle quartiles.

In addition to differences by entry pathway and effectiveness, this study also seeks to understand differences in early career teachers’ turnover patterns across schools with different school characteristics. Because of the high degree of correlation between commonly used measures of school context—the percentage of economically disadvantaged students, the percentage of minority students, and school-wide proficiency rates—we create an underserved school index by regressing the percentage of Black, Hispanic, and other non-White students, average student enrollment, the suspension rate, violent acts rate, per pupil expenditures, and the teacher salary supplement on school-level proficiency rates (i.e., a fraction of the number of tests passed over the number of tests taken within a school). The underserved school index variable is the standardized fitted values from this regression.

Other school characteristics of interest include school level (elementary, middle, or high schools) and urbancity (city, suburb, rural, and town). Following prior research on teacher working conditions in North Carolina, we draw on the Teacher Working Conditions survey to develop measures of teacher-reported school conditions (Ladd, 2011). Using confirmatory factor analysis, we create the following measures: Distributed Leadership ( $\alpha = 0.86\text{--}0.88$ ), Principal Leadership ( $\alpha = 0.87\text{--}0.93$ ), Mentor Influence ( $\alpha = 0.97$ ), and Facilities and Resources ( $\alpha = 0.84\text{--}0.85$ ). As the Teacher Working Conditions survey was administered every other year, for off years, we use linear interpolation to impute the school-level averages. Supplementary Table A1 lists all variables and Supplementary Table A2 (supplementary materials are available in the online version of the journal) provides additional information on the specific survey items that comprise these measures. It is important to note that while these variables serve as independent variables of interest in some models, in others, they are used as covariates to adjust differences in the turnover patterns across different entry pathways and teacher effectiveness.

## **Analytical Methods**

To leverage the data on monthly observations of teachers, we begin with a discrete time survival analysis to predict when early career teachers turn over. By accounting for these temporal patterns in the timing of turnover, we are able to better model the complexities in the early career teacher labor market. This logistic regression model can be estimated as follows:

$$\text{logit } h(t) = \beta_0(t) + \beta_i \mathbf{X}_i \quad (1)$$

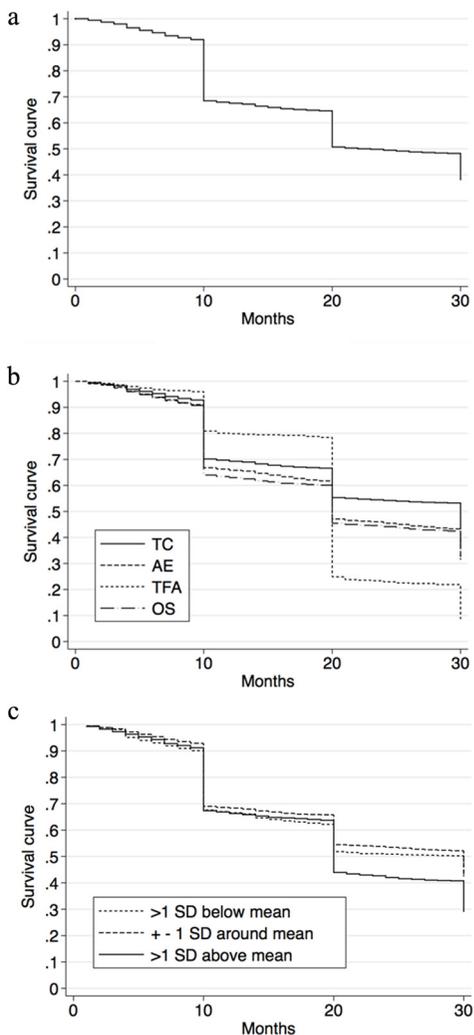
where  $\mathbf{X}_i$  is a vector of teacher and school characteristics. In these models,  $\beta_0(t)$  represents the baseline hazard and values  $\beta_i$  represent the difference from the baseline hazard. This, and all models described below, also include a cohort fixed effect to allow for cohort differences in the risk of turnover. We estimate two separate versions of  $t$  to better understand the extent to which the availability of data on within-year turnover helps uncover meaningful variation in the timing of early career teacher turnover. Our first model is restricted to 3 years of data on end-of-year turnover. The second model includes monthly turnover data for a teacher's first 3 years. Standard errors are clustered at the teacher level to account for repeated observations of the same teacher over time.

As additional unobserved variables are likely correlated with teachers' decision to turn over and vary systematically by entry pathway or any of the other covariates being examined, the results should not be interpreted as the causal influence of any one of those variables. To test the robustness of our findings, in Supplementary Tables A6 and A7 (available in the online version of the journal), we replicate our main analysis with school random effects to account for unobserved school-level differences that may predict teacher turnover. Overall, the magnitude of the estimates or level of significance is smaller in this analysis, suggesting that the estimates presented in the article are more conservative.

An additional limitation of the discrete time model is the lack of an efficient way to examine differences in the relationship between teacher and school characteristics and within- and end-of-year teacher turnover or model changes in the effect of regression coefficients over time. To address this limitation, we estimate a multinomial logistic regression model comparing within-year moving, end-of-year moving, within-year leaving, end-of-year leaving, and temporary exit and return, all in reference to teachers who stayed in the same school for their first 3 years of teaching. This model helps us identify differences in the associations of within- and end-of-year moving and leaving, respectively, regardless of when the turnover occurred in a teacher's first 3 years of teaching.

## Results

To understand the timing of early career teacher turnover and how it is distributed across teacher entry pathways and school types, Figure 1 plots Kaplan-Meier survival curves for early career teacher turnover. Figure 1a shows that by the end of their third year in the profession, only 38% of early career teachers remain in the same school in which they began their career. This turnover rate is consistent with the rates found by Papay et al. (2017), who report that novice teachers remain in their original school after 3 years



**Figure 1. Kaplan-Meier survival curves for early career teacher turnover, by teacher and school characteristics: (a) all teachers, (b) teacher entry pathway, and (c) minority student involvement.**

*Note.* Each school year is coded as having 10 months. TC = in-state, traditional preparation; AE = alternate entry; TFA = Teach For America; OS = out-of-state prepared.

range between 29% and 54%, depending on the district. In Supplementary Figures A1 and A2 (available in the online version of the journal), we show that the 3-year turnover rate for the current study includes 40% of early career teachers who moved schools and 33% who left teaching.

In addition to the cumulative turnover rates, a couple of other patterns regarding the timing of turnover stand out. First, while the largest share of teacher turnover occurs at the end of the school year, early career teachers turn over during the school year as well, particularly in their first year, when 8% turned over before the end of the year. This finding is important because within-year turnover is more disruptive and appears to have more detrimental effects on student achievement.

When examining the survival curves by type of turnover, we find teachers to be slightly more likely to move schools than leave teaching during their first year (4.8% vs. 3.5%; see Supplementary Figures A1 and A2). Early career teachers are most likely to move schools both during and at the end of their first year, whereas the rate at which early career teachers leave teaching only decreases slightly over the first 3 years of teaching. Throughout their first year, 21% of teachers moved schools, which decreases to less than 10% during their third year. In contrast, the rate at which early career teachers leave the profession decreased only slightly during their first 3 years, with 12% having left by the end of their first year, an additional 11% in their second year, and an additional 10% in their third year.

In terms of teacher entry pathways, TFA teachers are the least likely to turn over within their first year, whereas alternate entry and out-of-state prepared teachers are most likely to turn over. Only 4% of TFA teachers turn over during their first year compared with 7% of traditionally prepared teachers and 9% of alternate entry and out-of-state prepared teachers. The low level of TFA teacher turnover continues to the end of their second year, by which point only 22% of TFA teachers had turned over from their first school compared with 33% of traditionally prepared teachers. By the end of 3 years, in-state, traditionally prepared teachers were most likely to remain in their first school. Whereas 57% of traditionally certified teachers had turned over from their original school, 68% of out-of-state prepared teachers, 69% of alternate entry teachers, and 91% of TFA teachers had turned over by the end of 3 years. When teacher turnover is separated by moving schools or leaving teaching, we find that in-state, traditionally prepared teachers are most likely to move schools but least likely to leave teaching, including during the school year (see Supplementary Figures A1 and A2). For instance, during their first year, only 2% of traditionally prepared teachers left teaching compared with 4% of alternate entry teachers and 5% of out-of-state prepared teachers, a pattern of within-year turnover that continues into teachers' second and third years.

Differences in the timing of teacher turnover also occur across schools with various school characteristics. Figure 1c examines the relationship

between minority student enrollment and the timing of turnover, with separate lines for schools 1 standard deviation below the average racial/ethnic minority enrollment (<28%), at the mean (55%), and 1 standard deviation above the mean (>81%). With no apparent differences following the first 2 years, a turnover gap emerges at the end of the second year. Approximately, 52% of teachers in schools with the fewest minority students remain in their school after their second year compared with only 44% in the schools with the highest concentration of minority students. By the end of 3 years, 42% of teachers in schools with low minority student enrollment remain in the same school compared with 29% of teachers in schools with the highest minority student enrollments. This turnover is driven by high rates of leaving teaching in North Carolina. After the second year, a 10-percentage-point gap between teachers in high minority schools compared with all other schools—20% of teachers who began their careers in schools enrolling the greatest concentrations of minority students had left teaching in North Carolina compared with 10% of teachers in schools enrolling smaller shares of minority students.<sup>2</sup>

This graphical analysis shows that early career teachers turn over not only at the end of the school year but during the year as well, and that these turnover patterns seem to differ by teacher entry pathway and concentration of minority students. Next, we begin to more formally test the degree to which the availability of data on monthly turnover adds to our understanding of the associations between early career teacher turnover and teacher entry pathway and other characteristics as well as school characteristics. Table 3 presents the results from two discrete time survival models: (1) a model restricted to data on end-of-year turnover and (2) a model drawing on monthly turnover data for a teacher's first 3 years. Throughout this analysis, we assume proportionality—that is, the odds of turnover are assumed to be constant across all time periods in which a teacher is observed (Allison, 2014).

In the column labeled (1) of Table 3, we find alternate entry, TFA, and out-of-state prepared teachers are predicted to turn over at higher rates than in-state, traditionally prepared teachers, holding all else constant. When accounting for monthly turnover in the column labeled (2), the magnitude of the odds ratios for TFA and, to a lesser degree, alternate entry teachers decrease, suggesting that teachers from these entry pathways are less likely to turn over within the school year when compared with traditionally prepared teachers. This suggests that examining the end-of-year turnover alone would exaggerate the differences in turnover between traditionally prepared teachers and TFA and traditionally prepared and other alternate entry teachers.<sup>3</sup>

Among school characteristics of main interest, there are generally fewer changes in the magnitude of the odd ratios. For instance, the underserved school index and principal leadership scale are consistently associated

Table 3  
Discrete Time Survival Analysis of Early Career Teacher Turnover

	(1)	(2)
Alternate entry	1.26*** (4.46)	1.13** (2.77)
Teach For America	2.37*** (15.15)	1.65*** (11.19)
Out-of-state prepared	1.39*** (8.92)	1.36*** (9.55)
Other	1.22* (2.21)	1.37*** (3.90)
Female	0.92* (-2.37)	1.00 (-0.01)
Black	0.94 (-1.27)	0.93 (-1.64)
Hispanic	0.82 (-1.95)	0.88 (-1.46)
Other races	0.94 (-0.81)	0.85** (-2.59)
Age	1.00 (0.94)	1.02*** (8.91)
Underserved school index (std)	1.14*** (7.91)	1.13*** (8.57)
Middle school	1.11** (2.76)	1.27*** (6.85)
High school	1.17*** (4.75)	1.68*** (17.82)
City	0.90 (-1.86)	0.95 (-1.14)
Rural	0.90 (-1.83)	0.97 (-0.71)
Town	0.84* (-2.51)	0.87* (-2.43)
Distributed leadership (std)	1.00 (-0.19)	1.00 (-0.23)
Principal leadership (std)	0.93** (-3.17)	0.93*** (-3.38)
Mentor influence (std)	0.96 (-1.93)	0.97* (-2.06)
Facilities and resources (std)	1.00 (-0.18)	1.01 (0.80)
Constant	0.31*** (-12.99)	0.00*** (-38.59)
Observations	26,536	250,090

Note. std = standard. Column labeled (1) includes data on end-of-year turnover for a teacher's first 3 years. Column labeled (2) includes monthly turnover data for a teacher's first 3 years. Exponentiated coefficients are reported. Z statistics are reported in parentheses. All models include cohort fixed effects. Underserved school index is the standardized fitted values from a regression using the following school-level covariates—percentage of Black students, percentage of Hispanic students, percentage of other non-White students, school size, suspension rate, violent acts rate, per pupil expenditures, and teacher salary supplement—to predict school-level proficiency rates.

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

with greater odds of turnover and lower odds of turning over, respectively, regardless of the availability of data on within-year turnover.<sup>4</sup> The main exception to this pattern is school level, where the odds of turnover increase in middle and high schools when including data on within-year turnover in the model, suggesting that examining end-of-year turnover alone would undercount the volume of turnover in secondary schools. Mentor influence is associated with reducing turnover when data on within-year turnover is included in the model, but its associations with end-of-year turnover, while of similar magnitude, is not statistically significant.<sup>5</sup>

A limitation of this survival analysis is that it does not directly test for the significance of the predictors of within- versus end-of-year turnover. Next, we investigate the differences in the associations between the key independent variables and turnover by types of turnover. In Table 4, we present the relative risk ratios from a multinomial logistic regression model examining within-year moving, end-of-year moving, within-year leaving, end-of-year leaving, and temporary exit and return, all in reference to teachers who stayed in the same school for their first 3 years of teaching. The timing of turnover data has been coarsened to facilitate this analysis. We use Wald tests to compare for significant differences between the predictors of within- and end-of-year moving and leaving, respectively (indicated in Table 4 by bold-faced coefficients).

Alternate entry, TFA, and out-of-state prepared teachers all have greater risk of leaving teaching in North Carolina within and at the end of the school year compared with in-state, traditionally prepared teachers, controlling for other variables in the model. The strength of this relationship is significantly larger at the end of the school year for alternate entry and TFA teachers. Compared with traditionally prepared teachers, entering teaching through an alternate entry program is associated with a 44% increase in the risk of within-year leaving and a 152% increase in the risk of end-of-year leaving. While entering teaching as a TFA corps member is associated with very high end-of-year leaving (13.94,  $z = 15.60$ ), TFA teachers are also predicted to leave within the school year at higher rates than traditionally prepared teachers (3.19,  $z = 4.39$ ). In contrast, out-of-state prepared teachers are at consistently greater risk of leaving teaching in North Carolina, irrespective of time in the school year. We find a relative risk ratio of 2.23 for within-year leaving and 2.66 for end-of-year leaving. Controlling for other variables in the model, we find no evidence of differences in the risk of moving schools—either within or at the end of the school year—between in-state, traditionally prepared teachers and alternate entry, TFA, and out-of-state prepared teachers.

Among other teacher characteristics, we find evidence of gender differences in the timing of within- and end-of-year moving and leaving. Although teachers who identify as female have no greater risk of moving schools within or at the end of the school year than teachers who identify as

**Table 4**  
**Multinomial Logistic Regression Associations With Type of Turnover Among Early Career Teachers**

	Within-Year Moving (1)	End-of-Year Moving (2)	Within-Year Leaving (3)	End-of-Year Leaving (4)	Temporary Exit and Return (5)
Alternate entry	1.06 (0.40)	0.89 (-1.42)	1.44** (3.08)	<b>2.52***</b> <b>(11.89)</b>	1.01 (0.03)
Teach For America	0.90 (-0.24)	1.13 (0.54)	3.19*** (4.39)	<b>13.94***</b> <b>(15.60)</b>	1.07 (0.14)
Out-of-state prepared	1.01 (0.12)	0.92 (-1.36)	2.23*** (9.13)	<b>2.66***</b> <b>(16.60)</b>	1.18 (1.36)
Other	1.33 (1.32)	<b>0.76</b> <b>(-1.95)</b>	2.17*** (4.80)	<b>1.93***</b> <b>(5.00)</b>	1.16 (0.69)
Female	1.24 (1.85)	<b>0.95</b> <b>(-0.85)</b>	1.04 (0.50)	<b>0.79***</b> <b>(-4.01)</b>	<b>1.57***</b> <b>(3.65)</b>
Black	0.86 (-1.04)	0.94 (-0.86)	0.68** (-3.20)	<b>0.89</b> <b>(-1.47)</b>	1.06 (0.39)
Hispanic	0.80 (-0.71)	0.82 (-1.17)	1.36 (1.56)	<b>0.91</b> <b>(-0.52)</b>	0.95 (-0.15)
Other races	0.75 (-1.25)	0.92 (-0.67)	0.65* (-2.26)	0.94 (-0.55)	0.71 (-1.29)
Age	1.02*** (3.74)	<b>0.99*</b> <b>(-2.15)</b>	1.02*** (5.81)	<b>0.99**</b> <b>(-3.06)</b>	1.05*** (11.28)
Underserved school index (std)	1.27*** (4.40)	1.24*** (5.87)	1.30*** (6.00)	<b>1.18***</b> <b>(5.28)</b>	1.17** (2.72)
Middle school	1.14 (0.93)	1.18* (2.03)	2.46*** (7.74)	1.07 (1.00)	1.20 (1.25)
High school	1.51*** (3.68)	<b>1.00</b> <b>(0.08)</b>	4.74*** (14.50)	<b>1.17*</b> <b>(2.54)</b>	2.42*** (7.55)
City	0.73 (-1.70)	0.98 (-0.21)	0.93 (-0.41)	<b>0.88</b> <b>(-1.08)</b>	0.61** (-2.64)
Rural	0.84 (-1.01)	0.98 (-0.21)	0.99 (-0.09)	0.85 (-1.47)	0.66* (-2.40)
Town	0.51** (-2.82)	<b>0.91</b> <b>(-0.66)</b>	0.98 (-0.10)	0.85 (-1.20)	0.51** (-2.73)
Distributed leadership (std)	0.96 (-0.45)	0.99 (-0.26)	1.06 (0.70)	0.98 (-0.32)	0.87 (-1.39)
Principal leadership (std)	1.00 (-0.05)	0.94 (-1.21)	0.79** (-2.95)	<b>0.89*</b> <b>(-2.34)</b>	1.18 (1.81)
Mentor influence (std)	0.98 (-0.33)	0.96 (-1.02)	0.96 (-0.70)	0.98 (-0.48)	1.01 (0.14)
Facilities and resources (std)	0.94 (-0.87)	0.98 (-0.39)	1.02 (0.38)	0.99 (-0.32)	0.96 (-0.52)

Note. std = standard.  $N = 13,665$ . Exponentiated coefficients are reported.  $Z$  statistics are reported in parentheses. All models include cohort fixed effects. Wald tests were used to compare differences in the coefficients for within-year and end-of-year moving (columns labeled 1 and 2) and within-year and end-of-year leaving (columns labeled 3 and 4). A boldfaced coefficient signifies a difference of at least the 0.05 level.

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

a male, the significant Wald test indicates that female teachers have a greater risk of moving schools within the school year compared with the end of the year. Identifying as female is also associated with a 21% decrease in the risk of end-of-year leaving compared with male teachers, with no evidence of a relationship between gender and within-year leaving. Female teachers are more likely to temporarily exit midyear and return to the same school than male teachers (1.57,  $z = 3.65$ ). There is no evidence of racial/ethnic differences in the risk of within- and end-of-year moving. Compared with teachers who identify as White, teachers who identify as Black have a reduced risk of leaving teaching midyear, holding all else constant (0.68,  $z = -3.20$ ). For Hispanic teachers, the significant Wald test indicates that they have greater risk of leaving teaching within the school year rather than at the end of the year. Age is positively associated with within-year moving and leaving but negatively associated with end-of-year moving, holding all else constant. Each additional year of age is associated with a 2% increase in the risk of within-year moving and leaving and a 1% decrease in the risk of end-of-year moving or leaving. Among the sample of beginning teachers, age is also positively associated with an increased risk of temporary exit. Each additional year is associated with a 5% increase in the risk of temporary exit and return.

Among school characteristics, a standard deviation increase in the underserved school index is associated with a 27% increase in the risk of within-year moving and a 24% increase in the risk of end-of-year moving. The underserved school index is associated with a greater risk of leaving teaching, with a stronger magnitude of the relationship within the school year compared with the end. A standard deviation increase in the underserved school index is associated with a 30% increase in the risk of within-year leaving and an 18% increase in the risk of end-of-year leaving, controlling for other variables in the model.

Working in schools that score higher on the underserved school index are more at risk of temporary leave and exit, as well (1.17,  $z = 2.72$ ). Beginning one's teaching career in a middle school is associated with a greater risk of moving at the end of year, compared with elementary school teachers (1.18,  $z = 2.03$ ). Beginning one's teaching career in a high school is associated with a greater risk of moving within the school year than being elementary school teachers (1.51,  $z = 3.68$ ). Compared with elementary school teachers, novice teachers in middle and high schools have a greater risk of leaving teaching during the school year.

The principal leadership scale is the only school working condition factor associated with a lower risk of turnover. A standard deviation increase in this measure is associated with a 21% decrease in the risk of within-year leaving and an 11% decrease in the risk of end-of-year leaving, with no significant difference in the strength of this relationship within the school year as opposed to the end of the year.<sup>6</sup>

In Table 5, we extend this analysis by examining the extent to which teacher effectiveness is related to an increased risk of within- or end-of-year moving or leaving or temporary exit and return. In Panel A, we find no overall relationship between the continuous measure of teacher value-added and any type of within- or end-of-year turnover. When examining the relationships by comparing teachers in the top and bottom quartiles of value-added scores with the teachers in the middle two quartiles, we find that the teachers with the highest value-added scores (Quartile 4) have a reduced risk of moving schools and leaving teaching at the end of the school year. Compared with moderately performing teachers (Quartiles 2 and 3), being a teacher in the highest quartile of value-added is associated with a 29% reduction in the odds of end-of-year moving and leaving. While the direction of the relative risk ratios is similar, we find no statistically significant evidence of a relationship between teacher value-added and within-year turnover.

In Panel B, we consider the relationship between a teacher's summative evaluation and within- and end-of-year turnover. Teachers with the lowest scores, that is, teachers who scored below a 3 on any of the five evaluation categories, have an increased risk of leaving teaching, both during or at the end of the school year, as well as an increased risk of temporary exit and return. Compared with teachers who were rated above 3 on all domains, scoring below 3 was associated with a 52% increase in the risk of within-year leaving and a 74% increase in the risk of end-of-year leaving. The only evidence of a difference in the relationship between within- and end-of-year turnover is in terms of moving, where we find evidence of a greater risk of moving schools within the year when a teacher received at least one score rating below a 3. The final model of Table 5 shows further evidence of a relationship between higher evaluation scores and a reduced risk of leaving teaching with no difference in this relationship between within- and end-of-year leaving.

## **Conclusion**

The use of survival analysis to understand the timing of turnover throughout the school year gives a nuanced view of the turnover patterns of early career teachers. Consistent with previous research (Boyd et al., 2008; Papay et al., 2017; Smith & Ingersoll, 2004), we find new teachers to turn over at incredibly high rates: at the end of their third year, only 38% of teachers remain in the school in which they started their career. A notable share of this turnover occurs within the school year, a phenomenon that is most acute among first year teachers, 8% of whom turned over in their first year.

The availability of monthly turnover data also sheds light on differences in when early career teacher turn over across different entry pathways and

Table 5

**Multinomial Logistic Regression Analysis Predicting the Relationship Between Early Career Teacher Effectiveness and Within-Year or End-of-Year Turnover**

	Within-Year Moving (1)	End-of-Year Moving (2)	Within-Year Leaving (3)	End-of-Year Leaving (4)	Temporary Exit and Return (5)
Panel A: Teacher effectiveness					
Teacher value-added	1.26 (1.38)	0.94 (-1.00)	0.91 (-0.86)	0.90 (-1.76)	1.02 (0.09)
Quartile 1	0.70 (-0.95)	1.01 (0.08)	1.05 (0.21)	1.00 (-0.03)	1.06 (0.12)
Quartile 4	0.84 (-0.51)	<b>0.71*</b> (-2.24)	0.67 (-1.41)	<b>0.71*</b> (-2.25)	1.06 (0.13)
Observations	2,023	2,023	2,023	2,023	2,023
Panel B: Teacher evaluation score					
Any evaluation score below 3	1.36 (1.89)	<b>0.94</b> (-0.73)	1.52* (2.57)	1.74*** (6.92)	1.61* (2.22)
Median evaluation score = 3	0.76 (-1.24)	0.96 (-0.37)	0.61* (-2.24)	0.44*** (-7.42)	0.58 (-1.95)
Median evaluation score = 4 or 5	0.94 (-0.24)	1.13 (0.89)	0.63 (-1.73)	0.44*** (-6.31)	0.65 (-1.25)
Observations	7,757	7,757	7,757	7,757	7,757

*Note.* Estimates from four separate multinomial logistic regression models. In Panel A, Quartiles 1 and 4 are in reference to Quartiles 2 and 3. In Panel B, any evaluation score below 3 is in reference to all evaluation scores above 3. Median evaluation scores of 3, 4, or 5 are in reference to evaluation scores of 1 or 2. Models include controls for teacher and school characteristics. Exponentiated coefficients are reported. *Z* statistics are reported in parentheses. All models include cohort fixed effects. Wald tests were used to compare differences in the coefficients for within-year and end-of-year moving (columns labeled 1 and 2) and within-year and end-of-year leaving (columns labeled 3 and 4). A boldfaced coefficient signifies a difference of at least the 0.05 level.

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

school conditions. For instance, similar to other researchers (e.g., Kane, Rockoff, & Staiger, 2008), we show TFA teachers to turn over at incredibly high rates at the end of their 2-year commitment, with only a quarter of TFA teachers staying in their original school into their third year in the profession. Yet our analysis shows that, compared with other entry pathways, TFA teachers are the least likely to turn over during their first 2 years. Their low level of turnover includes the lowest levels of within-year turnover, with only 4% of TFA teachers turning over during their first year compared with 7% of traditionally prepared teachers and 9% of alternate entry and out-of-state prepared teachers. Another example where the monthly turnover data are informative is in terms of the relationship between teacher gender and turnover. Compared with male teachers, female teachers were less likely to leave teaching at the end of the school year and no more likely

to leave teaching during the school year once we account for temporary exit and return, a form of turnover that is most common among female teachers. We also found a distinct pattern in terms of teacher age for early career teachers, with age being positively associated with within-year turnover but negatively associated with end-of-year turnover.

In other instance, we found similar associations between teacher and school characteristics and within- and end-of-year turnover. More effective teachers, as measured by value-added and performance evaluation scores, were generally found to turn over at lower rates than less effective teachers, regardless of the time of the school year. The relationship between the underserved school index and principal leadership and within- and end-of-year turnover was almost identical, regardless of whether monthly data were used in the models. That being said, we found the underserved school index to be most strongly associated with within-year leaving.

When separating our results by moving schools and leaving teaching, we found that the availability of monthly turnover data to be most informative when looking at leaving teaching as opposed to moving schools. We show that alternate entry and TFA teachers' higher rates of leaving teaching than traditionally certified teachers are highest at the end of the school year. In contrast, out-of-state prepared teachers had an equally high risk of leaving teaching during and at the end of the school year.

Early career teachers are most likely to turn over from underserved schools, particularly those schools that enroll large numbers of Black students, the schools where alternate entry and out-of-state prepared teachers are most likely to begin teaching. The Kaplan-Meier survival curves show that teacher turnover from high minority schools is driven by higher rates of leaving teaching, with 42% of teachers in schools with more than 80% racial/ethnic minorities leaving teaching in North Carolina compared with 29% in all other schools. In regression analysis, the underserved school index further demonstrated this point, with evidence of a stronger relationship between this measure and leaving teaching, with the strongest relationship with within-year leaving. This finding is particularly concerning as both the within- and end-of-year turnover disrupt the learning environments for students in these challenging schools (Henry & Redding, 2018).

A couple of limitations of the study should be noted. First, as with most studies of teacher turnover, we are unable to identify whether or not the turnover was voluntary or involuntary. Second, to address the inherent selection bias in studying differences in teacher entry pathway, this study relies on a rich set of teacher and school characteristics to balance differences across entry pathways and types of schools. Still, the results should not be interpreted as the effect of an entry pathway or a teacher working in a school with particular characteristics, as there are likely additional factors correlated with teachers' pathways and turnover. Third, it is unclear the extent to which the results from this study generalize to other states. North

Carolina was an early adopter of statewide teacher evaluations. This policy overlaps with the timing of this study and likely changed the composition of the new teacher workforce (Cullen et al., 2016). In addition, the statewide teacher salary schedule and weak union presence compared with other states are additional factors that plausibly shape public school teachers' commitment to remain in the classroom. Despite these limitations, this study raises several policy implications related to new teacher preparation, hiring, and induction.

In recent decades, states have reduced the barriers into the teaching profession by establishing procedures for teachers to receive reciprocal licenses in other states and/or adopting alternate entry pathways into teaching outside traditional, university-based programs. While such programs have helped states meet staffing shortages in hard-to-staff subjects and schools, questions remain of the extent to which teachers from these new pathways have the same commitment to remain in the profession compared with in-state, traditionally prepared teachers. Evidence presented in this article indicates that alternate entry and out-of-state teachers do fill teaching positions in low-performing schools but also leave teaching at much higher rates than traditionally prepared teachers. Results from this study suggest that supportive principals can promote the retention of these and teachers from other pathways. At the same time, our results also suggest that high levels of within-year turnover could compromise the supports for new teachers if the teachers responsible for inducting novice teachers must shift their focus to multiple new teachers throughout the school year.

Findings from this article also indicate that within-year turnover includes sorting to a new school within the same district. Combined with evidence that teachers hired late in the school year have a negative effect on student achievement (Papay & Kraft, 2016), our results suggest that districts would be advised to reassign teachers as early in the year as possible to avoid the disruption to their students and the school environment when teachers are reassigned in the district once the year has begun.

The evidence of differences in the level and timing of turnover across entry pathways is useful information for administrators faced with hiring inexperienced teachers. Given the choice among candidates, principals may be particularly hesitant to hire out-of-state prepared teachers, knowing that they leave teaching at the highest rates during the school year of teachers from any pathway. At the same time, we show that TFA teachers turn over at the lowest rates until the end of their second year. This suggests that in schools facing perpetually high turnover, principals may prefer hiring TFA teachers given their 2-year commitment.

More broadly, this study's attention to the timing of turnover shifts the focus of teacher hiring as a spring and summer activity to one that occurs throughout the school year. Recent research on principal time use suggests principals are increasingly pulled out of the classroom and into

administrative tasks and organizational management, including hiring (Grissom, Loeb, & Master, 2013; Horng et al., 2010). When early career teachers turn over, administrators would be forced to shift school resources away from their instructional leadership to finding a replacement teacher.

Overall, the study raises important questions about the consequences of turnover with respect to timing and magnitude. Recently, the evidence about the negative effects of teacher turnover on student achievement has begun to accumulate (Hanushek, Rivkin, & Schiman, 2016; Henry & Redding, 2018; Ronfeldt, Loeb, et al., 2013). It seems reasonable to hypothesize that departing from a school during the school year has more negative consequences on student achievement than departing between years. Research that can distinguish the consequences of within and end-of-year turnover should prove helpful in guiding policies and practices about choosing which teachers to hire to improve student outcomes.

## Notes

Supplemental material is available for this article in the online version of the journal.

<sup>1</sup>In supplementary analysis in Supplementary Table A8 (available in the online version of the journal), we estimate separate models for within-district and within-state movers, to understand any differences in the predictors of these two types of mobility.

<sup>2</sup>We also find that early career teachers turn over from schools with greater concentrations of student poverty, although to a lesser degree. By the end of their third year, 35% of teachers in schools with more than 1 standard deviation above the average FRPL (free and reduced-price lunch)—that is, schools with more than 85% students on free or reduced lunch—have left their initial school. Teachers in schools with less concentrated poverty turnover at slightly lower rates, with 68% having left their initial school by the end of the third year. Counter to the hypothesis that early career teachers would turnover from low-performing schools at higher rates, we find no notable differences in relation to early career turnover and overall school performance. Results available on request.

<sup>3</sup>To test the sensitivity of these findings, we replicate Table 3, following the 2009–2010 cohort for their first 5 years in the profession. In Supplementary Table A3 (available in the online version of the journal), the coefficients of interest tend to be slightly smaller in magnitude, suggesting that the high turnover of alternate entry, TFA, and out-of-state prepared teachers is more concentrated in their first 3 years than in their fourth or fifth year. The two exceptions to this general pattern is the lack of evidence of a difference in the turnover between alternate entry and traditionally prepared teachers. Controlling for other variables in the model, alternate entry and out-of-state teachers are no more or less likely to move schools that in-state, traditionally prepared teachers.

<sup>4</sup>In Supplementary Table A4 (available in the online version of the journal), we separate the underserved school index into the separate variables used to estimate this index and find that the percentage of economically disadvantage and Black students in a school to be the only two variables associated with teacher turnover. Holding all else constant, the percentage of economically disadvantage students is more strongly associated with within-year turnover than end-of-year turnover, whereas the percentage of Black students is more strongly associated with end-of-year turnover than within-year turnover.

<sup>5</sup>In Supplementary Table A5 (available in the online version of the journal), we present the results from the survival analysis of moving schools and leaving teaching in North Carolina. In general, the largest differences emerge in the predictors of within-year versus end-of-year leaving as opposed to moving.

<sup>6</sup>In Supplementary Table A8 (available in the online version of the journal), we estimate a multinomial logistic regression model focused on teachers who move in their district or throughout the state, either within or at the end of the school year. Our chief

hypothesis for this analysis was that there would be no association between teacher characteristics and within-year, within-district movers. We generally find this to be the case. TFA teachers have a lower risk of moving within the year than traditionally prepared teachers. Age, on the other hand, is positively related to within-year, within-district movers. Overall, we find the strongest associations between teacher and school characteristics with end-of-year movers transferring outside their district.

## References

- Allensworth, E., Ponisciak, S., & Mazzeo, C. (2009). *The schools teachers leave: Teacher mobility in Chicago Public Schools*. Chicago, IL: Consortium on Chicago School Research, University of Chicago. Retrieved from [https://consortium.uchicago.edu/sites/default/files/publications/CCSR\\_Teacher\\_Mobility.pdf](https://consortium.uchicago.edu/sites/default/files/publications/CCSR_Teacher_Mobility.pdf)
- Allison, P. D. (2014). *Event history and survival analysis* (2nd ed.). Thousand Oaks, CA: Sage.
- Bastian, K. B., & Henry, G. T. (2015). Teachers without borders: Consequences of teacher labor force mobility. *Educational Evaluation and Policy Analysis, 37*, 163–183.
- Borman, G. D., & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of Educational Research, 78*, 367–409.
- Boyd, D., Grossman, P. L., Ing, M., Lankford, R. H., Loeb, S., & Wyckoff, J. (2011). The influence of school administrators on teacher retention decisions. *American Educational Research Journal, 48*, 303–333.
- Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008). *Who leaves? Teacher attrition and student achievement* (NBER Working Paper 14022). Cambridge, MA: National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w14022.pdf>
- Boyd, D., Lankford, H., Loeb, S., & Wyckoff, J. (2005). The draw of home: How teachers' preferences for proximity disadvantage urban schools. *Journal of Policy Analysis and Management, 24*, 113–132.
- Buckley, J., Schneider, M., & Shang, Y. (2005). Fix it and they might stay: School facility quality and teacher retention in Washington, D.C. *Teachers College Record, 107*, 1107–1123.
- Carver-Thomas, D., & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it*. Palo Alto, CA: Learning Policy Institute.
- Chingos, M. M., & West, M. R. (2012). Do more effective teachers earn more outside the classroom? *Education Finance and Policy, 7*, 8–43.
- Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2005). Who teaches whom? Race and the distribution of novice teachers. *Economics of Education Review, 24*, 377–392.
- Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education, 26*, 673–682.
- Cullen, J. B., Koedel, C., & Parsons, E. (2016). *The compositional effect of rigorous teacher evaluation on workforce quality* (NBER Working Paper No. 22805). Cambridge, MA: National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w22805.pdf>
- Darling-Hammond, L., Chung, R., & Frelow, F. (2002). Variation in teacher preparation: How well do different pathways prepare teachers to teach? *Journal of Teacher Education, 53*, 286–302.

- Goldhaber, D., & Cowan, J. (2014). Excavating the teacher pipeline: Teacher preparation programs and teacher attrition. *Journal of Teacher Education, 65*, 449–462.
- Goldhaber, D., Gross, B., & Player, D. (2011). Teacher career paths, teacher quality, and persistence in the classroom: Are schools keeping their best? *Journal of Policy Analysis and Management, 30*, 57–87.
- Goldhaber, D., Grout, C., Holden, K. L., & Brown, N. (2015). Crossing the border? Exploring the cross-state mobility of the teacher workforce. *Educational Researcher, 44*, 421–431.
- Goldhaber, D., Quince, V., & Theobald, R. (2018). Has it always been this way? Tracing the evolution of teacher quality gaps in U.S. public schools. *American Educational Research Journal, 55*, 171–201.
- Goldhaber, D., Strunk, K. O., Brown, N., & Knight, D. S. (2016). Lessons learned from the Great Recession: Layoffs and the RIF-induced teacher shuffle. *Educational Evaluation and Policy Analysis, 38*, 517–548.
- Goldring, E., Grissom, J. A., Rubin, M., Neumerski, C. M., Cannata, M., Drake, T., & Schuermann, P. (2015). Make room value added: Principals' human capital decisions and the emergence of teacher observation data. *Educational Researcher, 44*, 96–104.
- Grissom, J. A. (2011). Can good principals keep teachers in disadvantaged schools? Linking principal effectiveness to teacher satisfaction and turnover in hard-to-staff environments. *Teachers College Record, 113*, 2552–2585.
- Grissom, J. A., Loeb, S., & Master, B. (2013). Effective instructional time use for school leaders: Longitudinal evidence from observations of principals. *Educational Researcher, 42*, 433–444.
- Grissom, J. A., & Reiningger, M. (2012). Who comes back? A longitudinal analysis of the reentry behavior of exiting teachers. *Education Finance and Policy, 7*, 425–454.
- Guarino, C. M., Santibañez, L., & Daley, G. A. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research, 76*, 173–208.
- Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (2004). Why public schools lose teachers. *Journal of Human Resources, 39*, 326–354.
- Hanushek, E. A., Rivkin, S. G., & Schiman, J. C. (2016). Dynamic effects of teacher turnover on the quality of instruction. *Economics of Education Review, 55*, 132–148.
- Henry, G. T., Bastian, K. C., & Fortner, C. K. (2011). Stayers and leavers: Early-career teacher effectiveness and attrition. *Educational Researcher, 40*, 271–280.
- Henry, G. T., Fortner, C. K., & Bastian, K. C. (2012). The effects of experience and attrition for novice high-school science and mathematics teachers. *Science, 335*, 1118–1121.
- Henry, G. T., Purtell, K. M., Bastian, K. C., Fortner, C. K., Thompson, C. L., Campbell, S. L., & Patterson, K. M. (2014). The effects of teacher entry portals on student achievement. *Journal of Teacher Education, 65*, 7–23.
- Henry, G. T., & Redding, C. (2018). *The consequences of leaving school early: The effects of within-year and end-of-year teacher turnover*. Manuscript submitted for publication.
- Horg, E. L., Klasik, D., & Loeb, S. (2010). Principal's time use and school effectiveness. *American Journal of Education, 116*, 491–523.
- Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Education Research Journal, 38*, 499–534.

- Ingersoll, R. M., Merrill, L., & Stuckey, D. (2014). *Seven trends: The transformation of the teaching force* (CPRE Research Report # RR-80). Philadelphia, PA: Consortium for Policy Research in Education.
- Johnson, S. M., & Birkeland, S. E. (2003). Pursuing a “sense of success”: New teachers explain their career decisions. *American Educational Research Journal, 40*, 581–617.
- Johnson, S. M., Kraft, M., & Papay, J. P. (2012). How context matters in high-need schools: The effects of teachers’ working conditions on their professional satisfaction and their students’ achievement. *Teachers College Record, 114*(10), 1–39.
- Kalogrides, D., & Loeb, S. (2013). Different teachers, different peers: The magnitude of student sorting within schools. *Educational Researcher, 42*, 304–316.
- Kane, T. J., Rockoff, J. E., & Staiger, D. O. (2008). What does certification tell us about teacher effectiveness? Evidence from New York City. *Economics of Education Review, 27*, 615–631.
- Kardos, S. M., & Johnson, S. M. (2007). On their own and presumed expert: New teachers’ experience with their colleagues. *Teachers College Record, 109*, 2083–2106.
- Kee, A. N. (2012). Feelings of preparedness among alternatively certified teachers: What is the role of program features? *Journal of Teacher Education, 63*, 23–38. doi:10.1177/0022487111421933
- Koski, W. S., & Horng, E. L. (2007). Facilitating the teacher quality gap? Collective bargaining agreements, teacher hiring and transfer rules, and teacher assignments among schools in California. *Education Finance and Policy, 2*, 262–300.
- Kraft, M. A. (2015). Teacher layoffs, teacher quality and student achievement: Evidence from a discretionary layoff policy. *Education Finance and Policy, 11*, 467–507.
- Ladd, H. F. (2011). Teachers’ perceptions of their working conditions: How predictive of planned and actual teacher movement? *Educational Evaluation and Policy Analysis, 33*, 235–261.
- Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher sorting and the plight of urban schools: A descriptive analysis. *Education Evaluation and Policy Analysis, 24*, 37–62.
- Papay, J. P., Bacher-Hicks, A., Page, L. C., & Marinell, W. H. (2017). The challenge of teacher retention in urban schools: Evidence of variation from a cross-site analysis. *Educational Researcher, 46*, 434–448.
- Papay, J. P., & Kraft, M. A. (2016). The productivity costs of inefficient hiring practices: Evidence from late teacher hiring. *Journal of Policy Analysis and Management, 35*, 791–817.
- Peske, H. G., Liu, E., Johnson, S. M., Kauffman, D., & Kardos, S. M. (2001). The next generation of teachers: Changing conceptions of a career in teaching. *Phi Delta Kappan, 83*, 302–311.
- Podgursky, M., Monroe, R., & Watson, D. (2004). The academic quality of public school teachers: An analysis of entry and exit behavior. *Economics of Education Review, 23*, 507–518.
- Redding, C., & Henry, G. T. (2018). *New evidence on the frequency of teacher turnover: Accounting for within-year turnover*. Manuscript submitted for publication.
- Redding, C., & Smith, T. M. (2016). Easy in, easy out: Are alternatively certified teachers turning over at increased rates? *American Educational Research Journal, 53*, 1086–1125.
- Redding, C., & Smith, T. M. (in press). Supporting early career alternatively certified teachers: evidence from the beginning teacher longitudinal survey. *Teachers College Record*.

- Reininger, M. (2012). Hometown disadvantage? It depends on where you're from teachers' location preferences and the implications for staffing schools. *Educational Evaluation and Policy Analysis*, *34*, 127–145.
- Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal*, *50*, 4–36.
- Ronfeldt, M., Kwok, A., & Reininger, M. (2016). Teachers' preferences to teach under-served students. *Urban Education*, *51*, 995–1030.
- Ronfeldt, M., Reininger, M., & Kwok, A. (2013). Recruitment or preparation? Investigating the effects of teacher characteristics and student teaching. *Journal of Teacher Education*, *64*, 319–337.
- Schweig, J. (2014). Cross-level measurement invariance in school and classroom environment surveys implications for policy and practice. *Educational Evaluation and Policy Analysis*, *36*, 259–280.
- Simon, N. S., & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What I know and can do. *Teachers College Record*, *117*(3), 1–36.
- Singer, J. D., & Willett, J. B. (1991). Modeling the days of our lives: Using survival analysis when designing and analyzing longitudinal studies of duration and the timing of events. *Psychological Bulletin*, *110*, 268–290.
- Smith, T. M., & Ingersoll, R. M. (2004). What are the effects of induction and mentoring on beginning teacher turnover? *American Educational Research Journal*, *41*, 681–714.
- U.S. Department of Education. (2016). *Preparing and credentialing the nation's teachers: The secretary's 10th report on teaching quality*. Retrieved from <https://title2.ed.gov/Public/TitleIIReport16.pdf>

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