



# Teacher Turnover: Why It Matters and What We Can Do About It

Desiree Carver-Thomas and Linda Darling-Hammond



# **Teacher Turnover: Why It Matters and What We Can Do About It**

Desiree Carver-Thomas and Linda Darling-Hammond

## Acknowledgments

The authors would like to thank Larry Rosenthal, Senior Lecturer of Public Policy at University of California, Berkeley, for his insights and advice. We also thank the following LPI colleagues for their valuable feedback: Leib Sutchter, Roneeta Guha, Tara Kini, and the entire Educator Quality team. We thank Bulletproof Services and Penelope Malish for their editing and design contributions to this project, and Lisa Gonzales for overseeing the editorial process.

Research in this area of work is funded in part by the S. D. Bechtel, Jr. Foundation. Core operating support for the Learning Policy Institute is provided by the Ford Foundation, the William and Flora Hewlett Foundation, and the Sandler Foundation.

### External Reviewers

This report benefited from the insights and expertise of two external reviewers: Li Feng, Brandon Dee Roberts Excellence Assistant Professor at Texas State University; and Jesse Rothstein, Professor of Public Policy and Economics and Director of the Institute for Research on Labor and Employment at University of California, Berkeley. We thank them for the care and attention they gave the report. Any remaining shortcomings are our own.

Suggested citation: 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.

The report can be found online at <https://learningpolicyinstitute.org/product/teacher-turnover>.

This work is licensed under the Creative Commons Attribution—NonCommercial 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc/4.0/>.



# Table of Contents

<b>Executive Summary</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>1</b>
<b>Trends in Teacher Turnover</b> .....	<b>3</b>
National Trends.....	3
Regional and State-by-State Trends.....	9
Subject-Area Turnover .....	11
Turnover in Schools Serving Historically Underserved Students.....	14
Turnover of Teachers of Color .....	20
<b>Predictors of Turnover</b> .....	<b>24</b>
School Characteristics .....	24
Teacher Characteristics .....	25
Main Teaching Subject Area .....	27
Teaching Conditions.....	29
<b>Summary of Findings</b> .....	<b>30</b>
<b>Policy Considerations</b> .....	<b>32</b>
Compensation.....	32
Teacher Preparation and Support.....	33
School Leadership .....	34
<b>Conclusion</b> .....	<b>34</b>
<b>Technical Appendix</b> .....	<b>35</b>
Data .....	35
Methodology .....	35
<b>Endnotes</b> .....	<b>43</b>
<b>About the Authors</b> .....	<b>48</b>

## List of Figures and Tables

Figure 1: Rate of Leaving Teaching Has Increased.....	3
Figure 2: Sources of Teacher Turnover, 2011-12 to 2012-13 .....	4
Figure 3: Occupational Status of Leavers.....	5
Figure 4: Factors Teachers Report as Being Very Important for Leaving Teaching.....	6
Figure 5: Factors Teachers Report as Being Very Important Reasons for Moving.....	6
Figure 6: Turnover Rates Vary by Region and District Type .....	10
Figure 7: Teacher Turnover Varies Widely by State.....	11
Figure 8: Turnover Rates Vary by Primary Teaching Assignment.....	12

Figure 9: Teacher Turnover Is Greater in Title I Schools .....	15
Figure 10: Teachers in Title I Schools Stay Fewer Years.....	16
Figure 11: Teachers in Title I Schools Have Fewer Years of Experience .....	16
Figure 12: Teacher Turnover Is Greater When Schools Serve Primarily Students of Color.....	17
Figure 13: Teachers in Schools Serving Primarily Students of Color Stay Fewer Years .....	18
Figure 14: Teachers at Schools Serving Primarily Students of Color Have Less Overall Experience .....	19
Figure 15: Teacher Leaving Rate, 1988–89 to 2012–13 .....	21
Figure 16: Teacher Moving Rate, 1988–89 to 2012–13 .....	21
Figure 17: Teacher Leaver and Mover Rates, 2012.....	22
Figure 18: Predicted Turnover Rate by Population of Students of Color .....	25
Figure 19: Predicted Turnover Rate by Population of Students of Color and Teacher Preparation Pathway .....	26
Figure 20: Predicted Turnover Rates by Subject Area.....	27
Figure 21: Predicted Turnover Rate by Highest District Salary.....	28
Figure 22: Predicted Turnover Rate by Teacher Report of Administrative Support .....	29
Table 1: Teacher Reasons for Leaving.....	7
Table 2: Change in Proportion of Teachers in Selected Cities by Teacher Race, 2000–12 .....	23
Table A-1: Independent Variable Means for Teachers Overall; Teachers of Color; Mathematics, Science, and Special Education; and Teachers from Alternative Pathways.....	40
Table A-2: Logistic Regression Odds Ratios: Probability of Teachers Moving or Leaving .....	41



## Executive Summary

Growing teacher shortages nationally have made filling vacancies with qualified teachers increasingly difficult. Curbing teacher turnover—that is, all teacher movement out of schools or out of the profession—can go a long way toward solving shortages. About 90% of the nationwide annual demand for teachers is created when teachers leave the profession, with two-thirds of teachers leaving for reasons other than retirement. If school systems can address the factors that create high turnover, they can reduce the demand for teachers who are in short supply.

Not only does turnover contribute to shortages, teacher movement out of schools and out of teaching creates costs for the schools they leave behind. Estimates exceed \$20,000 to replace each teacher who leaves an urban school district. Most importantly, high turnover rates reduce achievement for students whose classrooms are directly affected, as well as for other students in the school.

Our analysis of nationally representative survey data from the 2012 Schools and Staffing Survey and the 2013 Teacher Follow-up Survey reveals that the severity of turnover varies markedly across the country:

- Total turnover rates are highest in the South (16.7%) and lowest in the Northeast (10.3%), where states tend to offer higher pay, support smaller class sizes, and make greater investments in education.
- Teachers of mathematics, science, special education, English language development, and foreign languages are more likely to leave their school or the profession than those in other fields. These are teaching fields that experience shortages in most states across the country.
- Turnover rates are 50% higher for teachers in Title I schools, which serve more low-income students. Mathematics and science teacher turnover rates are nearly 70% greater in Title I schools than in non-Title I schools, and turnover rates for alternatively certified teachers are more than 80% higher.
- Turnover rates are 70% higher for teachers in schools serving the largest concentrations of students of color. These schools are staffed by teachers who have fewer years of experience and, often, significantly less training to teach. Teacher turnover rates are 90% higher in the top quartile of schools serving students of color than in the bottom quartile for mathematics and science teachers, 80% higher for special education teachers, and 150% higher for alternatively certified teachers.
- Teachers of color—who disproportionately teach in high-minority, low-income schools and who are also significantly more likely to enter teaching without having completed their training—have higher turnover rates than White teachers overall (about 19% versus about 15%). While they leave at higher rates than White teachers generally, their turnover rates are about the same as those of all other teachers in high-poverty and high-minority schools.

Teachers cite a number of reasons for leaving their school or the profession. The most frequently cited reasons in 2012–13 were dissatisfactions with testing and accountability pressures (listed by 25% of those who left the profession); lack of administrative support; dissatisfactions with the teaching career, including lack of opportunities for advancement; and dissatisfaction with working conditions. These kinds of dissatisfactions were noted by 55% of those who left the profession and 66% of those who left their school to go to another school.

Personal and financial reasons were also cited, along with the desire to take another kind of job or to retire.

Among the key variables that drive turnover are the kind of preparation teachers have had prior to entry and the kind of administrative support they receive on the job. In an analysis of predictors of turnover in which we controlled for a large number of student, teacher, and school characteristics, we found that:

Among the key variables that drive turnover are the kind of preparation teachers have had prior to entry and the kind of administrative support they receive on the job.

- Teachers who enter the profession through alternative certification pathways—who have had less coursework and student teaching, on average, than teachers who are prepared through traditional programs—are 25% more likely to leave their schools and the profession, even after controlling for their students, schools, and teaching conditions.
- Teachers of mathematics or science, special education, or foreign languages were much more likely to leave their schools or the profession in comparison with elementary school teachers. Holding all else constant, mathematics and science teachers have a predicted turnover rate 37% greater than that of elementary school teachers, special education teachers have a rate 46% higher, and foreign language teachers have a rate 87% higher.
- Teacher reports of a lack of administrative support have the strongest relationship with teacher turnover. In a model controlling for other factors, teachers who strongly disagree that their administration is supportive are more than twice as likely to leave their school or teaching than teachers who strongly agree their administration is supportive.
- Controlling for other factors, teachers in districts with a maximum teacher salary greater than \$72,000 are 20% to 31% less likely to leave their schools than those in districts with maximum salaries under \$60,000.

Turnover was also higher for teachers in small schools and for those under 30 or over 50, as compared to those in mid-career. Having controlled for school size and location and other student, teacher, and school characteristics, no other teaching conditions proved to be significant predictors of teacher turnover.

## Recommendations

To stem teacher turnover, federal, state, and district policymakers should consider improving the key factors associated with teacher turnover: compensation, teacher preparation and support, and school leadership.

### Compensation

- Provide **compensation packages** that are competitive with those of other occupations requiring similar levels of education and that are equitable across districts, so all schools can compete in the labor market for well-prepared teachers.
- Offer **service scholarship and loan forgiveness programs** that reduce the debt burden



of teaching and encourage entry into the profession through high-retention pathways that provide comprehensive preparation with strong clinical training. These programs pay the cost of teacher preparation in exchange for a commitment to teach in a subject or location of need for 3 to 5 years and can be targeted to the subjects and schools where teachers are least likely to be well prepared and where turnover is greatest: mathematics, science, special education, and in schools serving primarily students of color and students in poverty.

### **Teacher Preparation and Support**

- Establish other high-retention pathways into teaching that explicitly serve high-need communities, such as **teacher residency programs**. Based on the medical residency model, residents train in high-needs schools for an entire school year under the guidance and supervision of a master teacher, while earning a credential and a master’s degree from a partnering university. Most programs offer tuition assistance and a stipend for living expenses, plus two years of mentoring after the training year. In exchange, residents commit to teaching in the district for 3 to 5 years after their residency year. These programs tend to have much higher than average teacher retention rates.
- Develop “**Grow Your Own**” teacher preparation models for hard-to-staff communities that can recruit local high school students, paraprofessionals, after-school program staff, or other local community members into teaching. These models capitalize on the fact that teachers are more likely to stay and continue teaching in their own communities. Grow your own models often underwrite the costs of teacher training through the kind of high-quality preparation programs associated with improved teacher retention, while they also provide supports for candidates to succeed.
- Provide **high-quality mentoring and induction** to beginning teachers that helps teachers learn to teach effectively in high-need schools. High-quality induction programs that reduce attrition include mentoring with observation and feedback, time for collaborative planning with colleagues, a reduced teaching load, and a focus on high-leverage activities—such as analyzing student work and discussing instructional strategies.

### **School Leadership**

- Develop rigorous **accreditation and licensure standards for principal training programs** aligned with research on effective school leadership, as well as systems for regular program review by qualified experts.
- Fund **residencies for principal training** and **state leadership academies** that coordinate mentoring and professional learning to develop school leadership capacity to build and nurture collegial school settings that encourage teacher retention.
- Create systems and resources for developing **robust leadership pipelines** within districts to fill positions districtwide and targeted to the schools in greatest need.

Effectively retaining teachers is crucial to ensuring there are enough well-prepared and committed teachers to staff all of our nation’s schools and that the teachers in our classrooms have the experience and expertise to effectively serve all students. Tailored policy interventions can play a role in addressing the key factors that drive teachers from their schools, stabilizing and ultimately improving the teacher workforce so that it can serve all students well.



## Introduction

With the U.S. facing a national teacher shortage that is projected to grow substantially in the coming years, school systems across the country are grappling with the challenge of building and maintaining a high-quality teacher workforce for all students.<sup>1</sup> While school leaders and policymakers might be tempted to solve shortages by focusing solely on teacher recruitment strategies, a better approach begins with understanding teacher attrition and turnover.

A high rate of **teacher attrition**—that is, teachers leaving the profession—is a primary contributor to teacher shortages nationally. The profession has a national attrition rate of about 8% annually, and research shows that the number of teachers leaving each year accounts for close to 90% of annual teacher demand.<sup>2</sup> Furthermore, less than a third of national teacher attrition is due to retirement. In other words, each year schools nationwide must hire tens of thousands of teachers as a result of beginning and mid-career teachers leaving the profession.

Each year schools nationwide must hire tens of thousands of teachers as a result of beginning and mid-career teachers leaving the profession.

**Teacher turnover** can also contribute to labor market imbalances. When teachers move between schools, even if they stay in the profession, the effect on the schools they leave is essentially the same as if they had left teaching altogether. In times of shortage, teachers who shift between schools, known as “movers,” can further exacerbate hiring difficulties in the hardest-hit schools.

Researchers agree that teacher turnover is to be expected, and, indeed, some amount of turnover can be beneficial as teachers find schools or professions that are the right fit. That said, teacher turnover takes a toll on schools and students. In particular, when turnover contributes to teacher shortages, schools often respond by hiring inexperienced or unqualified teachers, increasing class sizes, or cutting class offerings, all of which impact student learning.<sup>3</sup> Research is clear that both teacher inexperience and rates of turnover negatively impact student learning,<sup>4</sup> which means that students in schools with high turnover and few experienced teachers are at a decided educational disadvantage.

In addition, turnover impacts the achievement of all students in a school, not just those with a new teacher, by disrupting school stability, collegial relationships, collaboration, and the accumulation of institutional knowledge.<sup>5</sup> Financial costs also accrue when replacing teachers, with estimates reaching \$20,000 or more for each teacher who leaves an urban district.<sup>6</sup>

The costs of teacher turnover are disproportionately borne by students in hard-to-staff schools, typically those serving primarily students of color and students in poverty, which are more likely to rely upon uncertified teachers who are often hired as a last resort when fully certified teachers are not available. In 2013–14, the quarter of schools enrolling the most students of color nationally had four times as many uncertified teachers as the quarter of schools enrolling the fewest students of color. Uncertified teachers were also more common in schools serving the most students eligible for free and reduced-price lunch than in those with the fewest.<sup>7</sup>

This report uses data from the most recent nationally representative survey of U.S. teachers (Restricted-Use Schools and Staffing Survey [SASS] 2011–12 and Teacher Follow-Up Survey [TFS] 2012–13) to investigate how turnover trends vary across teachers and schools. Given the significant role turnover plays in teacher shortages, this report discusses turnover trends in major subject areas that commonly suffer shortages—mathematics, science, special education, and English language development—as well as among teachers of color and in high-poverty and high-minority schools.

We begin with an overview of trends in teacher attrition and turnover, nationally and regionally. We then look at these trends by subject area and by teacher and school characteristics. Next, we discuss predictors of teacher turnover that have been surfaced in previous research and test them with the most recent national data. We end with a discussion of policy considerations, based on research on stemming teacher turnover.

## Trends in Teacher Turnover

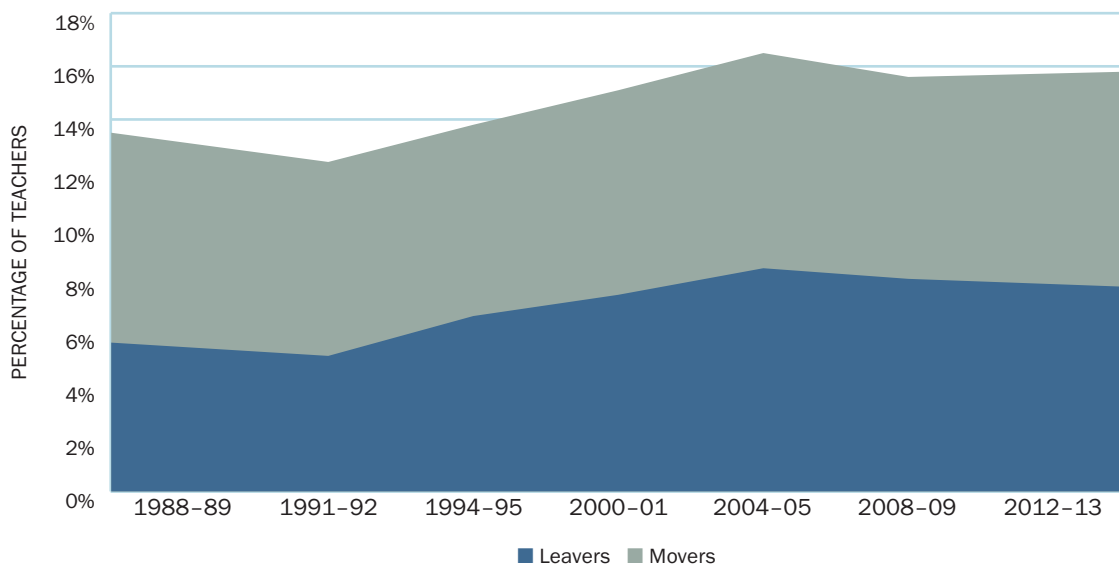
Teacher turnover varies considerably across states and regions of the country, among and within school districts, and among teachers of different types. Below, we discuss the variation in turnover trends, including nationally; regionally; in math, science, special education, and English language development; in schools serving students in poverty and students of color; and among teachers of color.

### National Trends

The percentage of teachers leaving the profession—known as “leavers”—has increased substantially over the past two decades: 5.1% of public school teachers left the workforce in 1992, while 8.4% left in 2005. Attrition rates have continued to hover around 8% since then (see Figure 1).<sup>8</sup> The 3% increase in attrition rates is not trivial: It amounts to about 90,000 additional teachers needing to be hired across the U.S. each year. In high-achieving school systems such as those in Finland, Singapore, and Ontario, Canada, annual teacher attrition rates typically average as low as 3% to 4%.<sup>9</sup> If attrition rates in the U.S. could be reduced by half to be more comparable with these systems, the national teacher shortage could be virtually eliminated.<sup>10</sup>

The percentage of teachers leaving the profession has increased substantially over the past two decades.

**Figure 1**  
**Rate of Leaving Teaching Has Increased**



Source: National Center for Education Statistics Schools and Staffing Survey; Goldring, R., Taie, S., & Riddles, M. (2014). *Teacher Attrition and mobility: Results from the 2012–13 Teacher Follow-Up Survey*. National Center for Education Statistics.

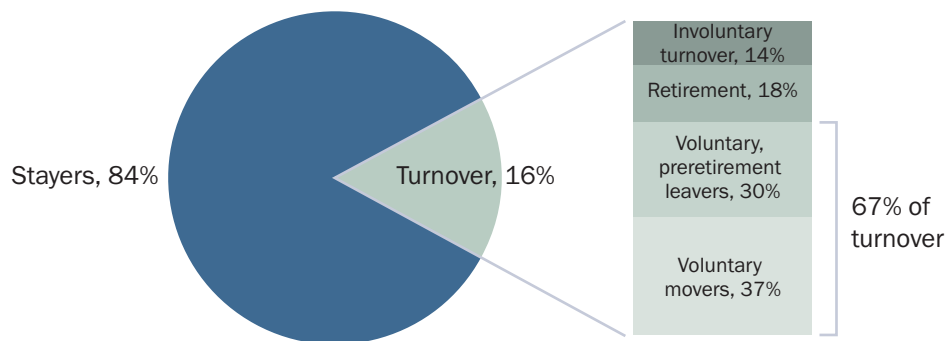
In addition to the 8% of teachers who leave the profession each year, about 8% shift schools. Thus, the overall turnover rate is currently about 16%. Movers and leavers may leave their schools or the teaching profession voluntarily or involuntarily, and they may leave to retire or for other preretirement reasons.

In addition to the 8% of teachers who leave the profession each year, about 8% shift schools. Thus, the overall turnover rate is currently about 16%.

During 2012–13, when many schools were being closed and many teachers were being laid off during the Great Recession, there was a higher than usual rate of involuntary turnover, at 14%. (For context, less than 8% of turnover was involuntary in 2008–09.) Most of these teachers attributed their involuntary moves to budget cuts, school closures, reduced student enrollment, and school transfers. Almost all movers go on to regular teaching positions; the remaining few become itinerant teachers who travel between school sites, long-term substitutes, or other nontraditional teachers.

About 18% of total turnover (including movers and leavers) was due to retirement. Importantly, more than two-thirds of all teacher turnover between the 2011–12 and 2012–13 school years was voluntary, preretirement turnover (see Figure 2). The reasons for leaving a school can be wide-ranging. One teacher might change schools, for example, because of unfavorable working conditions, while another might leave to teach somewhere else as part of a family move.

**Figure 2**  
**Sources of Teacher Turnover, 2011–12 to 2012–13**



Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-Up Survey, 2012–13.

### Where Do Teachers Who Leave the Profession Go?

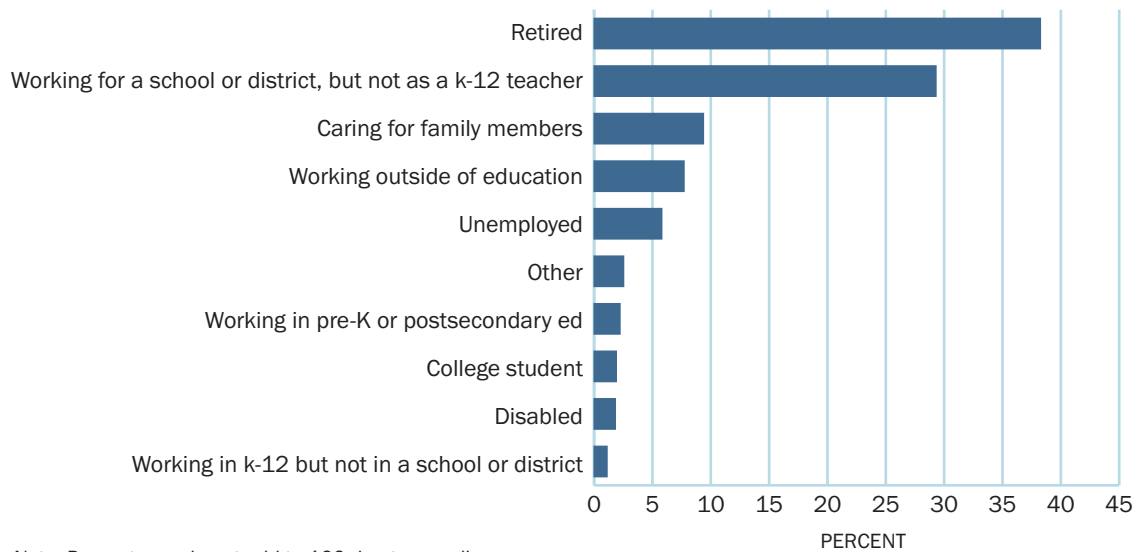
Among those who left teaching entirely in 2012–13, about 38% retired (see Figure 3), but only 31% cited retirement as the major reason they left. Teachers who retired without claiming retirement as a significant reason might have taken an early-retirement package and gone on to take another job or might have left for other reasons, but took retirement because they were eligible. For example, a teacher may leave teaching because she moves to a new state and has difficulty transferring her teaching certification or pension plan to her new home state. If she



responds by retiring, she would be counted among retirees, despite not leaving with the intention to retire. Others may have taken retirement because they were dissatisfied with teaching or in lieu of a layoff or nonrenewal. About 12% of involuntary leavers went on to retire.

Aside from retirees, nearly 30% of leavers continued to work for a school or district outside of the classroom, 9% left to take care of family members, and 8% took jobs outside of education. The remaining leavers were unemployed, in college, disabled, working in education outside of k-12 or in k-12 outside of a school or district, or working in some other unspecified occupation.

**Figure 3**  
**Occupational Status of Leavers**



Note: Percentages do not add to 100 due to rounding.

Source: National Center for Education Statistics Teacher Follow-Up Survey, 2012–13.

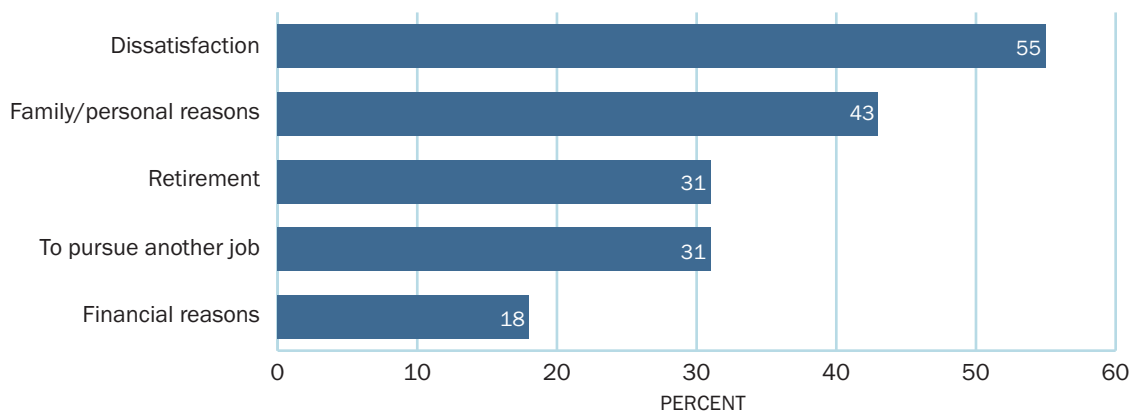
### Why Do Teachers Leave the Profession?

According to their survey responses, teachers most often cite dissatisfaction as a very important reason for voluntarily leaving the profession. (See Figure 4 for an overview and Table 1 for disaggregated reports of each reason category.) The most frequent area of dissatisfaction cited by voluntary leavers in 2012–13 concerned testing and accountability measures (25%), followed by unhappiness with the school administration (21%) and dissatisfaction with the teaching career (21%), which likely has to do with many factors. Some of these teachers may be among those who left to pursue another job (31%) and those who left for financial reasons (13%) as teachers could cite multiple reasons for leaving.

Teachers most often cite dissatisfaction as a very important reason for voluntarily leaving the profession.

The next-largest group of leavers is made up of teachers who left for family or personal reasons that include moving to a more conveniently located job, health reasons, and caring for family members.

**Figure 4**  
**Factors Teachers Report as Being Very Important for Leaving Teaching**

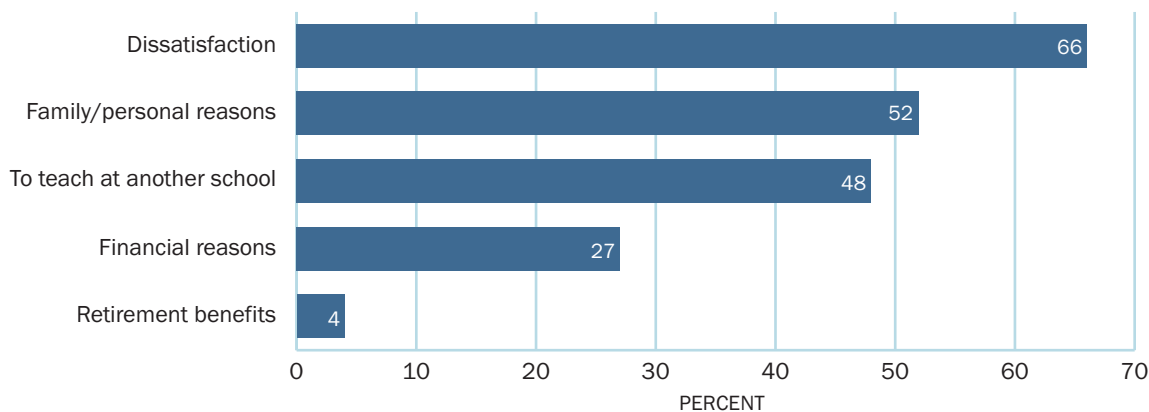


Note: Percentages do not add to 100 as teachers may select more than one reason for leaving.  
Source: Learning Policy Institute analysis of National Center for Education Statistics Teacher Follow-up Survey, 2012–13.

### Why Do Teachers Move Schools?

Voluntary movers also most commonly cite dissatisfaction as a very important reason for voluntarily moving schools (see Figure 5). Among the two-thirds who leave for reasons of dissatisfaction, the most frequent concerns are with school administration (33%), lack of influence on school decision making (29%), and school conditions, including facilities and resources (27%). Financial reasons were separately cited by 27% of teachers.

**Figure 5**  
**Factors Teachers Report as Being Very Important Reasons for Moving**



Note: Percentages do not add to 100 as teachers may select more than one reason for moving.  
Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2012–13.

Family and personal reasons are also cited by 52% of movers as important reasons for leaving their school; these reasons overlap with dissatisfactions, as respondents could choose more than one response. These data do not provide more fine-grained responses that would distinguish between teachers who leave for child-rearing purposes, to take care of an aging parent, to attend to their own health issues, and so on.

The fact that 4% of movers cited retirement benefits as a reason for leaving (although they did go on to teach in another school) suggests that a small share of teachers are motivated to take these benefits when they are eligible and then find another place to continue teaching.

While leaver and mover reports shed some light on reasons for turnover, they have a limited capacity to definitively predict it, especially since the federal Teacher Follow-Up Survey cited here asks only those who leave for their reasons in doing so. After all, teachers who choose to stay in their classrooms and at their schools may experience many of the same challenges and frustrations as those who decide to move or leave. In addition, the questions asked of movers and leavers do not offer the opportunity for teachers to speak to the role of their preparation, or other key factors associated with teacher turnover, in their decision making. We discuss these other reasons for teacher attrition in a later section of this report.

**Table 1  
Teacher Reasons for Leaving**

Reasons Given for Leaving	Overall	Mathematics & Science Teachers	Special Education Teachers	ELD Teachers*	Teachers of Color	Teachers in High-Poverty Schools	Teachers in High-Minority Schools
<b>Areas of Dissatisfaction</b>							
<b>Dissatisfaction With Assessment and Accountability Issues</b>							
Dissatisfied because of assessments and accountability measures	25%	26	24	26	26	30	35
Dissatisfied because not enough support to prepare students for assessments	17%	18	14	4	18	24	25
Dissatisfied with compensation tied to student performance	8%	5	6	6	11	8	8
<b>Dissatisfaction With Administrative Issues</b>							
Dissatisfied with the administration	21%	13	14	6	22	18	15
Too many intrusions on teaching time	18%	11	13	25	15	16	14
Discipline issues were an issue at school	17%	10	10	26	19	18	17
Not enough autonomy in the classroom	14%	7	6	12	15	12	10
Dissatisfied with lack of influence over school policies and practices	13%	10	8	4	14	12	9

**Table 1: Teacher Reasons for Leaving (continued)**

Reasons Given for Leaving	Overall	Mathematics & Science Teachers	Special Education Teachers	ELD Teachers*	Teachers of Color	Teachers in High-Poverty Schools	Teachers in High-Minority Schools
<b>Dissatisfaction With Teaching Career</b>							
Dissatisfied with teaching as a career	21%	12	15	12	19	18	16
Not enough opportunities for leadership or professional advancement	9%	7	7	2	9	6	5
<b>Dissatisfaction With Working Conditions</b>							
Dissatisfied with job description or assignment	12%	11	11	22	12	13	14
Dissatisfied with large class sizes	10%	6	7	20	6	8	7
Dissatisfied with working conditions (facilities, classroom resources, school safety)	9%	6	7	3	11	8	9
<b>Personal or Life Reasons (43%)</b>							
Wanted to take a job more conveniently located	11%	10	9	16	13	11	11
Other personal life reasons (e.g., pregnancy/child care, health, caring for family)	37%	33	42	42	40	37	41
<b>Change of Career (31%)</b>							
Decided to pursue another career	28%	22	23	31	29	25	24
Taking courses to improve career opportunities within the field of education	13%	9	13	3	19	11	10
Taking courses to improve career opportunities outside the field of education	5%	5	4	0	5	3	3
<b>Retirement (31%)</b>							
Decided to retire or receive retirement benefits	31%	28	37	50	27	29	22
<b>Financial Reasons ( 18%)</b>							
Wanted or needed a higher salary	13%	11	16	3	11	1	9
Needed better benefits	8%	5	8	0	6	5	3
Concerned about job security	7%	6	7	1	6	6	4

\* The sample of ELD teachers is small. Interpret with caution.

Sources: National Center for Education Statistics Schools and Staffing Survey, 2011–12, and Teacher Follow-Up Survey, 2012–13.

## Regional and State-by-State Trends

There is wide variation among states and regions in teaching conditions—such as salaries offered, certification requirements, working conditions, per-pupil spending, and a host of other factors—that affect teachers and students. For example, at the high end of the spectrum, Wyoming teachers had higher than average starting salaries of over \$43,000 in 2013, and teachers on average earned 94% of what other comparably educated professionals in the state earned at the same age, education level, and hours worked.<sup>11</sup> On the other end, Arizona teachers had lower beginning salaries at just \$31,874 and earned only 62% of what other professionals in the state did at the same age, education level, and hours worked.

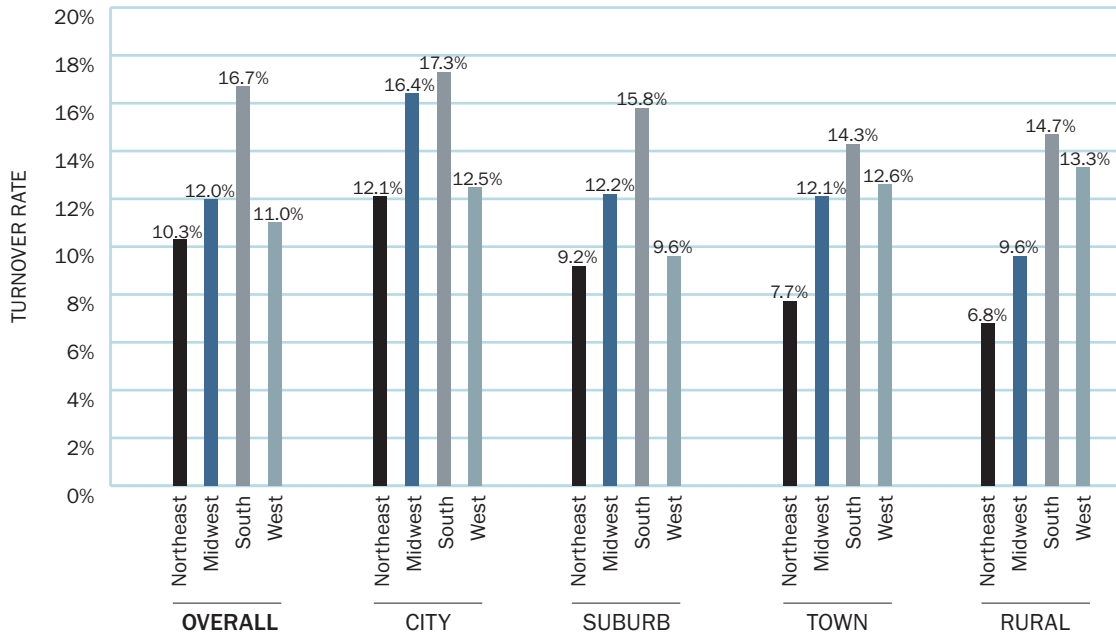
At 16.7% annually, the South has a particularly high turnover rate. The higher-spending Northeast averages the lowest turnover rates, with about 10% turnover overall.

These estimates may actually overstate the comparability of teacher salaries with those of other workers because studies find that teachers often work considerably longer hours than required by their contracts and do substantial work in the summer to prepare for the next school year.<sup>12</sup>

Aside from the unique status of Wyoming, which has had significant oil revenues in recent years, salaries are typically highest in the Northeast and lowest in the South and West. Teaching conditions also vary dramatically across regions. In the West, pupil-teacher ratios are especially high, ranging between 18-to-1 and 24-to-1 in Colorado, Washington, Idaho, Nevada, Oregon, Arizona, Utah, and California, from least to greatest. In the Northeast, pupil-teacher ratios are much smaller, ranging from just 11-to-1 in Vermont to a high of 15-to-1 in Rhode Island.<sup>13</sup> (Note that class sizes are always larger than pupil-teacher ratios, since teachers have other non-teaching duties and time during the day.)

At 16.7% annually, the South has a particularly high turnover rate compared to the northeastern, midwestern, and western regions, which average, at most, 13% annual turnover. Southern and midwestern cities have the highest rates of teacher turnover, followed by southern suburbs, towns, and rural areas (see Figure 6). The higher-spending Northeast averages the lowest turnover rates across all district types, with about 10% turnover overall and less than 8% turnover in its towns and rural areas. For most regions, turnover is higher in cities than in any other district type. By contrast, in the West, turnover in cities and suburbs is lower than turnover in towns and rural areas.

**Figure 6**  
**Turnover Rates Vary by Region and District Type**



Note: District types are based on 2000 Census population and geography information. For more information, see Documentation to the NCES Common Core of Data Public Elementary/Secondary School Universe Survey: School Year 2009–10 (NCES 2008–332).

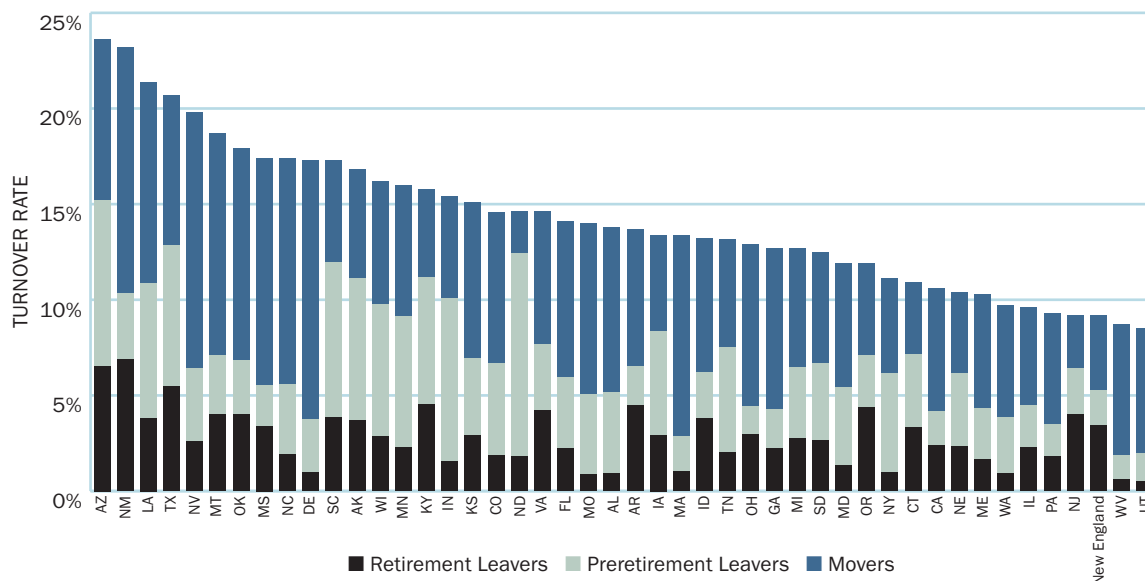
Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey 2011–12, and Teacher Follow-Up Survey 2012–13.

The variation in annual turnover is even greater between states, ranging from just over 8% in Utah to 24% in Arizona (see Figure 7). In almost every state, the bulk of turnover is due to preretirement leaving and moving. Retirement represents less than a third of all turnover in every state except for Oregon and New Jersey, where retirement accounts for 37% and 44% of turnover, respectively. In 30 states, retirement turnover is 25% or less of all turnover.

In almost every state, the bulk of turnover is due to preretirement leaving and moving. Retirement represents less than a third of all turnover in every state except for Oregon and New Jersey.



**Figure 7**  
**Teacher Turnover Varies Widely by State**



Note: States with fewer than 25 teachers surveyed were excluded (DC, HI, and WY). Three small New England states with similar data patterns were combined (NH, RI, VT).

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-up Survey, 2012–13.

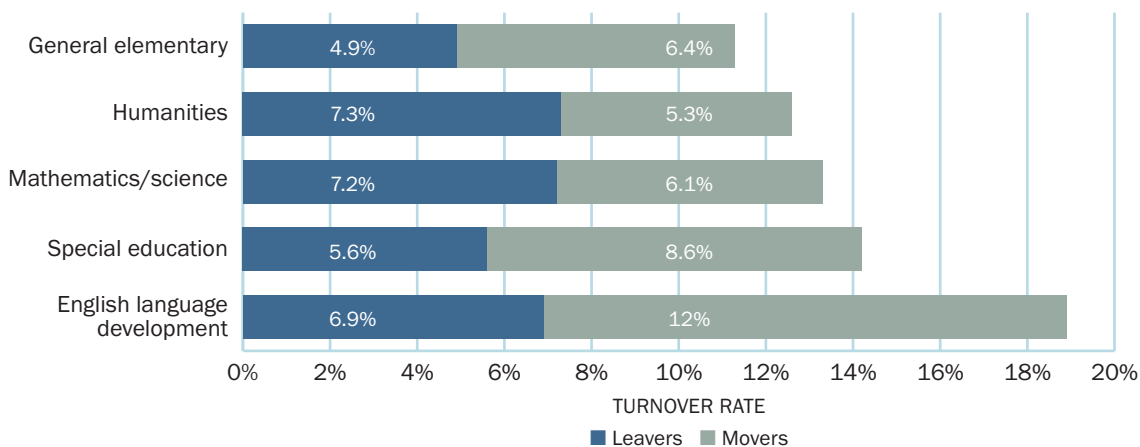
### Subject-Area Turnover

In recent years, there have been severe shortages of teachers qualified to teach mathematics, science, special education, and English language development in schools across the country. High teacher turnover rates can intensify these shortages, especially in hard-to-staff schools with few resources to attract teachers from a limited pool of qualified teachers. As discussed below, research suggests that the causes of these shortages differ among subject areas.

Turnover rates vary across subject areas, with the lowest rates found among general elementary teachers and humanities teachers. Mathematics, science, and special education teachers have higher turnover rates, exceeding 13% annually. Teachers who primarily teach English to speakers of other languages have an even higher turnover rate of about 19%; this rate is driven especially by movers<sup>14</sup> (see Figure 8).

Turnover rates vary across subject areas, with the lowest rates found among general elementary and humanities teachers.

**Figure 8**  
**Turnover Rates Vary by Primary Teaching Assignment**



Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12.

### **Mathematics and science**

American students have demonstrated declining achievement in mathematics and science, subjects that are increasingly important in an economy driven by technological innovation.<sup>15</sup> According to the most recent Program for International Student Assessment (PISA) results from 2015, the United States scores well below average in mathematics, ranking 31st out of 35 Organisation for Economic Co-operation and Development (OECD) countries. The U.S. ranks 19th in science, with average scores among this group.<sup>16</sup> U.S. performance on these international tests has dropped in these subjects plus reading since 2000, when PISA was first administered.<sup>17</sup>

A well-prepared mathematics and science teacher workforce can support student achievement; however, secondary mathematics and science positions have been historically difficult to fill.<sup>18</sup> Indeed, one recent national study showed that schools were about four times more likely to have trouble filling mathematics and science positions than English positions. Compared to schools not reporting these difficulties, schools that reported difficulties filling mathematics and science positions were nearly twice as likely to have above-average teacher turnover rates the year before having the vacancy.<sup>19</sup> When schools have trouble filling positions, they often rely on hiring unqualified and inexperienced teachers, which undermines student achievement and contributes to ongoing turnover.<sup>20</sup>

There are two primary arguments for why mathematics and science teachers have higher turnover rates than teachers in other subject areas: (1) opportunities for better-compensated positions in other occupations as well as in other school districts, and (2) lack of teacher preparation. The literature on mathematics and science teacher turnover offers evidence that these teachers leave teaching because their skills give them access to higher-paying jobs.<sup>21</sup> In addition, scholars have found that mathematics and science teachers often tend to have less teacher preparation than teachers of other subjects—in part because many enter through alternative pathways, which are associated with higher attrition rates.<sup>22</sup>

Differences in attrition rates for mathematics and science teachers in comparison to teachers in other subject areas are not statistically significant overall; however, mathematics and science teachers leave Title I schools at a significantly higher rate than they leave non-Title I schools. In Title I schools, the turnover rate for mathematics and science teachers is nearly 70% greater than it is in non-Title I schools (17.8% versus 10.5%).

Additionally, in schools serving low-income students and students of color, mathematics and science teachers are also more likely to have been certified via an alternative pathway. While the characteristics of alternative certification pathways vary, these accelerated programs often require fewer courses and less clinical experience than traditional programs do before participants become teachers. In schools with the most students of color, fully 30% of mathematics and science teachers entered teaching via an alternative pathway, compared to just 12% of mathematics and science teachers at schools with mostly White students. Teachers who enter through such pathways often lack the experience of student teaching and may also lack critical coursework in subject-specific teaching methods and curricula that can undermine their initial teaching experiences.

### **Special education**

Since federal law was passed in 1975 to ensure all students have access to a free and appropriate education, the proportion of students who receive special education services has steadily grown.<sup>23</sup> When the Individuals With Disabilities Education Act (IDEA) went into effect, 8.3% of public school children, ages 3 to 21, were served by the law. In 2012–13, that percentage rose to nearly 13%, a 55% increase over nearly 40 years. Schools need special education teachers who can meet the needs of a variety of students, including those with autism, developmental delays, learning disabilities, health impairments, and other disabilities.<sup>24</sup>

Teacher shortages in special education have been severe and persistent. In every year of the 1990s, more than 30,000 special education positions were filled by uncertified teachers, and in 2000–01, over 47,000 (or 11%) of those filling special education positions were not certified to teach in the subject area.<sup>25</sup> A recent study of teacher shortages found that, in 2015–16, 48 states plus the District of Columbia reported special education teacher shortages, with these being the most severe shortages for most states.<sup>26</sup>

According to past research, two primary factors drive special education teacher shortages: (1) too few special education teachers are being prepared, and (2) too many leave each year. Importantly, difficult working conditions—such as lack of administrative support, lack of collaboration, and excessive paperwork—play a key role in teacher decisions to leave the profession or transfer from special education to general education positions.<sup>27</sup>

In Title I schools, the turnover rate for mathematics and science teachers is 70% greater than it is in non-Title I schools.

As illustrated in Figure 8, special education teacher turnover rates are greater than those of most other categories of teachers. Special education teachers have about the same turnover rates in Title I schools as they do in non-Title I schools. However, in high-minority schools, their turnover rates

are considerably higher than turnover rates in low-minority schools (19.9% versus 10.8%). Special education teachers in high-minority schools are also 3.5 times more likely to be alternatively certified than special education teachers in low-minority schools (24.7% versus 6.9%).

Special education teachers are more likely to state that they left teaching due to retirement or for financial reasons, compared to average leaver reports (Table 1).

## Turnover in Schools Serving Historically Underserved Students

Research has long found that schools with larger low-income and student-of-color populations experience greater rates of teacher turnover than schools on average.<sup>28</sup> Thus, in schools serving predominantly low-income students and students of color, students are often subjected to a “revolving door” of less-experienced teachers.<sup>29</sup> Previous research suggests many conditions contribute to these high turnover rates. Among them, schools with primarily low-income students and students of color are staffed by newer teachers and teachers with less preparation, report having inferior teaching supports and working conditions, and are more deeply impacted by accountability measures.<sup>30</sup>

In schools with predominantly low-income students and students of color, students are often subjected to a “revolving door” of less-experienced teachers.

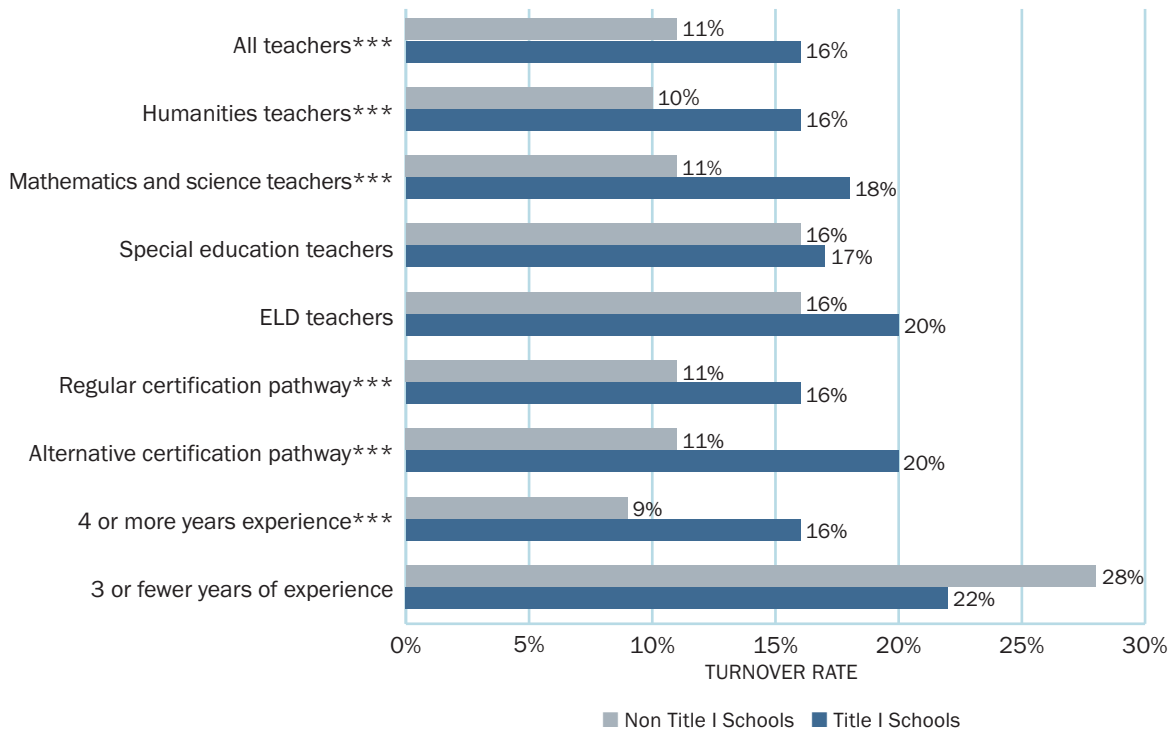
Many of these factors have previously been found to influence teacher attrition. For example, teachers who lack comprehensive preparation are 2 to 3 times more likely to leave teaching in their early years than those who are fully prepared.<sup>31</sup> Similarly, teachers who receive less mentoring and induction support are more likely to leave,<sup>32</sup> as are those who experience less desirable working conditions.<sup>33</sup>

Schools serving vulnerable populations have the additional responsibility of responding to community concerns, such as food insecurity, environmental pollution, and access to adequate health care and housing. While improving teacher turnover rates may not be wholly sufficient to address every one of these needs, increasing student access to high-quality teachers by reducing teacher turnover is a critical effort.

### Title I schools

Title I schools are those with high percentages of low-income students that receive federal funds under Title I of the Elementary and Secondary Education Act to help students meet academic standards. The turnover rate in Title I schools is nearly 50% greater than that in non-Title I schools (16% versus 11%) (see Figure 9). Mathematics and science teacher turnover rates are nearly 70% greater in Title I schools than in non-Title I schools, and alternative certification teacher turnover is more than 80% higher. While turnover rates for teachers with 3 or fewer years of experience are high for teachers in all schools (with no statistically significant difference between those in Title I and non-Title 1 schools), teachers with more experience have turnover rates nearly 80% higher in Title I schools than in non-Title I schools.

**Figure 9**  
**Teacher Turnover Is Greater in Title I Schools**



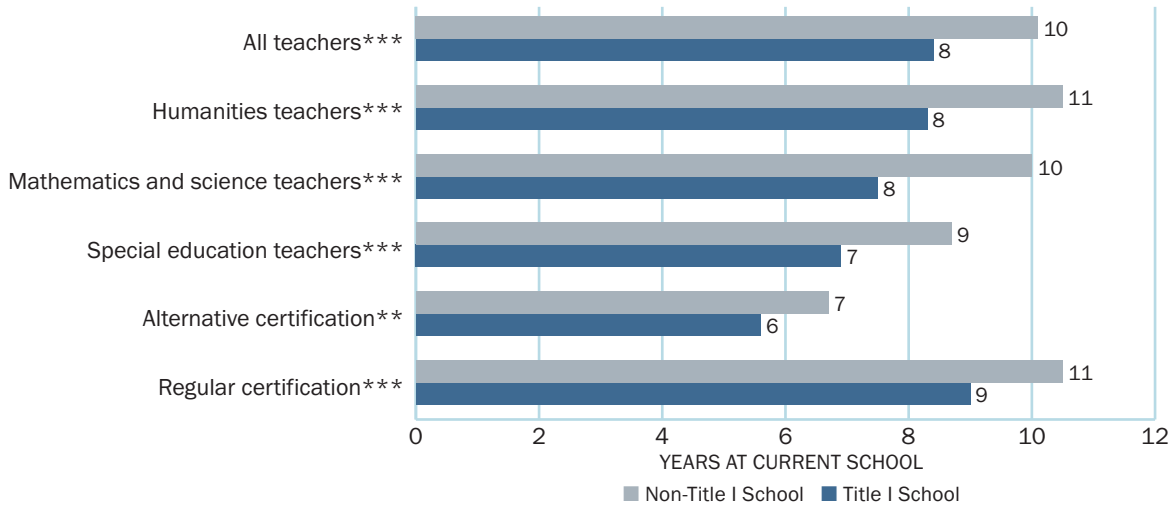
Note: Percentages are rounded to the nearest whole number; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-Up Survey, 2012–13.

Teachers in Title I schools have spent about 2 years less at their current school and have a year less of overall teaching experience than teachers in non-Title I schools (see Figures 10 and 11). In most of the major subject areas, teachers in Title I schools have spent about 2 years fewer at their current school than those teachers in non-Title I schools. Teachers certified through a regular pathway have the greatest longevity at their current Title I school (9 years), while alternatively certified teachers spend the least time (6 years) teaching at their current Title I school (see Figure 10).

Teachers in Title I schools have spent about 2 years less at their current school and had a year less of overall teaching experience than teachers in non-Title I schools.

**Figure 10**  
**Teachers in Title I Schools Stay Fewer Years**

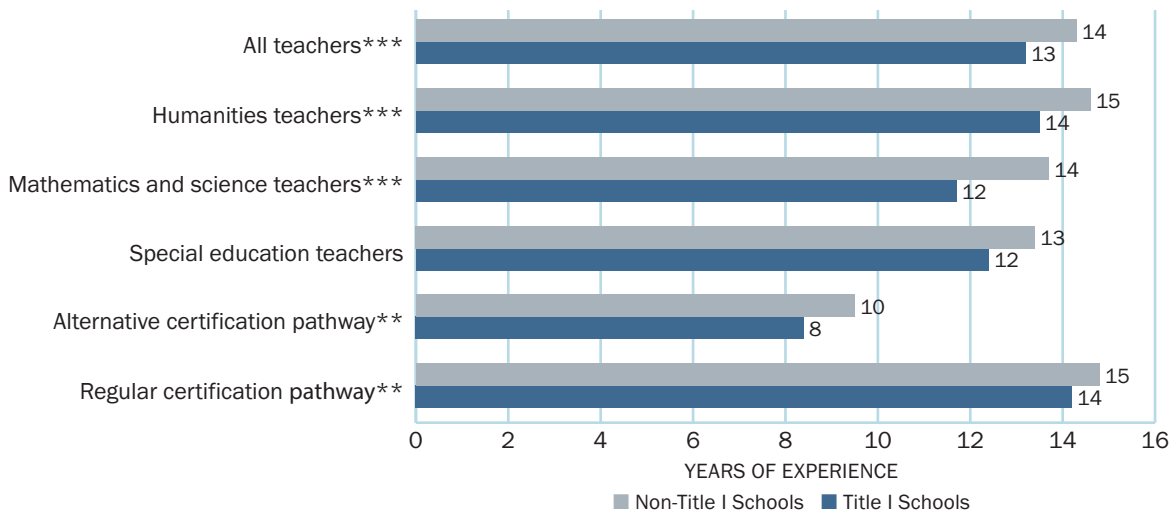


Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12.

For the most part, differences in years of teaching experience are slight between teachers in Title I schools and non-Title I schools. Mathematics and science teachers, however, have 2 fewer years of experience in Title 1 schools.

**Figure 11**  
**Teachers in Title I Schools Have Fewer Years of Experience**



Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12.

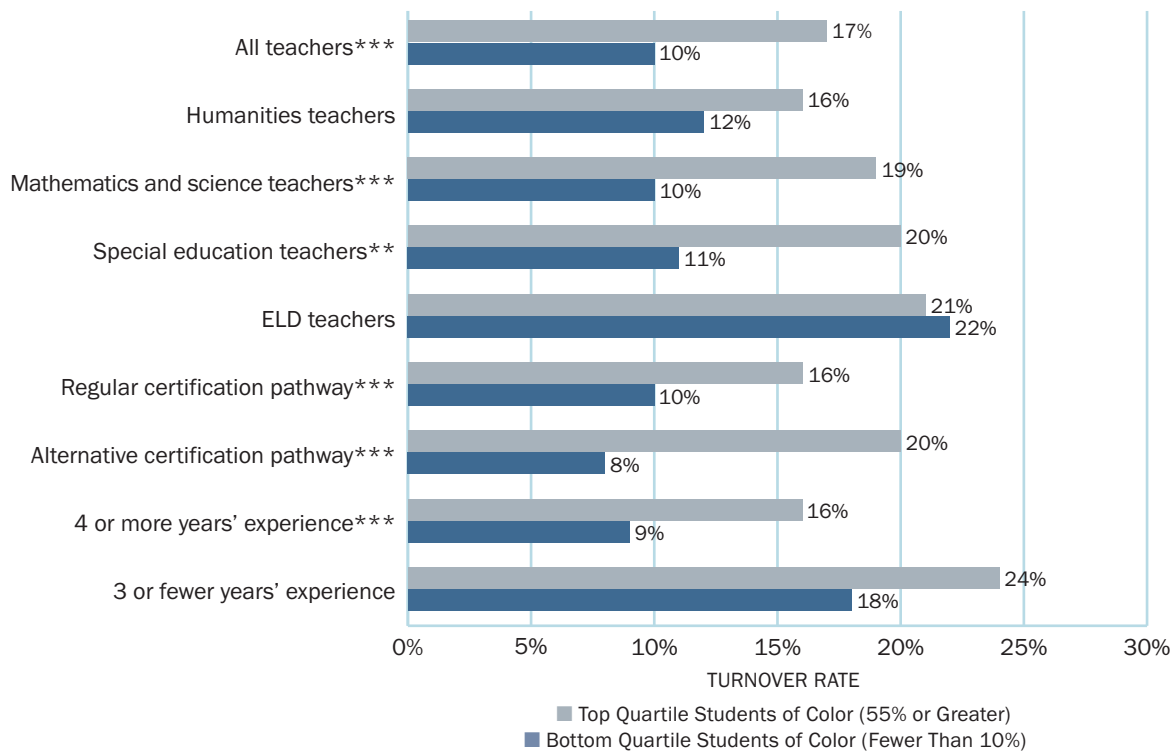


Compared to the average teacher, teachers in schools serving students of color and students in poverty were more likely to report that, in their decision to leave teaching, testing and accountability measures and administrative support were very important reasons. They were less likely to state that retirement and financial reasons were as important.

### Schools serving students of color

In the quartile of schools with the most students of color (more than 55%), the turnover rate is about 70% greater than that in the quartile of schools with the fewest students of color (less than 10%). Across the board, turnover rates in high-minority schools are higher—regardless of teachers’ subject taught, years of experience, or certification pathway (see Figure 12). Mathematics and science teacher turnover rates are 90% higher in the top quartile of schools than in the bottom. Special education teachers are more than 80% more likely to turn over, and teachers certified via an alternative pathway are 150% more likely to leave in schools with the greatest concentration of students of color than in those with the lowest. English language development teachers and teachers with 3 or fewer years of experience have high turnover rates in both high-minority and low-minority schools. Nearly one in four inexperienced teachers leave high-minority schools in a given year.

**Figure 12**  
**Teacher Turnover Is Greater When Schools Serve Primarily Students of Color**



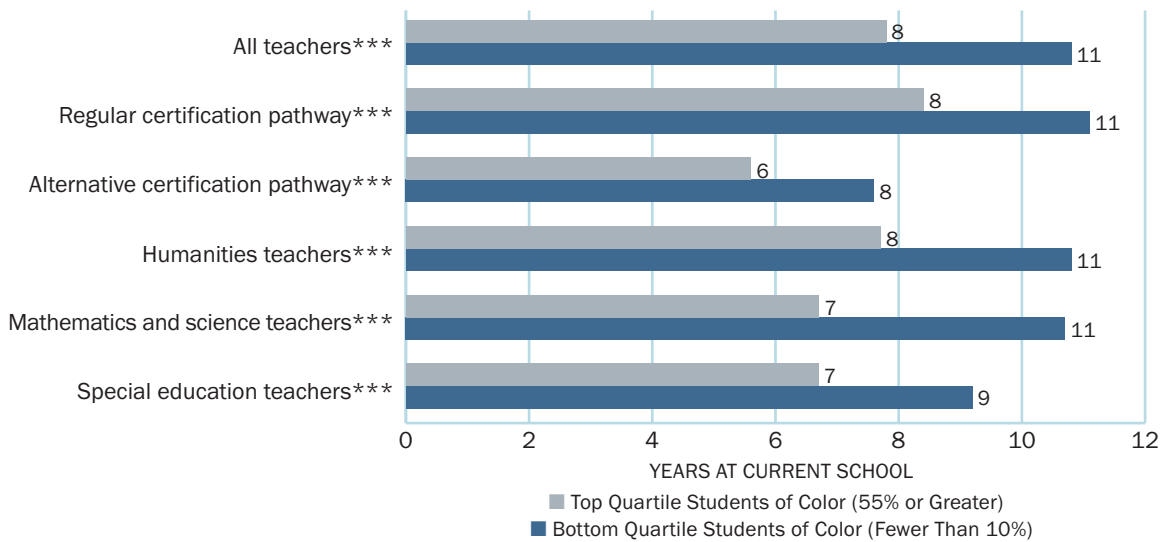
Note: Percentages are rounded to the nearest whole number; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-Up Survey, 2012–13.

Consistent with the literature, teachers in high-minority schools tend to have less experience overall and, according to our analysis, have spent less time teaching at their current school. In schools with predominantly White students, the average teacher has been teaching at the same school for 11 years and has 15 years of teaching experience. At schools with predominantly students of color enrolled, the average teacher has been teaching at the same school for 8 years and has about 12 years of experience (see Figures 13 and 14). This differential is even greater for mathematics and science teachers who have been at their current school for 4 years fewer if they are in the top quartile of schools serving students of color (see Figure 13).

Of all teachers, those certified through a regular pathway average the greatest amount of teaching experience overall, as well as at their current placement.

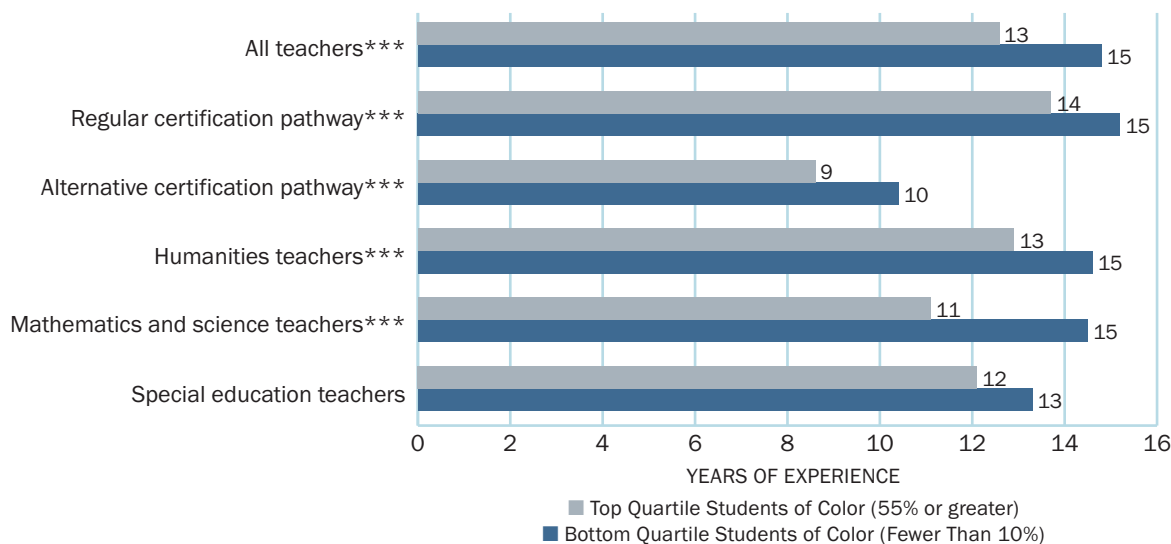
**Figure 13**  
**Teachers in Schools Serving Primarily Students of Color Stay Fewer Years**



Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12.

**Figure 14**  
**Teachers in Schools Serving Primarily Students of Color Have Less Overall Experience**



Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12.

Of all teachers, those certified through a regular pathway average the greatest amount of teaching experience overall and time at their current placement, whether at schools with predominantly students of color or with predominantly White students, while alternatively certified teachers average the least amount of teaching experience and fewest years teaching in their current placement. Alternatively certified teachers spend about 3 years fewer at schools with predominantly students of color than regularly certified teachers and have 5 fewer years of experience overall. More than half of all alternative certification teachers teach in schools with the greatest concentrations of students of color and account for 21% of teachers in these schools. In contrast, alternative certification teachers account for less than 9% of teachers in schools with predominantly White students. Thus, schools with predominantly students of color are most likely to have teachers with the fewest years of teaching experience, the fewest years at their school site, and the highest turnover rates at their schools.

Controlling for all other variables, teachers at schools with the greatest proportion of students of color move schools or leave teaching at a rate 50% higher than teachers in schools with the fewest students of color ( $p < 0.05$ ). However, as other studies show, the predictive relationship between student race and teacher turnover is reduced when working conditions are included as well, suggesting that these conditions explain at least some of the high rates of teacher turnover in high-minority schools.<sup>34</sup>

## Turnover of Teachers of Color

Students of color comprised 49% of public school students nationally in 2012 and are projected to be in the majority by the year 2024. Teachers of color made up just 18% of the public school teacher workforce in 2012. Although that proportion has been steadily growing, the numbers are still much smaller than the demand from employers and families.<sup>35</sup> Previous research demonstrates that teacher diversity has several important outcomes for students of color: Teachers of color appear to improve the schooling experiences and academic outcomes of students of color, and they are more likely to feel called to teaching positions in low-income communities of color where openings are difficult to fill.<sup>36</sup> Several studies also suggest that all students benefit from having teachers of color because they bring distinctive knowledge and experiences, and function as role models to the student body as a whole.<sup>37</sup>

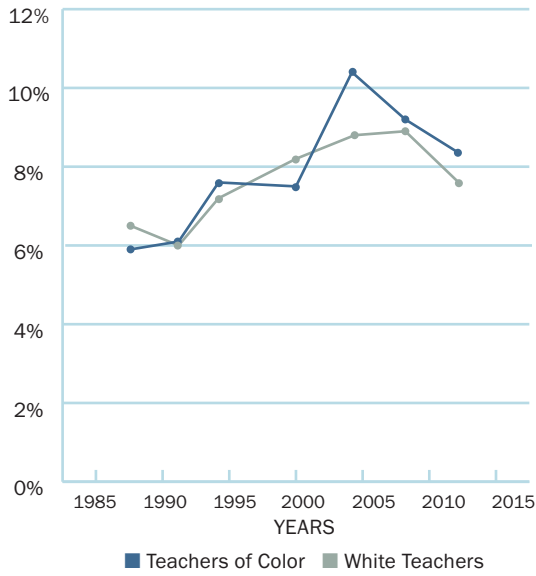
Teachers of color appear to improve the schooling experiences and academic outcomes of students of color, and they are more likely to feel called to teaching positions in low-income communities of color where openings are difficult to fill.

Despite successful recruitment of teachers of color in recent years, high turnover rates continue to contribute to shortages of teachers of color.<sup>38</sup> A key step to increasing the proportion of teachers of color in the teacher workforce is addressing the particular factors that contribute to their decisions to move schools and leave teaching.

With 3 in 4 teachers of color working in the quarter of schools with the most students of color, their turnover decisions have important implications, especially for students of color, who have been found to perform better in school when they have teachers of color.<sup>39</sup> While the overall teacher mover rate has remained fairly steady, that is not so for teachers of color, who have experienced a mover rate that has ranged from 6% to 10% since 1988. Teachers of color and White teachers have left the workforce at similar rates over time (see Figure 15) but have moved schools at significantly different rates (see Figure 16).

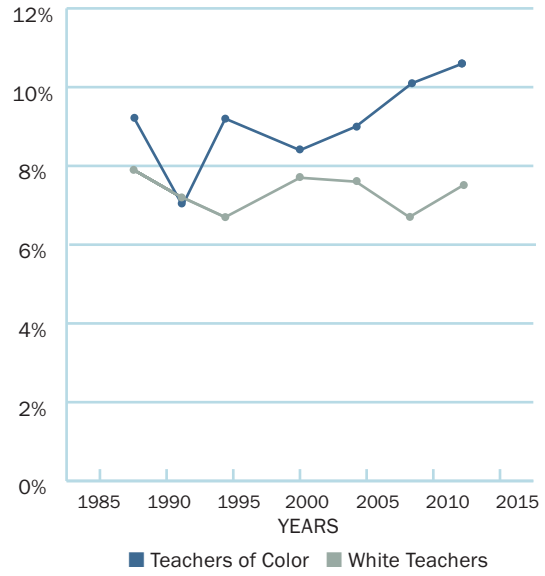
Teachers of color are also more likely to enter teaching through an alternative pathway. A quarter of teachers of color did so, double the share for White teachers. While there is a statistically significant difference in the overall turnover rates of teachers of color and White teachers (18.9% and 15.1%, respectively), this does not hold true across school types. When teachers of color and White teachers work in schools with the same proportion of students of color, their turnover rates are statistically indistinguishable. This analysis shows that teachers of color are simply more likely to teach in schools where turnover rates are higher for all teachers.

**Figure 15**  
**Teacher Leaving Rates,**  
**1988-89 to 2012-13**



Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12 and Teacher Follow-up Survey, 2012-13.

**Figure 16**  
**Teacher Moving Rates,**  
**1988-89 to 2012-13**



Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12 and Teacher Follow-up Survey, 2012-13.

## The Special Case of Black Teacher Turnover

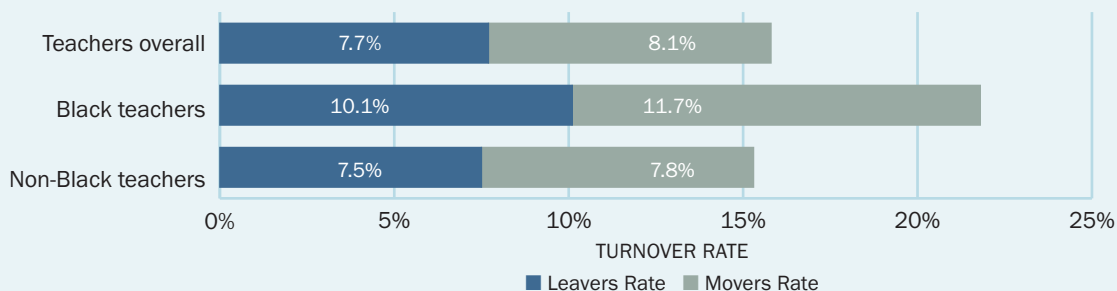
Historically, Black teachers have played a central role in American schools. Being largely responsible for the education of Black children from Reconstruction to the era of school integration—about 100 years—Black teachers have been community leaders and have helped to build the Black middle class.<sup>40</sup> In more recent years, Black teachers have comprised a perpetually small share of the teacher workforce. While the Black teacher workforce has grown from 191,000 teachers in 1987–88 to 231,000 in 2011–12, the proportion of Black teachers decreased from 8.2% to 6.8% of the teacher workforce during the same period. Meanwhile, Black students comprised nearly 16% of the public school student population in 2013.

Across a range of studies, Black teachers have been associated with lower dropout rates, improved student achievement, increased student interest in college, and positive perceptions from students.<sup>41</sup> Additionally, Black teachers are more likely to feel called to teaching in low-income communities of color where openings are difficult to fill. Nearly 80% of Black teachers work in schools in the top quartile of students of color, and more than 70% teach in Title I schools.

Although Black teachers were once more likely to stay in teaching than White teachers, Black teacher turnover rates are now extremely high. At about 22%, the Black teacher turnover rate is nearly 50% greater than the non-Black teacher turnover rate (see Figure 17). In the South, where Black teachers are most likely to teach, their annual turnover rates are 26%.

Considering the important role Black teachers play in the workforce and their diminishing position in it, it is essential to identify ways to reduce their attrition from the workforce.

**Figure 17**  
**Teacher Leaver and Mover Rates, 2012**



Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-Up Survey, 2012–13.

### Reasons for Black teacher turnover

Black teachers have about the same average age and teaching experience as other teachers, but Black teachers in their first year in 2012 were 3.5 times more likely to have no student teaching experience than all other first-year teachers (28.2% versus 7.9%), a discrepancy driven by disproportionate entry through alternative certification routes. Nearly half of newly hired Black teachers were certified through an alternative pathway, compared to just 22% of all other first-year teachers.



In 2012, in an era of school closings and layoffs in many cities, the rate of involuntary turnover was much higher for Black teachers than for all other teachers, constituting nearly a third of all turnover. Twelve percent of Black teachers who left the profession did so involuntarily, while 10% of teachers on average did.<sup>42</sup> While about 30% of all movers left their schools involuntarily,<sup>43</sup> over 50% of Black teachers moved involuntarily.

This has been substantially a function of teacher layoffs during the recession and school closings in urban districts due both to declining enrollments and sanctions targeted to schools with low test scores under No Child Left Behind.<sup>44</sup> Decreases in the numbers of Black teachers have been proportionally much greater than decreases in the size of the overall teaching force in some of the nation’s largest cities, listed in Table 2. In New Orleans, more than 7,000 teachers—most of whom were Black—were fired en masse after Hurricane Katrina. They were replaced by predominantly young, White teachers brought in to teach in the charter schools that replaced the district schools. As a result, the number of Black teachers declined there by more than 62%. In other major cities, the number of Black teachers has declined by anywhere from 15% to 39%.

**Table 2**  
**Change in Proportion of Teachers in Selected Cities by Teacher Race, 2000–12**

City	Overall	White	Black	Hispanic
Boston	-3.3	-0.8	-18.3	1.1
Chicago	-13.4	-3.2	-39.2	6.4
Cleveland	-17.4	-12.0	-33.9	-9.4
Los Angeles	-16.9	-28.0	-33.2	6.5
New Orleans	-44.4	3.3	-62.3	43.5
New York City	-2.0	-1.9	-15.1	2.4
San Francisco	-11.9	-21.9	-32.4	8.1

Source: Albert Shanker Institute

Among voluntary leavers, Black teachers in 2012–13 were much less likely to say they left for personal or family reasons, or to find a school in a more convenient location, and much more likely to express dissatisfaction with their salary, lack of resources, worries about job security due to accountability measures, lack of classroom autonomy, and lack of collegial support. Nearly twice as many Black teachers as non-Black teachers strongly disagreed that the materials they need to teach were readily available to them (e.g., textbooks, supplies, copy machines, etc.).

There is hope to be found in the fact that Black teachers tended to cite specific issues with respect to their teaching conditions as reasons for leaving. These can be addressed by policy interventions, which can be a tool for increasing Black teacher retention.

## Predictors of Turnover

The descriptive data presented above illustrate patterns of attrition; however, they do not control for various influences that might be associated with these trends. There are a number of factors that have been found to impact teachers' decisions to stay in their classrooms, move schools, or leave teaching altogether, including compensation, student characteristics, teacher preparation and mentoring, age and experience, and working conditions.

In order to learn how each of these contribute to decisions to move or leave, we calculated teachers' predicted probabilities of leaving their school from a logistic regression model that controls, first, for a variety of school characteristics, then for teacher characteristics, main teaching subject area, and, finally, workplace conditions (see Technical Appendix, page 35).

### School Characteristics

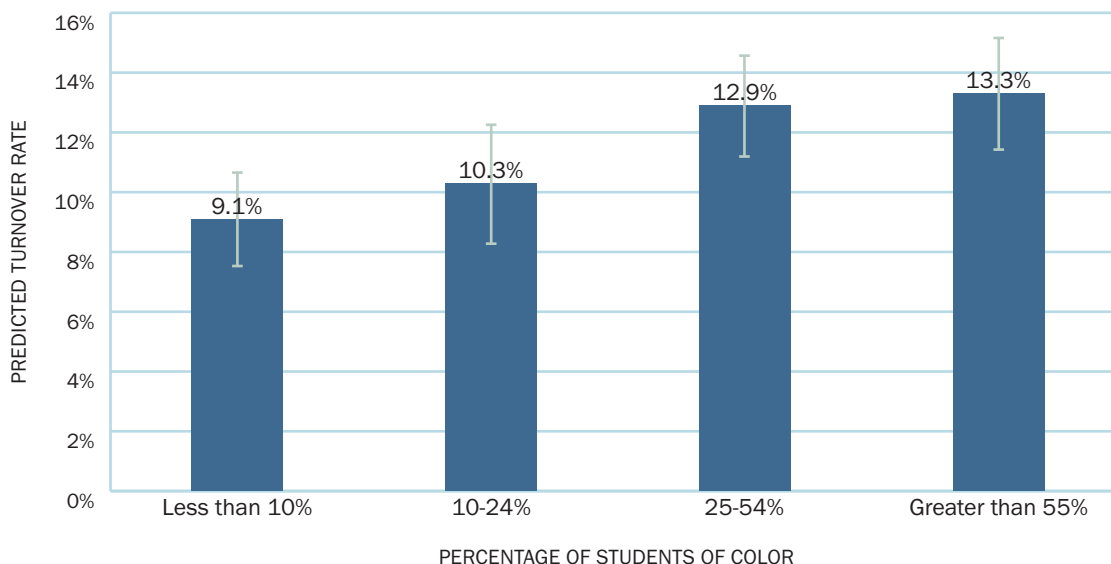
Some previous research has suggested that teachers have a preference for teaching in schools with wealthier, higher-performing, and greater proportions of White students.<sup>45</sup> Other research, however, emphasizes the desire of many teachers to work with vulnerable student populations and illustrates how a host of factors, including teacher preparation and workplace conditions, make that difficult to sustain.<sup>46</sup>

Consistent with previous research, we found that, controlling for school size and student poverty rates, those teaching in schools with 25% or more students of color were more likely to move or leave teaching than teachers in schools with fewer students of color, all else being equal (see Figure 18). Student characteristics, such as eligibility for free or reduced-price lunch, were not significantly related to turnover, but it is of interest to note that they became somewhat less predictive of teacher turnover when other variables, such as working conditions, were also included in the model. We recognize that there may be other unobserved variables, such as working conditions that are not accounted for in our model, given the limitations of our data. Some of these factors may be related to both the proportion of low-income students and students of color in a school and high rates of teacher turnover.

We found that those teaching in schools with 25% or more students of color were more likely to move or leave teaching than teachers in schools with fewer students of color, all else being equal.

Teacher turnover rates were negatively correlated with school size, but not with urbanicity variables or school level. Turnover rates were positively correlated with class size but the correlation was not statistically significant

**Figure 18**  
**Predicted Turnover Rate by Population of Students of Color**



Note: Brackets represent 95% confidence interval of the estimate.

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-up Survey, 2012–13.

## Teacher Characteristics

As expected, teacher age was related to leaving rates, with the youngest and oldest categories of teachers having higher rates than those who were mid-career. After controlling for age, experience levels did not have an effect on turnover. With controls for other student and teacher characteristics, teachers' race did not influence turnover.

However, we found that teachers' preparation pathway did influence turnover. Those who entered the profession through an alternative certification program were 25% more likely to leave their schools than were full-time teachers who entered teaching through a regular certification program, holding all else constant. About 15% of all teachers surveyed in 2011–12 and about 1 in 4 first-year teachers surveyed had entered teaching through an alternative pathway, which typically requires that a teacher work toward the requirements of a full credential while teaching and receiving little formal training beforehand.<sup>47</sup> Disparities in turnover rates were slightly greater in schools with predominantly students of color. Alternative pathway teachers left their schools at rates about 28% greater than regular certification teachers when in high-minority schools (see Figure 19).

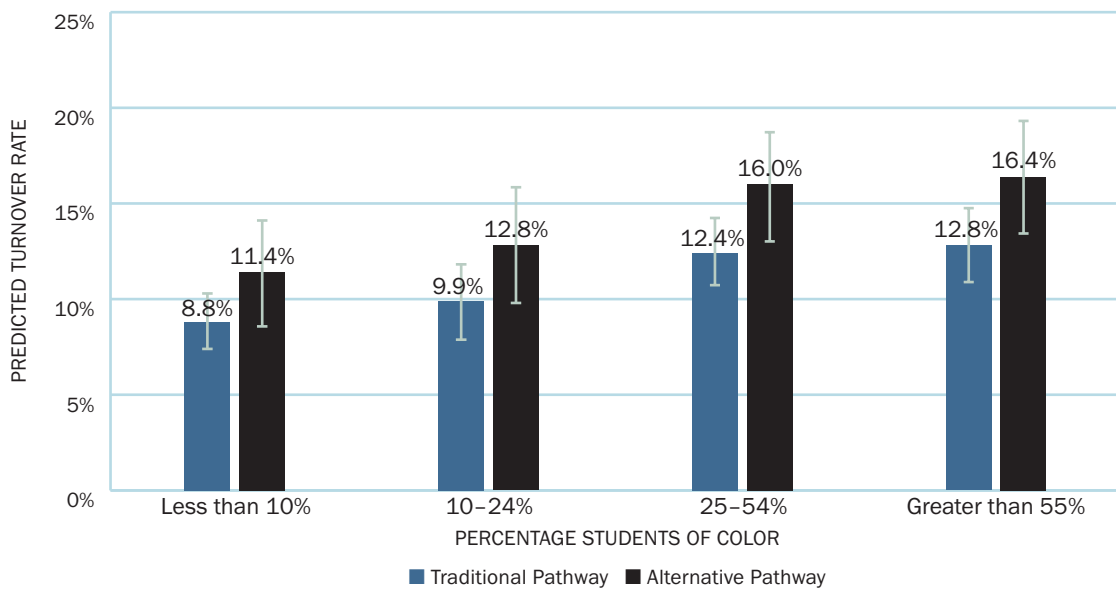
Those who entered the profession through an alternative certification program were 25% more likely to leave their schools than were full-time teachers who entered teaching through a regular certification program, holding all else constant.

These findings are not surprising. Studies of the relationship between teacher preparation and teacher turnover suggest teachers with the least preparation are 2 to 3 times more likely to leave the profession than those with the most comprehensive preparation—including student teaching and courses in teaching methods.<sup>48</sup> In our sample, consistent with the literature, teachers who were alternatively certified received less preservice preparation. Based on analysis of the data, alternative pathway teachers were less likely to have student taught before teaching, and those who did were less likely to have taught more than a few weeks. Traditional pathway teachers were more likely to report having taken 10 or more courses in teaching methods, and they were more likely to report feeling well prepared or very well prepared to handle a variety of teaching responsibilities in their first year, including classroom management, choosing instructional materials, and using assessment to inform instruction.

Quite often, teachers choose alternative certification pathways because, without financial aid, they cannot afford to be without an income for the time it takes to undergo teacher training. Furthermore, candidates are less likely to be willing to go into debt for training if the financial rewards of the occupation are lower.<sup>49</sup> Those states and districts that offer fewer inducements to teaching are most likely to rely on teachers

Quite often, teachers choose alternative certification pathways because, without financial aid, they cannot afford to be without an income for the time it takes to undergo teacher training.

**Figure 19**  
**Predicted Turnover Rate by Population of Students of Color and Teacher Preparation Pathway**



Note: Brackets represent 95% confidence interval of the estimate.

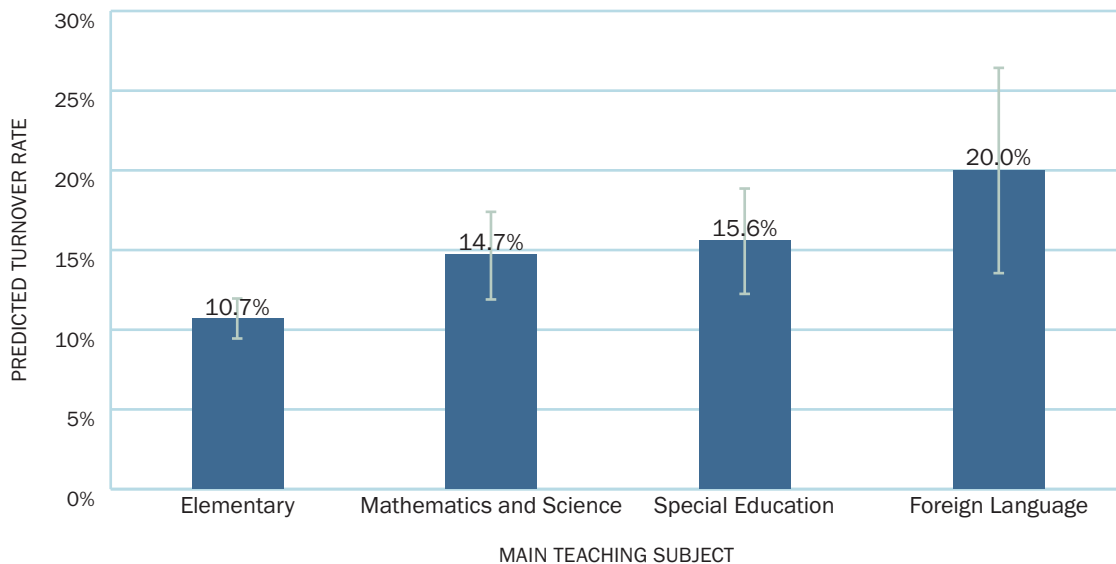
Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12 and Teacher Follow-Up Survey, 2012-13.

who are not yet fully trained. Thus, it is not surprising that alternatively certified teachers were more likely to teach in states where wages were less comparable to wages for other professionals with graduate degrees and in districts with lower than average maximum salaries.

## Main Teaching Subject Area

With the addition of main teaching subject in our third model, we found that teachers had considerably higher likelihoods of moving schools or leaving teaching entirely if they taught mathematics and science, special education, or foreign languages, in comparison to elementary school teachers, who are the least likely to move or leave. Holding all else constant, mathematics and science teachers have a predicted turnover rate 37% greater than elementary teachers, special education teachers have a rate 46% higher, and foreign language teachers have a rate 87% higher (see Figure 20).

**Figure 20**  
**Predicted Turnover Rate by Subject Area**



Note: Brackets represent 95% confidence interval of the estimate.

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12 and Teacher Follow-up Survey, 2012-13.

## Workplace Conditions

Our fourth model added workplace conditions to the equation, including compensation and a variety of school working conditions, some of which prove significant in predicting teacher turnover.

### Compensation

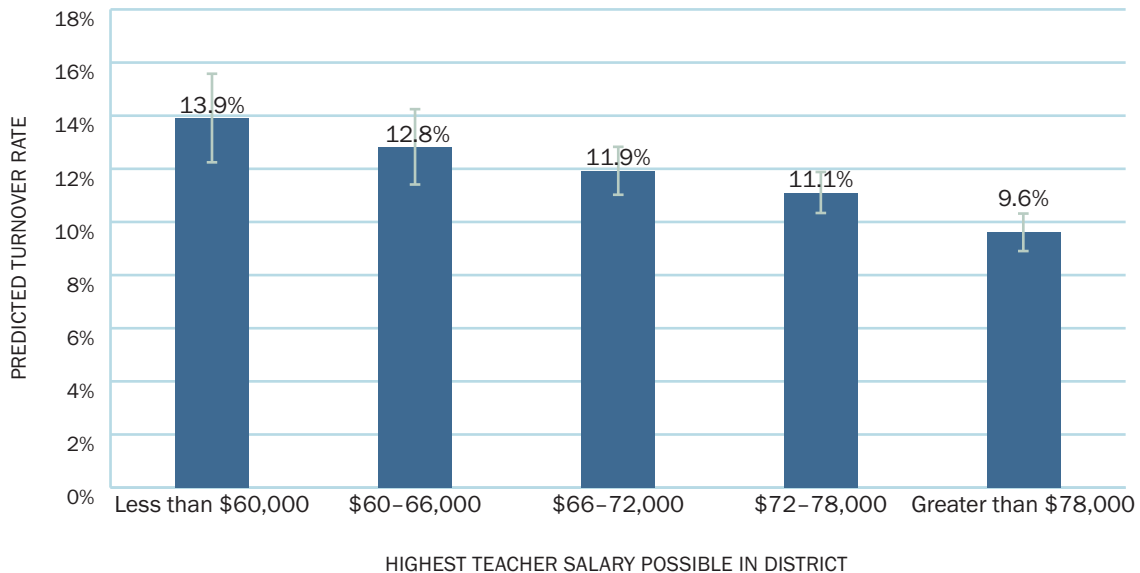
Previous research indicates that teachers are more likely to continue teaching and stay at their schools when their wages increase and are comparable with job opportunities in other industries or in nearby school districts.<sup>50</sup> In addition to wage comparability, data from the National Center for Education Statistics 5-year longitudinal study show that teachers whose first-year salary was less

than \$40,000 had an attrition rate 10 percentage points higher than teachers who earned more in their first year.<sup>51</sup>

This analysis controlled for beginning salaries in each district, adjusted by the Comparable Wage Index (CWI), a measure of noneducator wage comparability across labor markets (see Technical Appendix, page 35). Secondly, it included the highest possible district salaries, adjusted by the CWI. The purpose of including both of these measures is to account for the range of salaries teachers can expect over the course of their careers. In some cases, districts have higher beginning salaries to attract teachers but relatively low salary increases over time. Other districts have may have low beginning salaries, but teachers can earn higher wages as they become more experienced.

We found that the level of beginning teacher salaries was not predictive of teacher turnover after controlling for district type, class size, and other school factors; however, the highest possible district salary was related to teacher turnover (see Figure 21). That is, teachers who could one day expect to earn more than \$78,000 at the highest end of their district salary schedules—the top quintile of teachers— had a predicted turnover rate 31% lower than those with maximum district salaries less than \$60,000—the bottom quintile of teachers. Teachers in districts that offered salaries up to \$72,000 to \$78,000 were 20% less likely to turn over than those in the bottom quintile.

**Figure 21**  
**Predicted Turnover Rate by Highest District Salary**



Note: Brackets represent 95% confidence interval of the estimate.

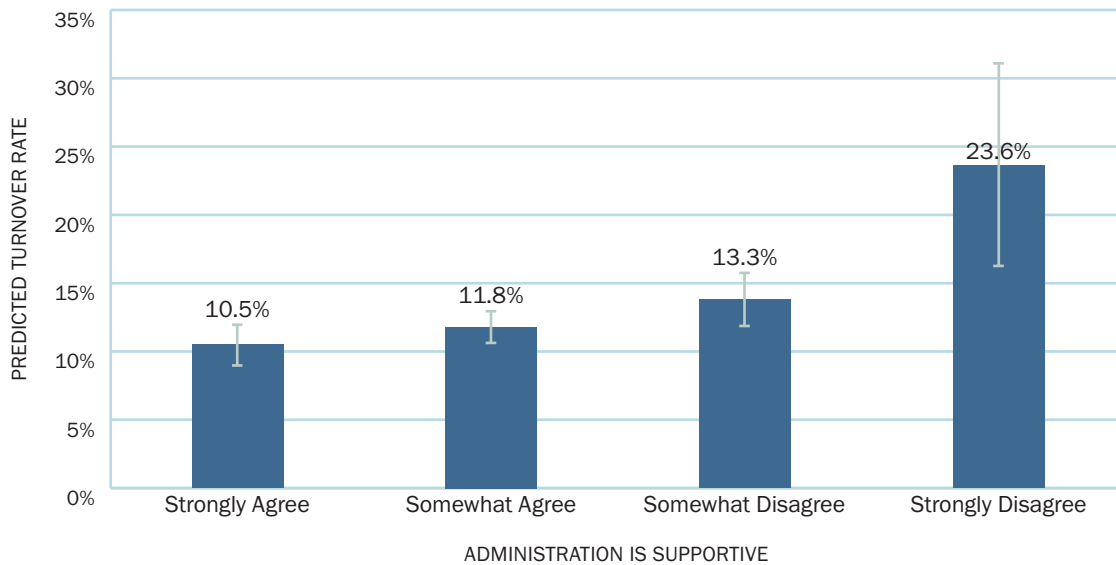
Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12 and Teacher Follow-up Survey, 2012-13.

### Teaching conditions

Researchers have identified several workplace conditions associated with teacher turnover, including experiences with professional development, facilities, teaching resources, parental involvement, instructional leadership, time for collaboration and planning, school culture, collegial relationships, and decision-making power.<sup>52</sup> A review of the literature concerning teacher turnover and working conditions found that school leadership, collegial relationships, and school culture are of particular importance to teacher retention.<sup>53</sup>

Our analysis reinforces some of these findings. With controls for student and teacher characteristics, we found that the workplace condition most predictive of teacher turnover was a perceived lack of administrative support, a construct that measures how teachers rate an administrator’s ability to encourage and acknowledge staff, communicate a clear vision, and generally run a school well. When teachers strongly disagree that their administration is supportive, they are more than twice as likely to move schools or leave teaching than when they strongly agree that their administration is supportive (see Figure 22). This finding is consistent with other studies that similarly have found that more effective principals were associated with higher rates of teacher satisfaction and lower teacher turnover, especially in high-needs schools.<sup>54</sup>

**Figure 22**  
**Predicted Turnover Rate by Teacher Reports of Administrative Support**



Note: Brackets represent 95% confidence interval of the estimate.

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011–12 and Teacher Follow-up Survey, 2012–13.

Holding all else constant, including administrative support, we did not find independent, significant effects on turnover of other workplace conditions, including student behavior, parent support, school resources, duties and paperwork that interfere with teaching, collegial support, concerns about job security due to accountability measures, classroom control, or teacher influence over school decisions. It is possible that the strong impact of administrative support on turnover in our model subsumes many of these variables, since school leaders have an effect on most aspects of school operations, including virtually all of these factors.

## Summary of the Findings

At 8% annually, teacher attrition in the United States is high relative to that of other high-achieving countries, where teachers often leave the profession at half that rate or less. More than two-thirds of this attrition is due to reasons other than retirement. For most teachers, the decision to leave is associated with dissatisfactions with teaching. Among the most prominent reasons for dissatisfaction in recent years have been pressures associated with test-based accountability, unhappiness with administrative support, and dissatisfaction with teaching as a career. Teachers also report that they leave for both financial and personal reasons.

Among the most prominent reasons for dissatisfaction in recent years have been pressures associated with test-based accountability, unhappiness with administrative support, and dissatisfaction with teaching as a career.

In addition to those who leave the profession each year, another 8% of teachers move between schools, creating costs and disruptions in the schools they leave behind. High rates of attrition have significant financial costs, which can exceed \$20,000 per teacher for replacing one who leaves in an urban school district. Attrition also carries costs for student learning, as high turnover rates reduce achievement for students whose classrooms are directly affected and for other students in the school.

Overall turnover rates are highest in the South, while they are lowest in the higher-paying northeastern states, which also feature smaller class sizes and greater investments in education.

Teachers of mathematics, science, special education, English language development, and foreign languages are more likely to leave their school or the profession than those in other subjects. These are teaching fields that experience shortages in most states across the country.

Data show that teachers are more likely to leave schools where there are more students of color and more low-income students, where salaries are lower, and where working conditions are poorer. These are frequently conditions that coexist. In schools with a majority of low-income students and students of color, turnover rates can be double the rates in schools with more White students and fewer low-income students. These schools wind up with teachers who have fewer years of experience and, often, significantly less training to teach.

These factors are associated with the high turnover rates of teachers of color, who disproportionately teach in high-minority, low-income schools and who are also significantly more likely to enter teaching without having completed their training. Mathematics and science teachers are also more likely to enter teaching through alternative pathways that typically provide less training.

Teachers who enter the profession through alternative certification pathways are much more likely to leave their schools and the profession, especially when they teach in schools with high proportions of students of color. These teachers—who constituted 25% of entering teachers in 2012 and a higher share in the neediest schools—have had less coursework and student teaching, on average, than teachers who are prepared through traditional programs. This predicts high rates of



leaving, even after controlling for other student and teacher characteristics and working conditions. Ironically, while policymakers often seek to address shortages of mathematics and science teachers, as well as teachers of color, the use of shortcut training programs exacerbates the turnover that keeps shortages prevalent.

Other factors that are highly predictive of teacher turnover in statistically controlled models are lack of administrative support, maximum district salaries, school size, and the proportion of students of color. Teachers in districts with the highest salary scales, who are better prepared, and who feel the most supported by their school leaders, are least likely to leave their school or teaching altogether.

## Policy Considerations

Retaining teachers requires a comprehensive approach that ensures teachers are well prepared for the challenges of teaching, compensates them adequately for their labor, and provides the teaching and learning environments that support their growth and help them to be effective. With high turnover rates across the board, policymakers should pursue strategies that can advance these goals in all schools, but especially in those where turnover rates are most extreme—schools serving students of color and students in poverty. We highlight policy considerations below that address the findings of this report. For a more comprehensive review of recruitment and retention strategies, see our companion report: *Solving the teacher shortage: How to attract and retain excellent educators*.<sup>55</sup>

### Compensation

As in countries with well-developed teaching systems, states and districts should work to provide **compensation packages** that are competitive with those of other occupations requiring similar levels of education and that are equitable across districts, so all schools can compete in the labor market for well-prepared teachers.

Currently, salaries vary widely across and within states, and these differences are associated with both attrition rates and shortage levels.<sup>56</sup>

Reflecting on her choice to move from an Oklahoma school to one across the border in Arkansas, Alishia Morris recalled, “It wasn’t the school’s fault. If it was, it wouldn’t have been so difficult for me to leave. It’s just that Arkansas has more resources—they just make teaching easier.” Morris received a salary increase of

about 25%, the support of reading and mathematics facilitators for her students, a \$500 materials allowance, and opportunities for professional development from a mentor teacher.<sup>57</sup>

Salaries vary widely across and within states, and these differences are associated with both attrition rates and shortage levels.

Overall, however, teacher salaries have declined since the 1990s. One recent report found that in 30 states, teacher wages are so low that a teacher with 10 years of experience heading a family of four would qualify for several forms of government assistance.<sup>58</sup> While beginning teacher salaries may be more important for recruiting than retaining teachers, the prospect of a reasonable salary at the highest end of the district salary schedule does influence teacher retention decisions.

Federal and state governments can also provide other forms of compensation that reduce the debt burden of teaching, which is currently severe for most college students.<sup>59</sup> **Service scholarship and loan forgiveness programs** that pay the cost of teacher preparation in exchange for a commitment to teach in a subject or location of need for 3–5 years can help retain teachers in two ways: (1) they provide the financial incentive for teachers to continue teaching, and (2) they draw prospective teachers into the workforce through high-quality preparation programs associated with greater teacher retention.

Loan forgiveness and service scholarships can be particularly useful when targeted to the subjects and schools where teachers are least likely to be well prepared and where turnover is greatest: mathematics, science, special education, and in schools serving students of color and students in poverty.

The federal government has long provided such supports to medical personnel in shortage fields and for shortage locations, and once provided robust scholarships to teachers as well, though these have dwindled in recent years. Research shows that college students' potential debt burdens have an influence on their decisions about what profession to enter, and that these kinds of incentives are effective in recruiting and retaining individuals in teaching and other professions.<sup>60</sup>

## Teacher Preparation and Support

In addition to service scholarships and loan forgiveness programs that allow teachers to complete a strong preservice teacher preparation program without incurring substantial student debt, other high-retention pathways into teaching can provide new teachers with the skills they need to be successful in and available to the high-need communities where they are most needed.

High-retention pathways into teaching can provide new teachers with the skills they need to be successful in and available to the high-need communities where they are most needed.

In **teacher residency** programs, based on the medical residency model, residents train in high-needs schools for an entire school year under the guidance and supervision of a master teacher, while earning a credential and a master's degree from a partnering university. Most programs offer tuition assistance and a stipend for living expenses, plus two years of mentoring after the training year.

In exchange, residents commit to teaching in the district for 3 to 5 years after their residency year. This has the triple benefit of filtering out candidates not willing to make a serious commitment to teach, ensuring that they are well prepared for the particular context in which they will teach, and continue to teach in high-needs schools as their effectiveness increases.<sup>61</sup> Teacher residencies have been successful at recruiting teachers of color and mathematics and science teachers to high-need urban and rural districts, and yield above-average teacher retention rates even after 5 years.<sup>62</sup>

**Grow your own** teacher preparation models create a pool of potential teachers by recruiting high school students, paraprofessionals, after-school program staff, or other local community members into teaching. These models capitalize on the fact that teachers are more likely to stay and continue teaching in their own communities. Grow your own models often provide incentives to participants to pursue teacher training through the kind of high-quality preparation programs associated with improved teacher retention. For instance, California's Paraprofessional Teacher Training Program, funded from 1995 to 2011 and renewed in 2016, successfully recruited, supported, and funded community college, bachelor's degrees, and teacher preparation expenses for more than 2,200 racially and linguistically diverse paraprofessionals to become fully certified teachers by 2014. By the 13th year of the program's operation, program sponsors reported that 92% of graduates continued to be California public school teachers.<sup>63</sup>

Districts should provide **high-quality mentoring and induction** to beginning teachers, and in particular, should consider how these supports can meet the needs of a diverse workforce. Induction programs that include being assigned a mentor, meeting frequently, and focusing on high-leverage activities—observation and feedback; analyzing student strengths and needs; discussing instructional issues; and developing a professional growth plan—have been found to result in improved teacher retention.<sup>64</sup>

## School Leadership

Effective leadership is at the heart of every school and drives high-quality support for new teachers and improved teaching conditions. To develop strong school leaders, state policymakers, in partnership with local education agencies, school leadership training programs, and other key stakeholders, can develop rigorous **training program accreditation and principal licensure standards** aligned with research on effective school leadership, as well as systems for regular program review by qualified experts.

As provided in Title II of the Every Student Succeeds Act, federal and state governments can fund **residencies for principal training and state leadership academies** that coordinate mentoring and professional learning to develop school leadership capacity to build and nurture school settings that encourage teacher retention. These approaches have been found effective in developing leaders who both support effective teaching and enable stronger student learning.<sup>65</sup>

To develop strong school leaders, state policymakers, in partnership with local education agencies, school leadership training programs, and other key stakeholders, can develop rigorous training program accreditation and principal licensure standards.

Districts can also consider strategies for ensuring principals enter leadership positions with the skills needed to nurture positive school environments, such as partnering with local administrative credential programs to determine and support competencies participants need to develop; nominating and subsidizing teachers who show instructional leadership skills to pursue administrative credentials; nominating and training mentor principals to provide high-quality clinical training experiences; creating principal pipeline programs that focus on the skills administrators need to be effective as both assistant principals and principals; and assigning highly qualified and experienced administrators to the schools in need of the greatest support.

## Conclusion

Among in-school factors, teachers have the greatest direct impact on student learning. Effectively retaining teachers is crucial to making sure there are enough well-prepared and committed teachers to staff all of our nation's schools and that the teachers in our classrooms have the time and experience to effectively serve all students. Tailored policy interventions can play a role in addressing the key factors that drive teachers from their schools, stabilizing and ultimately improving the teacher workforce so that it can serve all students well.

# Technical Appendix

## Data

This paper draws primarily from the U.S. Department of Education, National Center for Education Statistics Schools and Staffing Survey (2011–12) and Teacher Follow-up Survey (2012–13).

The Schools and Staffing Survey (SASS) is a set of questionnaires administered to a nationally representative sample of teachers across the country in 1987–88, 1990–91, 1993–94, 1999–2000, 2003–04, 2007–08, and 2011–12. District and school personnel also complete questionnaires to provide contextual information on the schools and districts where teachers teach.

The Teacher Follow-up Survey (TFS) has three components: (1) the Teacher Status Form, (2) a questionnaire for former teachers, and (3) a questionnaire for current teachers. The year the SASS is administered is referred to as the “base year.” The following year, or the “current year,” the Teacher Status Form is sent to all schools that had at least one teacher complete the SASS in the base year. The principal, or other knowledgeable staff member, indicates the current year occupational status of any of those teachers.<sup>66</sup> This form yields data for most SASS completers with a response rate of 79.6%. The former and current teacher questionnaires, in contrast, are administered to a subset of SASS respondents. The TFS in 2012–13 includes all SASS respondents who indicated they were first-year teachers, then a sample of SASS respondents stratified, in order, by school sector (i.e., public or private), teacher status (stayer, who continues teaching at the same school, leaver, mover, or unknown), experience, grade level, and race/ethnicity. Finally, the TFS dataset is completed with imputed data and sampling weights.<sup>a</sup>

In addition, this study draws in small part from previous years of the SASS and TFS and from the Beginning Teacher Longitudinal Survey (BTLs), which followed a cohort of beginning teachers from 2007–08 to 2011–12. The BTLs began with a subset of teachers surveyed for the 2007–08 SASS and 2008–09 TFS. The BTLs includes data on teacher preparation, induction, and mentoring experiences.

All estimations of means, differences in means, and regression modeling account for the survey structure of the data and use balanced, repeated replication to compute standard errors. This report also includes overall turnover data from SASS and TFS surveys from 1988 to 2009. Movers and leavers are combined into non-stayers in order to capture all movement of full-time teachers out of public schools. While macro-level supply may not change when teachers move schools, if teachers move out of schools with particular characteristics, it will result in a disproportionate impact on certain students. It is important to model the overall nature of teacher mobility and its effect on schools and students to better inform policymaking.

## Methodology

Section I of this study reports descriptive statistics and differences of means test results to identify differences in turnover rates across teacher and school characteristics. Then we use a

---

a. *The NCES Handbook of Survey Methods* includes a thorough discussion of the survey methods used to produce the SASS and TFS data.

logistic regression model to examine the relationship between teacher turnover and a series of school characteristics, teacher characteristics, and workplace conditions. The outcome of interest is the probability that a teacher will leave his or her school to move to another school or will leave the profession.

Consistent with prior literature, we control for teacher gender and age. Age has a U-shaped relationship with turnover, and so we control for teachers younger than 30 and older than 50.<sup>67</sup> School size is a measure of the number of students enrolled in a school during the base year and is measured as a categorical variable (bins of 49 from 1 to 199, bins of 149 to 499, bins of 249 to 999, then 1,000–1,199, 1,200–1,499, 1,500–1,999, and 2,000 or more students). Secondary school is an indicator variable that is 1 when the base year school is either a secondary school or includes middle or high school grades (i.e., 6–8, 8–12, 6–12, k–8 or k–12). The variable is 0 when the school is just an elementary school. Bivariate analyses of urbanicity detected a significant relationship between teaching in a city and higher turnover. City and rural teachers are included as control variables while teachers in suburbs and towns are omitted.<sup>b</sup>

We divide all teachers into quartiles by the percentage of students eligible for the National School Lunch Program (NSLP) at their school. The bottom quartile of teachers teach at schools with the fewest eligible students, and the top quartile teach at schools with the most eligible students. We also include an interaction term that controls for NSLP quartile and teaching at a school located in a city. Teachers in schools with the most NSLP-eligible students, located in cities, have higher turnover rates than either teachers in the top quartile of NSLP-eligible schools or teachers in cities.

We also create a variable representing the percentage of students of color in a school, such that the bottom quartile of teachers teach in schools with the fewest students of color (less than 10%), and the top quartile of teachers teach in schools with the most students of color (greater than 55%). Students of color are non-White students in a school and include Asian American, Pacific Islander, Black, Latino, Native American, and multiracial students. Of course, these groups are heterogeneous both internally and across racial categories. However, we expect to find some similar trends among students of color. The students of color category yields a conservative estimate of some of those trends, which are more extreme when looking at outcomes concerning Black and Latino students alone.

The teachers of color variable is a self-reported indicator signifying a teacher identifies as non-White, including Asian American, Pacific Islander, Black, Latino, and Native American, or any combination, including one or more of those identifications. Non-Hispanic White teachers are represented as 0.

Alternative pathway is an indicator variable signifying a teacher reports s/he entered teaching through an alternative certification program and 0 if s/he indicates entering through a regular pathway. It should be noted that *regular pathway* and *regular certification* are not interchangeable terms. A teacher who enters teaching through an alternative pathway may eventually complete all the requirements to earn a regular certification but would still be an alternative pathway teacher.

For elementary school teachers and other self-contained classroom teachers, average class size is the mean of the class size that those teachers report in the base year. For secondary school teachers,

---

b. For more information, please refer to Documentation to the NCES Common Core of Data Public Elementary/Secondary School Universe Survey: School Year 2009–10 (NCES 2008–332).

average class size is the mean of the number of students they have in each class or section they teach in the base year. Push-in and pull-out teachers are excluded from this portion of the analysis, since they do not manage a full class in the same way that classroom teachers do. Self-contained special education classes are included in class size; however, we also control for a teacher's main assignment being special education. We divide average class size into quartiles from 12 to greater than 50 students.

We include a set of binary variables for main teaching subject according to teachers' self-reported main teaching subject. Humanities combines English and Social Studies. Mathematics and Science combines all mathematics and natural science subjects.

We create working condition constructs from survey responses, using Cronbach's alpha to combine multiple responses on the same topic. All Cronbach alphas are equal to at least 0.7. Variables include the following:

- *Administrative support* is a construct that measures teacher attitudes on four questions about their administrator and is on a scale from 1 to 4, where 1 is the most favorable attitude toward their administrator and 4 is the least favorable attitude.
- *Student behavior problems* is a construct created from seven survey responses about whether student behaviors are a problem (i.e., tardiness, misbehavior).
- *Parent support* is a measure of whether teachers agree that they have the support they need from parents. A 1 means they strongly agree that they have parent support and 4 means that they strongly disagree.
- *Resources* is a measure of whether teachers agree that resources are available to them in their school, where 1 means they strongly agree that they have resources available and 4 means they strongly disagree.
- *Interference* is a measure of whether teachers believe that paperwork and other duties interfere with their teaching time. A 1 means they strongly disagree that paperwork and duties interfere with their teaching time and 4 means they strongly agree.
- *Collegiality* is a construct that combines three survey questions that measure the degree to which staff collaborate and hold similar values and is scaled from 1 to 4. A 1 represents the most positive attitude of colleagues and 4 represents the least positive attitudes about colleagues.
- *Job security* is a measure of how worried teachers are about their job security due to assessment and accountability measures. A 1 indicates that a teacher strongly disagrees that s/he is worried and 4 indicates that a teacher strongly agrees that s/he is worried about job security.
- *Classroom control* and *school influence* are constructs created from six and seven survey questions, respectively, and measure the degree of either control or influence a teacher feels s/he has. A 1 represents having the most control or influence and 4 represents having none at all.

We also control for the lowest starting salary in the district and the highest possible salary in the district, based on district reports of average beginning salaries and the highest salaries offered. These data are reported by districts through the district SASS questionnaire and merged to teacher data files. We use the Comparable Wage Index, a measure of non-teaching professional



salaries, controlling for age, education, and hours worked, to account for geographical variation in wages. The CWI can be used to adjust teacher salaries that may differ due to prevailing local wages—an indicator of cost of living. Each school district is linked to a labor market based on the Common Core of Data. For more details, see NCES documentation.<sup>68</sup> Finally, beginning and highest teacher salaries are divided into quintiles.

Our results are similar whether we include each working condition as a separate variable in our model or create a construct where working conditions vary from worst working conditions overall to best working conditions overall. For a complete list of variables and their means overall and across teacher subgroups, see Table A-1 below.

For simplicity sake, the models shown below do not list separately each variable included in the model; however, all variables included can be found in Table A-1 (see page 40). We first estimate a basic model that includes school characteristics, Model 1. Model 2 includes school and teacher characteristics. Model 3 adds in main teaching subject, and Model 4, the preferred model, includes school characteristics, teacher characteristics, main teaching subject, and working conditions.

Model 1:

$$\log p(\text{attrite}) / (1-p(\text{attrite})) = \beta_0 + S\beta_1,$$

where  $S$  is all school characteristics

Model 2:

$$\log p(\text{attrite}) / 1-p(\text{attrite}) = \beta_0 + S\beta_1 + T\beta_2,$$

where  $S$  is all school characteristics and  $T$  is all teacher characteristics

Model 3:

$$\log p(\text{attrite}) / (1-p(\text{attrite})) = \beta_0 + S\beta_1 + T\beta_2 + M\beta_3,$$

where  $S$  is all school characteristics,  $T$  is all teacher characteristics, and  $M$  is main teaching subject

Model 4:

$$\log p(\text{attrite}) / (1-p(\text{attrite})) = \beta_0 + S\beta_1 + T\beta_2 + M\beta_3 + W\beta_4,$$

where  $S$  is all school characteristics,  $T$  is all teacher characteristics,  $M$  is main teaching subject, and  $W$  is all working conditions

Using the Pearson chi-square goodness of fit test, the preferred model has a p-value of .9030, indicating that the model does indeed fit our observations.

Table A-2 (see pp. 41-42) displays the odds ratios estimated for each model. Odds ratios are used to compare the relative odds of the occurrence of the outcome of interest (in this case, leaving teaching at a given school), given certain other factors (e.g., school level, working conditions, salaries, etc.). The odds ratio can also be used to determine whether a particular factor is a risk factor for a particular outcome and to compare the magnitude of various risk factors for that outcome. Coefficients can be interpreted as follows:

- When the odds ratio is equal to 1, the factor is not associated with the odds of the outcome
- When the odds ratio is greater than 1, the factor is associated with higher odds of the outcome
- When the odds ratio is less than 1, the factor is associated with lower odds of the outcome



After estimating the preferred logistic regression model, we predict the probability of teacher turnover (moving or leaving) given a variety of conditions. Reporting predicted probabilities allows for a more intuitive interpretation of the regression outcomes. In this report, predicted probabilities hold all other variables constant at their means. For example, when predicting turnover given administrative support, only administrative support varies from 1 to 4, which is reported along the horizontal axis. Meanwhile, all other variables (teacher characteristics, student characteristics, and working conditions) are held at their mean value.

**Table A-1: Independent Variable Means for Teachers Overall; Teachers of Color; Teachers from Alternative Pathways & Science and Special Education; and Teachers from Alternative Pathways**

	Overall		Mathematics & Science		Special Education		Teachers of Color		Alternative Pathway	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
School size	7.50	2.17	8.23	2.84	7.36	2.22	7.82	1.84	7.95	2.26
Secondary school	0.37	0.48	0.62	0.58	0.36	0.49	0.34	0.40	0.48	0.49
Quartile % NSLP eligible	1.67	1.15	1.55	1.37	1.74	1.15	2.26	0.86	1.95	1.08
Quartile % students of color	1.82	1.11	1.77	1.33	1.84	1.12	2.68	0.56	2.20	0.99
Quartile class size	1.62	1.15	1.58	1.18	1.80	1.78	1.57	0.94	1.55	1.12
Rural	0.29	0.45	0.30	0.55	0.27	0.45	0.18	0.32	0.26	0.43
City	0.27	0.44	0.25	0.52	0.28	0.46	0.45	0.42	0.35	0.46
Female	0.76	0.43	0.64	0.57	0.86	0.35	0.74	0.37	0.69	0.45
Older than 50	0.28	0.45	0.24	0.51	0.30	0.47	0.26	0.37	0.23	0.41
Younger than 30	0.15	0.36	0.17	0.45	0.16	0.37	0.13	0.28	0.14	0.34
Teacher of color	0.18	0.38	0.17	0.45	0.18	0.39	1.00	0.00	0.31	0.45
Alternative pathway teacher	0.15	0.35	0.21	0.49	0.17	0.38	0.25	0.36	1.00	0.00
Total years of experience	13.76	9.35	12.97	10.89	12.90	9.55	12.17	7.24	9.05	6.19
Main assignment: Mathematics and science	0.16	0.37	1.00	0.00	(omitted)	(omitted)	0.15	0.30	0.23	0.41
Main assignment: Humanities	0.17	0.38	(omitted)		(omitted)	(omitted)	0.16	0.31	0.18	0.37
Main assignment: Special education	0.12	0.33	(omitted)		1.00	0.00	0.12	0.27	0.15	0.34
Main assignment: English language development	0.02	0.13	(omitted)		(omitted)	(omitted)	0.04	0.17	0.02	0.13
Main assignment: Arts	0.05	0.22	(omitted)		(omitted)	(omitted)	0.03	0.13	0.04	0.19
Main assignment: Foreign languages	0.03	0.16	(omitted)		(omitted)	(omitted)	0.06	0.19	0.04	0.19
Main assignment: Physical education	0.05	0.22	(omitted)		(omitted)	(omitted)	0.05	0.19	0.04	0.18
Main assignment: Career technical education	0.04	0.21	(omitted)		(omitted)	(omitted)	0.03	0.15	0.08	0.26
Main assignment: Miscellaneous	0.00	0.06	(omitted)		(omitted)	(omitted)	0.01	0.08	0.01	0.08
Administrative support	1.82	0.79	1.90	0.94	1.78	0.78	1.84	0.70	1.87	0.81
Student behavior	2.10	0.74	2.36	0.89	2.05	0.75	2.16	0.64	2.24	0.74
Parent support	2.44	0.91	2.60	1.05	2.41	0.92	2.51	0.80	2.57	0.91
Resources	1.86	0.87	1.84	1.04	1.93	0.90	1.96	0.78	1.96	0.90
Interferences	2.89	0.92	2.86	1.06	3.08	0.90	2.90	0.79	2.88	0.89
Collegiality	1.91	0.72	2.04	0.85	1.91	0.70	1.97	0.65	2.02	0.74
Job security	2.31	1.00	2.35	1.19	2.35	1.01	2.40	0.86	2.37	0.99
Control	1.67	0.64	1.68	0.71	1.64	0.65	1.72	0.55	1.73	0.65
Influence	2.88	0.70	2.91	0.80	2.85	0.69	2.87	0.65	2.97	0.69
District beginning salary	2.07	1.39	2.06	1.67	2.09	1.40	2.24	1.10	2.16	1.36
District highest salary	2.06	1.43	2.05	1.74	2.15	1.45	1.94	1.17	1.74	1.39

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12.

**Table A-2**  
**Logistic Regression Odds Ratios: Probability of Teachers Moving or Leaving**

Independent Variables	Model 1	Model 2	Model 3	Model 4
School size	0.926*** (0.0179)	0.925*** (0.0176)	0.920*** (0.0177)	0.916*** (0.0164)
Secondary school	1.074 (0.0906)	1.033 (0.0925)	0.913 (0.0846)	0.89 (0.0956)
2nd quartile % eligible for NSLP	1.098 (0.141)	1.106 (0.143)	1.1 (0.142)	1.062 (0.133)
3rd quartile % eligible for NSLP	1.098 (0.124)	1.092 (0.126)	1.085 (0.124)	0.993 (0.117)
Top quartile % eligible for NSLP	1.235 (0.14)	1.208 (0.141)	1.206 (0.139)	1.092 (0.13)
2nd quartile % students of color enrolled	1.144 (0.122)	1.134 (0.124)	1.135 (0.123)	1.137 (0.12)
3rd quartile % students of color enrolled	1.549** (0.195)	1.506** (0.19)	1.519** (0.191)	1.477** (0.189)
Top quartile % students of color enrolled color	1.722*** (0.219)	1.632*** (0.211)	1.659*** (0.212)	1.524** (0.202)
Average class size	1.042 (0.039)	1.054 (0.0402)	1.033 (0.0377)	1.036 (0.0372)
Rural	1.029 (0.0908)	1.028 (0.0909)	1.031 (0.0906)	0.976 (0.0843)
City	1.105 (0.129)	1.086 (0.127)	1.098 (0.128)	1.074 (0.121)
Female		0.977 (0.0945)	1.005 (0.107)	0.978 (0.101)
Older than 50		1.435** (0.151)	1.419** (0.147)	1.397** (0.153)
Younger than 30		2.162*** (0.239)	2.172*** (0.243)	2.229*** (0.242)
Teacher of color		1.079 (0.13)	1.054 (0.13)	1.076 (0.135)
Alternative pathway		1.365** (0.142)	1.324** (0.137)	1.251** (0.126)
Total years of experience		0.999 (0.00598)	1 (0.00593)	1 (0.00619)
Main assignment: Mathematics and science			1.391** (0.156)	1.367** (0.159)
Main assignment: Humanities			1.228 (0.141)	1.211 (0.142)
Main assignment: Special education			1.380** (0.198)	1.454** (0.205)
Main assignment: English language development			1.283 (0.648)	1.376 (0.703)
Main assignment: Arts			1.192 (0.178)	1.257 (0.201)
Main assignment: Foreign languages			1.814** (0.357)	1.910** (0.397)
Main assignment: Physical education			1.329 (0.307)	1.412 (0.33)
Main assignment: Career technical education			1.417 (0.28)	1.439 (0.295)

**Table A-2 Logistic Regression Odds Ratios: Probability of Teachers Moving or Leaving (continued)**

Independent Variables	Model 1	Model 2	Model 3	Model 4
Main assignment: miscellaneous			1.326 (0.807)	1.28 (0.847)
Administrative support: somewhat agree				1.14 (0.108)
Administrative support: somewhat disagree				1.304** (0.161)
Administrative support: strongly disagree				2.629*** (0.606)
Student behavior problems				1.047 (0.0685)
Lack of parent support				1.031 (0.0578)
Lack of resources				1.005 (0.0457)
Teaching interferences				1.013 (0.0489)
Lack of collegiality				1.039 (0.072)
Lack of job security				0.941 (0.0403)
Lack of classroom control				1.146 (0.0807)
Lack of school influence				1.115 (0.073)
Beginning salary (\$32,000–34,000)				0.927 (0.11)
Beginning salary (\$34,000–36,000)				0.946 (0.121)
Beginning salary (\$36,000–41,000)				1.03 (0.114)
Beginning salary (Greater than \$41,000)				1.028 (0.144)
Highest salary (\$60,000–66,000)				0.913 (0.106)
Highest salary (\$60,000–72,000)				0.84 (0.0962)
Highest salary (\$72,000–78,000)				0.777** (0.0947)
Highest salary (Greater than \$78,000)				0.658** (0.0891)
Constant	0.143*** (0.0259)	0.113*** (0.0252)	0.102*** (0.0239)	0.0630*** (0.0187)
Observations	26,916	26,916	26,916	26,916
Population size	2,473,469	2,473,469	2,473,469	2,473,469
McKelvey & Zavoina's R <sup>2</sup>	0.71	0.834	0.846	0.894

Standard error in parentheses

\*\*\* p<0.001, \*\*p<0.01, \* p<0.05

Source: Learning Policy Institute analysis of National Center for Education Statistics Schools and Staffing Survey, 2011-12, and Teacher Follow-up.

## Endnotes

1. For a thorough analysis of teacher supply and demand conditions, see: Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
2. Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
3. Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
4. Kini, T., & Podolsky, A. (2016). *Does teaching experience increase teacher effectiveness? A review of the research.* Palo Alto: Learning Policy Institute.
5. Ronfeldt, M., Loeb, S., & Wyckoff, J. 2013. "How Teacher Turnover Harms Student Achievement." *American Educational Research Journal* 50 (1): 4–36. doi:10.3102/0002831212463813.
6. Barnes, G., Crowe, E., & Schaefer, B. (2007). *The cost of teacher turnover in five school districts: A pilot study.* Washington, DC: National Commission on Teaching and America's Future. (Cost adjusted for inflation using the Bureau for Labor Statistics Consumer Price Index Inflation Calculator.)
7. Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
8. Goldring, R., Taie, S., & Riddles, M. (2014). *Teacher Attrition and Mobility: Results from the 2012–13 Teacher Follow-up Survey.* National Center for Education Statistics, 1–40.
9. Darling-Hammond, L., Burns, D., Campbell, C., Goodwin, A. L., Hammerness, K., Low, E. L., McIntyre, A., Sato, M., & Zeichner, K. (2017). *Empowered Educators: How Leading Nations Design Systems for Teaching Quality.* San Francisco, CA: Jossey-Bass.
10. Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
11. NEA Collective Bargaining/Member Advocacy's Teacher Salary Database, based on affiliate reporting as of December 2013, see <http://www.nea.org/home/2012-2013-average-starting-teacher-salary.html>; Baker, B., Farrie, D., & Sciarra, D. G. (2016). *Mind the Gap: 20 years of progress and retrenchment in school funding and achievement gaps*, Table 5. Educational Testing Service: Princeton, NJ, pp. 15.
12. Scholastic and the Bill and Melinda Gates Foundation. (2012). *Primary sources: America's teachers on the teaching profession.* New York. Retrieved from [http://mediaroom.scholastic.com/files/ps\\_fullreport.pdf](http://mediaroom.scholastic.com/files/ps_fullreport.pdf).
13. Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
14. Estimates for teachers whose main assignment is teaching English to English language learners are unfortunately imprecise due to small sample size. They comprise less than 2% of all teachers in our sample. Therefore, high ELD teacher turnover rates should be interpreted with caution. It is also difficult to separate English language instruction from school characteristics, like Title I status or the proportion of students of color. Only 16% of ELD teachers teach in non-Title I schools. Similarly, only 3% of ELD teachers teach in schools with the fewest students of color, while about 64% teach in schools with the most students of color. With a student population that is over 9% English language learners, and growing, greater information and data on ELD teachers is becoming more and more important.
15. Goldin, C., & Katz, L. F. (2007). *The race between education and technology: The evolution of U.S. education wage differentials, 1890 to 2005.* Cambridge, MA: National Bureau of Economic Research.
16. OECD. (2016). *PISA 2015 Results (Volume I): Excellence and Equity in Education.* Paris: PISA, OECD Publishing.
17. OECD. (2013). *Lessons from PISA 2012 for the United States, Strong Performers and Successful Reformers in Education.* OECD Publishing.
18. National Commission on Mathematics and Science Teaching for the 21st Century. (2000). *Before It's Too Late.* Washington, DC: U.S. Department of Education.

19. Ingersoll, R. M., & Perda, D. (2010). Is the Supply of Mathematics and Science Teachers Sufficient? *American Educational Research Journal*, 47(3), 563–594.
20. Goe, L. (2007). *The link between teacher quality and student outcomes: A research synthesis*. Washington, DC: National Comprehensive Center for Teacher Quality; Sadler, P. M., Sonnert, G., Coyle, H. P., Cook-Smith, N., & Miller, J. L. (2013). The influence of teachers' knowledge on student learning in middle school physical science classrooms. *American Educational Research Journal*, 50(5), 1020–1049.
21. Kershaw, J. A., & McKean R. N. (1962). Teacher shortages and salary schedules. Santa Monica, CA: RAND Corporation; Murnane, R. J., & Olsen, R. J. (1990). The effects of salaries and opportunity costs on length of stay in teaching: Evidence from North Carolina. *The Journal of Human Resources*, 25(1), 106–124.
22. Ingersoll, R., Merrill, L., & May, H. (2012). Retaining teachers: How preparation matters. *Educational Leadership*, 30–34.
23. U.S. Department of Education, National Center for Education Statistics. (2014). Table 204.30: Children 3 to 21 years old served under Individuals with Disabilities Education Act (IDEA), Part B, by type of disability: Selected years, 1976–77 through 2012–13. In U.S. Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2014 ed.). Retrieved from [https://nces.ed.gov/programs/digest/d14/tables/dt14\\_204.30.asp](https://nces.ed.gov/programs/digest/d14/tables/dt14_204.30.asp).
24. U.S. Department of Education, National Center for Education Statistics. (2014). Table 204.30: Children 3 to 21 years old served under Individuals with Disabilities Education Act (IDEA), Part B, by type of disability: Selected years, 1976–77 through 2012–13. In U.S. Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2014 ed.). Retrieved from [https://nces.ed.gov/programs/digest/d14/tables/dt14\\_204.30.asp](https://nces.ed.gov/programs/digest/d14/tables/dt14_204.30.asp).
25. Mcleskey, J., Tyler, N. C., & Flippin, S. S. (2004). The supply of and demand for special education teachers: A review of research regarding the chronic shortage of special education teachers. *The Journal of Special Education*, 38(1), 5–21.
26. Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
27. Mcleskey, J., Tyler, N. C., & Flippin, S. S. (2004). The supply of and demand for special education teachers: A review of research regarding the chronic shortage of special education teachers. *The Journal of Special Education*, 38(1), 5–21.
28. Simon, N. S., & Johnson, S. M. (2015). Teacher Turnover in High-Poverty Schools: What We Know and Can Do. *Teachers College Record*, 117, 1–36.
29. Ingersoll, R. M. 2001. Teacher Turnover and Teacher Shortages: An Organizational Analysis. *American Educational Research Journal*, 38(3), 499–534; 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(3), 367–409; Simon, N. S., & Johnson, S. M. 2015. Teacher Turnover in High-Poverty Schools: What We Know and Can Do. *Teachers College Record*, 117 (030308), 1–36; Clotfelter, C. T., Ladd, H. F., & Vigdor, J. 2005. Who Teaches Whom? Race and the Distribution of Novice Teachers. *Economics of Education Review*, 24(4), 377–92; Hanushek, E. A., Kain, J. F., & Rivkin, S. G. 2004. Why Public Schools Lose Teachers. *The Journal of Human Resources*, 39(2), 326–54.
30. Simon, N. S., & Johnson, S. M. (2015). Teacher Turnover in High-Poverty Schools: What We Know and Can Do. *Teachers College Record*, 117, 1–36.
31. Ingersoll, R., Merrill, L., & May, H. (2012). Retaining teachers: How preparation matters. *Educational Leadership*, 69(8), 30–34.
32. Ingersoll, R. M., & Strong, M. (2011). The Impact of Induction and Mentoring Programs for Beginning Teachers: A Critical Review of the Research. *Review of Educational Research*, 81(2), 201–233.
33. Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education*, 80(3), 44–70.
34. Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education*, 80(3), 44–70.



35. Goldring, R., Taie, S., & Riddles, M. 2014. *Teacher attrition and mobility: Results from the 2012–13 Teacher Follow-up Survey*. National Center for Education Statistics. Washington, DC; Ingersoll, R.M. and May, H. (2011). Recruitment, Retention and the Minority Teacher Shortage. *Consortium for Policy Research in Education*. CPRE Research Report #RR-69.
36. Villegas, A. M., & Irvine, J. J. 2010. Diversifying the Teaching Force: An Examination of Major Arguments. *Urban Review*, 42(3), 175–92.
37. Cherng, H. S., & Halpin, P. F. (2016). The importance of minority teachers: Student perceptions of minority versus white teachers. *Educational Researcher*, 45(7), 407–420; Cole, B. P. (1986). The black educator: An endangered species. *Journal of Negro Education*, 55(3), 326–334; Irvine, J. J. (1988). An analysis of the problem of the disappearing Black educator. *Elementary School Journal*, 88(5), 503–514; Waters, M. M. (1989). An agenda for educating Black teachers. *The Educational Forum*, 53(3), 267–279; Gershenson, S., Hart, C. M. D., Lindsay, C. A., & Papageorge, N. W. (2017). *The long-run impacts of same-race teachers*. Bonn, Germany: IZA. Institute of Labor Economics.
38. Ingersoll, R.M. and May, H. (2011). Recruitment, Retention and the Minority Teacher Shortage. *Consortium for Policy Research in Education*. CPRE Research Report #RR-69.
39. Egalite, A. J., Kisida, B., & Winters, M. A. (2015). Representation in the classroom: The effect of won-race teachers on student achievement. *Economics of Education Review*, 45, 44–52; Dee, T. S. (2004). Teachers, race and student achievement in a randomized experiment. *The Review of Economics and Statistics*, 86(1), 195–210.
40. Fairclough, A. (2007). *A Class of Their Own: Black Teachers in the Segregated South*. Cambridge, MA: The Belknap Press of Harvard University Press.
41. Villegas, A. M., & Irvine, J. J. 2010. Diversifying the Teaching Force: An Examination of Major Arguments. *Urban Review*, 42(3), 175–92; Cherng, H. S., Halpin, P. F. (2016). The importance of minority teachers: Student perceptions of minority versus white teachers. *Educational Researcher*, 45(7), 407–420; Cole, B. P. (1986). The black educator: An endangered species. *Journal of Negro Education*, 55(3), 326–334; Irvine, J. J. (1988). An analysis of the problem of the disappearing Black educator. *Elementary School Journal*, 88(5), 503–514; Waters, M. M. (1989). An agenda for educating Black teachers. *The Educational Forum*, 53(3), 267–279.
42. Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
43. Goldring, R., Taie, S., & Riddles, M. (2014). *Teacher attrition and mobility: Results from the 2012–13 Teacher Follow-up Survey*. Washington, DC: U.S. Department of Education.
44. Executive Office of the President (2012). *Investing in our future: Returning teachers to the classroom*. Washington, DC: Executive Office of the President, [https://obamawhitehouse.archives.gov/sites/default/files/Investing\\_in\\_Our\\_Future\\_Report.pdf](https://obamawhitehouse.archives.gov/sites/default/files/Investing_in_Our_Future_Report.pdf) (accessed 2/3/17).
45. Hanushek, E. A., Kain, J. F., & Rivkin, S. G. 2004. Why Public Schools Lose Teachers. *The Journal of Human Resources*, 39(2), 326–54. Scafidi, B., Sjoquist, D. L., & Stinebrickner, T. R. 2007. “Race, Poverty, and Teacher Mobility.” *Economics of Education Review*, 26(2), 145–59.
46. Allensworth, E., Ponisciak, S., & Mazzeo, C. 2009. The Schools Teachers Leave: Teacher Mobility in Chicago Public Schools. *Consortium on Chicago School Research*. Chicago, IL; Boyd, D., Grossman, P., Ing, M., Lankford, H., Loeb, S., & Wyckoff, J. 2011. The Influence of School Administrators on Teacher Retention Decisions. *American Educational Research Journal*, 48(2), 303–33; Loeb, S., Darling-Hammond, L., & Luczak, J. 2005. How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education*, 80(3), 44–70; Johnson, S. M., Kraft, M. A., & 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 (100306), 1–39; Ladd, H. F. 2011. Teachers’ Perceptions of Their Working Conditions: How Predictive of Planned and Actual Teacher Movement? *Educational Evaluation and Policy Analysis*, 33(2), 235–61; Marinell, W. H., & Coca, V. M. 2013. Who Stays and Who Leaves? Findings from a Three-Part Study of Teacher Turnover in NYC Middle Schools. New York: The Research Alliance for New York City Schools.
47. Goldring, R., Taie, S., Rizzo, L., Colby, D., & Fraser, A. (2013). *User’s Manual for the 2011–12 Schools and Staffing Survey Volume 6: Public and Private School Teacher Data Files* (NCES 2013–335). U.S. Department of

Education. Washington, DC: National Center for Education Statistics. Retrieved from <http://nces.ed.gov/pubsearch>.

48. Ingersoll, R., Merrill, L., & May, H. (2014). *What are the effects of teacher education and preparation on beginning teacher attrition?* Research Report (#RR-82). Philadelphia: Consortium for Policy Research in Education, University of Pennsylvania; Henke, R., Chen, X., & Geis, S. (2000). *Progress through the Teacher Pipeline: 1992–93 College Graduates and Elementary/Secondary School Teaching as of 1997*. Postsecondary Education Descriptive Analysis Report. U.S. Department of Education. Washington, DC: National Center for Education Statistics.
49. Podolsky, A., & Kini, T. (2016). *How effective are loan forgiveness and service scholarships for recruiting teachers?* (policy brief). Palo Alto, CA: Learning Policy Institute.
50. Baugh, W. H., & Stone, J. A. (1982). Mobility and Wage Equilibration in the Educator Labor Market. *Economics of Education Review*, 2(3), 253–274; Murnane, R. J., & Olsen, R. J. (1990). The effects of salaries and opportunity costs on length of stay in teaching: Evidence from North Carolina. *The Journal of Human Resources*, 25(1), 106–124; Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education*, 80(3), 44–70; Ondrich, J., Pas, E., & Yinger, J. (2008). The determinants of teacher attrition in upstate New York. *Public Finance Review*, 36(1), 112–144.
51. Gray, L., & Taie, S. (2015). *Public school teacher attrition and mobility in the first five years: Results from the first through fifth waves of the 2007–08 Beginning Teacher Longitudinal Study*. U.S. Department of Education. Washington, DC: National Center for Education Statistics.
52. For a comprehensive review, see Simon, N. S., & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What we know and can do. *Teachers College Record* 117(030308), 1–36; See also 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(3), 367–409; Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education*, 80(3), 44–70.
53. Simon, N. S., & Johnson, S. M. 2015. “Teacher turnover in high-poverty schools: What we know and can do.” *Teachers College Record* 117(030308), 1–36
54. 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(11), 2552–2585. See also Podolsky, A., Kini, T., Bishop, J., & Darling-Hammond, L. (2016). *Solving the teacher shortage: How to attract and retain excellent educators*. Palo Alto, CA: Learning Policy Institute.
55. Podolsky, A., Kini, T., Bishop, J., & Darling-Hammond, L. (2016). *Solving the teacher shortage: How to attract and retain excellent educators*. Palo Alto, CA: Learning Policy Institute.
56. Sutchter, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
57. Eger, A. (2015, September 21). Teachers struggle with low pay, working conditions: Teachers turn to extra jobs, soup kitchens to get by. *Tulsa World*.
58. Boser, U., & Straus, C. (2014). *Mid- and late-career teachers struggle with paltry incomes*. Washington, DC: Center for American Progress.
59. Greenstone, M., & Looney, A. (2013). *Rising student debt burdens: Factors behind the phenomenon*. Washington, DC: The Hamilton Project, The Brookings Institution.
60. Podolsky, A. & Kini, T. (2016). *How effective are loan forgiveness and service scholarships for recruiting teachers?* (policy brief). Palo Alto, CA: Learning Policy Institute.
61. Wiswall, M. (2013). The dynamics of teacher quality. *Journal of Public Economics*, 100, 61–78.
62. Boston Teacher Residency. (2016). “The BTR Impact.” Retrieved from <http://www.bpe.org/boston-teacher-residency/about/impact>; National Center for Teacher Residencies. (2016). 2015 Network Impact Overview. Chicago; Guha, R., Hyler, M., & Darling-Hammond, L. (2016). *Teacher residencies: Building a high-quality, sustainable workforce*. Palo Alto, CA: Learning Policy Institute; Solomon, J. (2009). The Boston Teacher Residency: District-Based Teacher Education. *Journal of Teacher Education*, 60(5), 478–488.



63. Commission on Teacher Credentialing, *California School Paraprofessional Teacher Training Program. An Annual Report to the Legislature as Required by SB 1636* (Sacramento, CA: Author, 2008), accessed August 10, 2016, [http://www.ctc.ca.gov/reports/PTTP\\_2008\\_LegRpt.pdf](http://www.ctc.ca.gov/reports/PTTP_2008_LegRpt.pdf); Podolsky, A., Kini, T., Bishop, J., & Darling-Hammond, L. (2016). *Solving the teacher shortage: How to attract and retain excellent educators*. Palo Alto, CA: Learning Policy Institute.
64. Picucci, A. (2016, May 13). Early results are in: NTC model leads to student learning [Web log]. Retrieved from <https://newteachercenter.org/blog/2016/05/13/early-results-ntc-model-leads-student-learning/>; Picucci, A. (2016, August 10). New i3 research shows student achievement gains continue with NTC support [Web log]. Retrieved from <https://newteachercenter.org/blog/2016/08/10/new-i3-research-shows-student-achievement-gains-continue-with-ntc-support/>.
65. Darling-Hammond, L., LaPointe, M., Meyerson, D., Orr, M. T., & Cohen, C. (2007). *Preparing School Leaders for a Changing World: Lessons from Exemplary Leadership Development Programs*. Stanford, CA: Stanford University, Stanford Educational Leadership Institute; Sutchter, L., Podolsky, A., & Espinoza, D. (2017). *Supporting principals' learning: Key features of effective programs*. Palo Alto, CA: Learning Policy Institute.
66. NCES Handbook of Survey Methods: SASS Teacher Follow-Up Survey (TFS), October (2015): 1–6. <https://nces.ed.gov/surveys/sass/>.
67. Ingersoll, R.M. and May, H. (2011). Recruitment, Retention and the Minority Teacher Shortage. *Consortium for Policy Research in Education*. CPRE Research Report #RR-69.
68. Taylor, L. L., & Glander, M. (2006). *Documentation for the NCES Comparable Wage Index Data File (EFSC 2006–865)*. U.S. Department of Education. Washington, DC: National Center for Education Statistics.

## About the Authors

**Desiree Carver-Thomas** is a Research and Policy Associate on LPI's [Educator Quality](#) Team. She is the lead author of *Addressing California's Growing Teacher Shortage: 2017 Update* and is the co-author of *A Coming Crisis in Teaching? Teacher Supply, Demand, and Shortages in the U.S.* Previously, she taught in New York City public schools, and consulted on strategies for diverting recidivism and implementing a full-service community schools initiative.

**Linda Darling-Hammond** is President of the Learning Policy Institute and Charles E. Ducommun Professor of Education Emeritus at Stanford University. She has conducted extensive research on issues of educator supply, demand, and quality. Among her award-winning publications in this area are *What Matters Most: Teaching for America's Future*; *Teaching as the Learning Profession*; *Powerful Teacher Education*; and *Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able to Do*.





1530 Page Mill Road, Suite 200  
Palo Alto, CA 94304  
p: 650.332.9797

1301 Connecticut Avenue NW, Suite 500  
Washington, DC 20036  
p: 202.830.0079

@LPI\_Learning | [learningpolicyinstitute.org](http://learningpolicyinstitute.org)

The Learning Policy Institute conducts and communicates independent, high-quality research to improve education policy and practice. Working with policymakers, researchers, educators, community groups, and others, the Institute seeks to advance evidence-based policies that support empowering and equitable learning for each and every child. Nonprofit and nonpartisan, the Institute connects policymakers and stakeholders at the local, state, and federal levels with the evidence, ideas, and actions needed to strengthen the education system from preschool through college and career readiness.