



# Pathways to the Teaching Profession: Teaching Assistants' and Substitute Teachers' Transitions into the Teacher Workforce

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Teacher shortages and lack of teacher diversity have led to growing efforts nationally to recruit teaching assistants (TAs) to be classroom teachers. Substitute teachers are not typically considered in these efforts. We pair longitudinal administrative data from a mid-sized urban district with survey follow-up to address how TAs and substitute teachers contribute to filling staffing shortages and diversifying the teacher workforce. While substitute teachers are rarely included in formal Grow-Your-Own efforts, they bring racial and ethnic diversity to the district in similar ways to TAs yet face fewer barriers to becoming classroom teachers. As a result, they do so at much higher rates and help prevent vacancies in hard-to-staff classrooms.

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**Abstract**

Teacher shortages and lack of teacher diversity have led to growing efforts nationally to recruit teaching assistants (TAs) to be classroom teachers. Substitute teachers are not typically considered in these efforts. We pair longitudinal administrative data from a mid-sized urban district with survey follow-up to address how TAs and substitute teachers contribute to filling staffing shortages and diversifying the teacher workforce. While substitute teachers are rarely included in formal Grow-Your-Own efforts, they bring racial and ethnic diversity to the district in similar ways to TAs yet face fewer barriers to becoming classroom teachers. As a result, they do so at much higher rates and help prevent vacancies in hard-to-staff classrooms.

*Keywords:* Teacher workforce, Teachers Aides, Substitute Teachers, Paraprofessionals, Teacher Diversity

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### **Pathways to the Teaching Profession: Teaching Assistants' and Substitute Teachers' Transitions into the Teacher Workforce**

Staffing public schools is a perpetual challenge. While overall teacher shortages wax and wane, there are persistent shortages in hard-to-staff areas that result in unfilled teacher vacancies and a teaching workforce that often does not reflect the demographics of the student population. The pandemic has exacerbated many of these staffing challenges, as teacher turnover has spiked and fewer teacher candidates are entering the classroom (Camp et al., 2024a; Carver-Thomas et al., 2021; Steiner & Woo, 2021).

As a result, there has been growing interest and investment in formal “Grow-Your-Own” (GYO) programs, which recruit community members and school staff such as Teaching Assistants (TAs) into the teaching profession. Many proponents of GYO programs argue that TAs represent an untapped pool of teachers and that they bring the ability to relate to their students, given that they are often people of color, multilingual, and have experience working with students (Gist et al., 2019; Villegas & Clewell, 1998). Interestingly, while substitute teachers also work directly with students and are more likely than TAs to already hold bachelor's degrees (BAs), they have not typically been the focus of prior GYO efforts. Kraft, Conklin and Falken (2022) estimate there are 600,000 substitute teachers in the U.S., and Substantial Classrooms (n.d.) reports that 38% of substitute teachers want to pursue teacher certification.

Despite widespread policy interest in supporting school staff to become teachers, research in this area remains scarce. We pair longitudinal administrative data from a mid-sized urban district with survey follow-up to address how school-based staff, specifically TAs and substitute teachers, contribute to filling staffing shortages and diversifying the teacher workforce. Substitute teaching has emerged organically as a pathway into teaching in this district, and we

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study the individuals who come through this pathway to think about how substitutes could be leveraged in formal GYO efforts. Specifically, we answer the following research questions:

What are the characteristics of TAs and substitute teachers in the district? How do TAs and substitutes become permanent teachers, and how has this changed over time? And, finally, how does this process shape staffing in the district?

This descriptive study of the rates and outcomes of school staff who become permanent teachers adds to the literature in several ways. We extend prior research showing that TAs who become permanent teachers bring needed diversity to the teacher workforce and fill hard-to-staff teaching positions, but that they make up a small number of individuals (Camp, Zamarro & MGee, 2024; Fortner et al., 2015). We compare TA outcomes and rates of transition into permanent teaching to those of substitute teachers, a group that has not been previously studied in detail due to limited information in most longitudinal datasets. Substitute teachers are rarely captured in longitudinal datasets because of the transient nature of their role, and we combine several data sources to paint a more complete and nuanced picture of these two groups of employees' trajectories.

We find that substitutes who become permanent teachers also help to diversify the teacher workforce and fill vacant positions, and that they make up a much larger share of permanent teachers than former TAs. Seven times as many substitute teachers than TAs transition into permanent teaching roles in the district, in part because the district employs more substitutes than TAs and in part because of structural differences in these pathways. While TAs represent a committed group of diverse individuals from the community who are likely to be retained in the teaching role, helping them to attain a bachelor's degree requires significant investment from the district. On the other hand, substitute teachers already hold a bachelor's

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degree, and so they face fewer barriers to entry into teaching, but their retention rates are similar to those of other newly hired teachers. Our survey analysis suggests that substitute teaching gives candidates a sense of the position and draws them into the profession. These findings highlight the distinct needs of these two groups and point to the importance of district support for substitute teachers in their transition into the permanent teaching role.

In the next section, we synthesize prior literature on teacher shortages, how efforts to recruit school staff into teaching can address staffing challenges, and the reasons that substitute teachers may be particularly well-suited for these efforts. Then, we describe the data and analytic approach to answering our research questions before presenting our results. In each section, we describe the results for TAs and then compare the findings for substitutes. We conclude with a discussion of policy implications and areas for future research.

### **Teacher Shortages and the Potential of GYO Programs and Substitute Teachers**

A large literature documents the negative consequences of teacher shortages, leading to calls to strengthen and expand the teacher pipeline. Emerging evidence suggests that GYO programs that recruit TAs and other community members into teaching may help to increase teacher supply and diversity. Below, we summarize existing research on teacher shortages, GYO programs, and substitute teachers. Though we study a naturally occurring pathway into teaching rather than a formalized GYO program, we draw on the GYO literature to illustrate how leveraging school staff (including substitutes) can help to mitigate staffing challenges.

#### ***Teacher Shortages***

Many schools struggle to staff their classrooms with highly qualified teachers, at least in certain subject areas, and some schools face more serious challenges than others. The most severe shortages are concentrated in schools serving larger populations of historically

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marginalized students (Ingersoll, 2003; Jacob, 2007). Numerous studies show that much of this relationship can be explained by supply-side factors that include wages, geography, and difficult working conditions (Boyd et al., 2005; Lankford et al., 2002; Scafidi et al., 2007). These teacher shortages have serious consequences for historically marginalized students who are most in need of highly effective teachers (Goldhaber et al., 2015).

A substantial body of research shows that teacher shortages are concentrated in hard-to-staff subjects, where unfilled teacher vacancies are most prevalent. Such shortage areas typically include special education (SPED), science, math and ESL (Cowan et al., 2016; Edwards et al., 2024; Nguyen et al., 2022). Several leaks in the teacher pipeline help explain shortages in these areas. First, individuals with science and math backgrounds face higher opportunity costs associated with becoming teachers (West, 2013), meaning that relatively few teachers are prepared in high-need subject areas (Goldhaber et al., 2015; Sutchter et al., 2016). Once in schools, SPED teachers often face more difficult working conditions (Billingsley et al., 2020). The consequences of teacher shortages are substantial as they often lead to classrooms staffed by underqualified teachers (Clotfelter et al., 2007; Dee & Cohodes, 2008; Kane et al., 2008).

The literature also highlights the severe underrepresentation of teachers of color compared to the demographics of the student population and the importance of diversifying the teacher workforce (Gist & Bristol, 2022). Nearly 80% of teachers in the U.S. are white while at least half of public school students are students of color (US Department of Education, 2023). Research on pathways into teaching suggests that potential teachers of color face substantial barriers in becoming teachers and fulfilling requirements for certification, including lower pass rates and retake rates on licensure exams than their white peers (Cowan et al., 2020; Nettles et al., 2011; Rucinski & Goodman, 2019). The lack of racial diversity among teachers is concerning

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considering the wealth of evidence that suggests that students of color benefit from having teachers of color in terms of academic achievement (Dee, 2004; Egalite et al., 2015), attendance (Blazar, 2024; Tran & Gershenson, 2021), and reductions in disciplinary infractions (Holt & Gershenson, 2017; Lindsay & Hart, 2017). Additionally, same-race teachers contribute to better long-term outcomes such as higher high school graduation rates and increased college enrollment (Papageorge et al., 2018). And, the research describes the ways that teachers of color are deeply committed to the communities they serve (Villegas & Irvine, 2010). Tapping other, more diverse school staff such as TAs for permanent teaching roles may offer opportunities to increase the supply of teachers of color.

### ***Recruiting Teachers From Within the Community***

“Grow your own” (GYO) programs have emerged as a popular approach to address the limited supply of teachers and lack of diversity in the teacher workforce. While there is considerable variation in the design of these programs, many recruit adults such as paraprofessionals, who are already working with students, from the school community (Edwards & Kraft, 2024). These individuals often have deep knowledge of and strong ties to the community (Abbate-Vaughn & Paugh, 2009). In contrast to teaching, the paraprofessional/TA role has few requirements for entry. Proponents of GYO programs argue that efforts to recruit teachers from within the community will result in a more committed and diverse workforce (e.g., Villegas & Irvine, 2010). Indeed, several studies find that paraprofessionals and TAs are more likely to reflect the racial diversity of their students and that they have higher retention rates than their peers without this prior experience (Clewell & Villegas, 2001; Fortner et al., 2015; Gist et al., 2019; Laski, 2024). Two studies also suggest that teachers with TA experience who come through alternative pathways are just as effective, if not more so, as their peers in terms of

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student test scores and teacher evaluation ratings (Fortner et al., 2015; Laski, 2024). However, efforts to recruit TAs and paraprofessionals into teaching can be difficult to implement at scale, particularly because many of them do not hold a bachelor's degree (Bisht et al., 2021). And, they may not transition in large enough numbers to meaningfully affect the teacher workforce; Camp et al. (2024b) find that although paraeducators in Arkansas are more racially/ethnically diverse than teachers, paraeducators transition in small numbers and Black and Hispanic educators are less likely to transition than their white peers. More research is needed to understand the scope and effectiveness of GYO programs.

### ***Substitute Teachers as Potential Permanent Teacher Supply***

About three-quarters of existing adult GYO programs in the United States draw on paraprofessionals (Edwards & Kraft, 2024). Substitute teachers are an often overlooked group of school staff that could serve as a potential supply of permanent teachers. Like TAs, substitute teachers are already working with students in classrooms. These individuals have expressed an interest in working in schools and likely have a better understanding of the teaching role and school community than their peers without this experience. Further, substitutes are more often required to hold a bachelor's degree than TAs. A scan of teacher contracts across the nation shows that at least 22 states require substitute teachers to complete some postsecondary education, while no state requires this of TAs (National Council for Teacher Quality, n.d.; Garcia, 2023).

Despite their potential as permanent teachers, substitute teachers remain an understudied group. Existing research has focused on describing substitute teachers' characteristics and their preferences about where to work, suggesting that substitute teachers are similar to the permanent teacher workforce in terms of their background characteristics (Liu et al., 2022) and preferences



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to work in better-resourced contexts with stronger working conditions (Gershenson, 2012; Liu et al., 2022). A recent research brief by Kirksey (2024) compares the performance of uncertified teachers in Texas and considers the extent to which their effectiveness varies based on prior classroom experience. They find that certified teachers are more effective than uncertified teachers without prior classroom experience, but similarly effective to the small number of uncertified teachers in their study who are former substitutes (just 2% of their sample). These findings suggest that substitute teaching may help prepare individuals for permanent teaching roles.

We are aware of only one study that has explored substitute teachers' pathways into the classroom. Clewell and Villegas (2002) studied a teaching pathway program that intentionally recruits and supports substitute teachers, along with paraprofessionals and former Peace Corps volunteers, in becoming permanent teachers. They surveyed program participants and found that 74% of substitute teachers who participated in the program were people of color, compared to 18% of novice teachers. Substitute teachers in the program had a three-year retention rate that was approximately 7 percentage points higher than that of novice teachers. And, they received higher evaluation scores from their principals, on average. While this study suggests that formal programs to recruit substitute teachers into formal teaching positions may be promising, the literature leaves unanswered broader questions about the pathways into permanent teaching roles for substitute teachers.

### **Research Design**

#### **District Context**

We study transitions into the permanent teacher workforce in a mid-sized urban school district in the northeast. Like in many urban districts, the teacher workforce is not reflective of

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the student population. While the majority (over 90%) of the student body are students of color, the teacher workforce is overwhelmingly white and female. Additionally, over a third of students are English Language Learners (ELLs).

The district has struggled to staff classrooms consistently, with approximately 100 unfilled teaching vacancies at the start of the school year for at least the past 5 years, meaning that roughly 5% of classrooms began the school year without a permanent teacher. The district faces significant challenges recruiting ESL-certified teachers and staffing SPED, science, and math positions. The pandemic has exacerbated these staffing difficulties. In 2019, only 6% of teachers left the district, which was lower than other urban districts in the region; by 2023, teacher turnover had more than doubled to 13%.

The district also faces a very tight labor market. While national data on the number of applicants to teaching positions is scarce, some studies find that larger urban districts like Boston and Washington, DC, have well over 5 unique applicants per open position, on average (Author et al., 2023; Jacob et al., 2018). By contrast, the district we study is more similar to smaller urban districts with a much more limited teacher applicant pool. In recent years, the district has had only 2 unique applicants per teaching position, on average, and many fewer in hard-to-staff subjects.

To address the lack of diversity and teacher shortages, the district has in recent years intensified its recruitment efforts. This has included marketing campaigns, recruiting teachers from out-of-state and even internationally, and providing hiring bonuses to teachers in hard-to-staff subject areas. Notably, since 2021, several local universities and non-profits have collaborated to create new pathways to support TAs in fulfilling teacher certification requirements. The district has supported this effort and has sponsored eligible TAs for

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emergency certification to fill classrooms that would have otherwise remained vacant. Our study period includes the school years in which these efforts began.

### **Longitudinal Dataset and Sample**

Our dataset allows us to describe TAs and substitute teachers and their pathways into the classroom in novel ways. In particular, substitute teachers are rarely captured in longitudinal datasets because of the temporary nature of their role. We merge multiple sources of data to provide a more comprehensive and detailed understanding of the career paths of TAs and substitute teachers.

We start with employee-by-year administrative files from the district for school years 2014-15 to 2023-24. These files contain information on an employee's positions, school assignment, salary, and individual characteristics (employee race/ethnicity, age, gender, years worked in district). To this, we add information on substitute teachers' daily assignments to describe the schools that substitute teachers work in, the number of days they worked in those schools, and the reason that their substitute assignment was required. Then, we merge data that describes characteristics of students in the school, such as their race/ethnicity, special education status, economic disadvantage, and multilingual learner (MLL) status. Finally, we include employee-by-year administrative data from the state that allows us to observe how teachers move across the state's public school system. In total, this dataset includes 29,887 observations of 6,528 unique individuals (teachers, administrators, and other school staff) in the district, of whom 1,033 are substitute teachers (16% of individuals) and 751 are TAs (12% of individuals).

This process results in a longitudinal individual-by-year dataset that allows us to document whether, where, and in what subject TAs and substitutes eventually become teachers, as well as the characteristics of the school where they teach. For substitutes, many of whom

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teach in multiple schools within the year, we construct a weighted average of school characteristics based on the number of days they worked in a given school within the year. We can also capture whether substitutes transition into permanent teaching roles mid-year because we observe work assignment transitions in real time throughout the school year. We also leverage the district's application and vacancy data for the school years 2019-20 to 2022-23. The application data provides insight into employees' preferences for schools and their intentions to teach by showing where and when staff apply for positions. The vacancy data details all posted positions, the timing of postings, the causes of vacancies, and whether and how each vacancy was filled. Given that some data sources are only available in some years, we focus some of our analyses in certain years. See Table 1 for data availability across years.

### **Identifying TAs and Substitute Teachers**

We identify TAs, substitutes, and permanent teachers using their position information in the longitudinal administrative data. Throughout this paper, we refer to three distinct groups of employees: 1) TAs, 2) Substitutes, and 3) Permanent teachers.<sup>1</sup> First, we define TAs as individuals who work as a teaching assistant or paraprofessional within the panel (the district uses the terms TA and paraprofessional interchangeably) and had not previously worked as a teacher. Second, we define substitute teachers as individuals who work as a day-to-day substitute teacher during the course of the panel and had not previously worked as a teacher.<sup>2</sup> Last, we define permanent teachers as those who hold a teaching position during the panel and have not worked as TAs or substitutes. In some cases, we compare new teachers who are former TAs and former substitutes to new, novice teachers who have not previously worked in the district and are on the first step of the district's salary schedule (and thus appear to be teaching for the first time).

### **Analytic Approach**

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We describe the characteristics of staff in our sample, how they become teachers, and what this means for human capital in the district. Specifically, we ask: 1) What are the characteristics of TAs and substitute teachers in the district? 2) How do TAs and substitutes become permanent teachers, and how has this changed over time? and 3) How does this process shape staffing in the district?

Because this study is purely descriptive, we compare average values across groups and use Ordinary Least Squares Regression or Logistic Regression to assess whether differences are statistically significant, controlling for other factors. Our models typically include individual (employee race/ethnicity, age, gender, years worked in district) and school-level (proportion students in each racial/ethnic group, special education status, economic disadvantage, and MLL) covariates and school year fixed effects to account for differences across the study period and we cluster standard errors by year. We describe each model more directly as we present the results.

To answer our second research question about how TAs and substitutes become teachers, we describe how different factors predict an individual's probability of becoming a teacher. We use a similar approach to Camp et al. (2024b) and employ a multinomial logit discrete-time hazard model with school and individual covariates. We model the probability that one of three events occurs for a given individual in the subsequent school year: 1) Remaining in a non-teaching role; 2) Transitioning to a teaching position, or 3) Exiting the district entirely. In the first set of models, we include only the individual-level covariates described above and in a second set, we add the school-level covariates.

We also fit a competing-risks survival regression to describe the timing of TAs and substitutes becoming permanent teachers. We predict whether an individual becomes a permanent teacher in the subsequent school year as a function of their years of experience in the

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district, and we account for the competing risk that they may exit the district before becoming a permanent teacher. This approach yields the cumulative incidence function, which represents the probability of an individual TA or substitute becoming a permanent teacher by a given year of experience in the district. We present the results as a graph of the cumulative incidence for TAs and substitutes by years of experience.

### **Survey Data**

To complement the quantitative data, we also surveyed permanent teachers working in the district in 2023-24 who had worked as substitute teachers in the past 10 years. The survey included questions about their motivations for substitute teaching, as well as the process to become a permanent teacher. We sent the survey to 75 former substitute teachers who transitioned into teaching in the district, and 32 (42%) responded. Four of these responses were partially complete, so we exclude them from our analysis. Survey respondents are similar in terms of their racial/ethnic characteristics to the substitutes who become teachers (Table A1). Though we recognize that the response rate is low and may not be representative of the district analytic sample, we reference survey responses to add texture to the rich administrative dataset.

## **Results**

### **What Are the Characteristics of TAs and Substitute Teachers in the District?**

*TAs Have Long Tenures in Their Schools and Most are Educators of Color.* TAs contribute to the racial diversity of their schools and may contribute to stability in their schools, given their low turnover rates and long tenures. TAs in 2022-23 (hereafter 2023) have 13 years of experience in the district on average (Table 2) and similar rates of exit to permanent teachers (12% exited in 2023, in comparison to 13% of teachers). Much like teachers, these turnover rates are substantially greater in recent years, with an average retention rate of 93% over the past

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decade. Two thirds of TAs (67%) are people of color: 39% are Hispanic and 21% are Black, much more diverse than the classroom teaching workforce.

TAs are concentrated in two main areas: elementary education and special education classrooms. 60% work in elementary schools, typically in early grades, and 56% work in special education positions (some in elementary schools), providing support for classroom teachers as well as one-on-one or small-group support to students with diverse learning needs. TAs work in schools serving large proportions of students of color (Table 2), likely increasing opportunities for students to interact with adults who share their racial identity, and perhaps facilitating sustained relationships with students and families over time. TAs earn less than half as much as permanent teachers, on average (\$31,301 versus \$78,922 annually). Perhaps as a result, TA positions are difficult to fill, attracting only one unique external applicant per posting, on average. This finding aligns with reports that TAs are hard-to-staff (e.g., Theobald, 2023), and provides important context for TAs' transitions into teaching.

***Most TAs Do Not Meet Requirements for the Permanent Teaching Role.*** In this study, we consider TAs' and substitutes' transitions into permanent teaching, and we think about them as falling into three groups: 1) Those who are not interested in becoming permanent teachers, but who enter the TA/substitute role for other reasons (e.g., financial, etc.); 2) Those who are open to the idea of becoming a permanent teacher, but have not yet met certification requirements; and 3) Those who enter the TA/substitute role because they intend to become permanent teachers, and want to get a foot in the door into the district.

We find that most TAs do not meet requirements for the permanent teaching role, and very few TAs fall under the third group we describe above. First, only a small proportion of TAs have BAs, meaning that they are not qualified to obtain teacher licensure. In 2024, the only year

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in which we have complete data about degree attainment, 18% of TAs have a BA or higher. We also use the application data to explore whether TAs would have preferred to teach, but were unable to secure a teaching position. Each year, just 1% of TAs applied to teaching positions before the beginning of the school year. These TAs are not hired into teaching positions at the beginning of the school year, but instead continue to work as TAs in the district

### *Substitute Teachers Bring a Diversity of Experiences and Identities to Their Work.*

Substitutes also play an important role in schools, and they have only become more crucial in recent years. We find a dramatic increase in the count of substitute teachers during the pandemic years (Figure 1), where the counts more than doubled from 2020 to 2022 and nearly tripled by 2023. This pattern aligns with national reports of teacher shortages and absences during the pandemic years that required districts to draw on substitute teachers to fill year-long vacancies and day-to-day teacher absences. It also reflects ESSER personnel spending on substitute teachers (districts in the state have invested 20% of ESSER personnel spending on substitute teachers) as well as the district's commitment to ensuring that classes were covered when teachers were absent rather than splitting students up to other classrooms in the school.

Substitute teachers contributed substantially to the teacher workforce in 2023 (the year for which we have the most complete data), with the 293 substitutes we observe each working 64 days, on average. However, the substitute teacher workforce is very heterogeneous. Some work nearly every day, while others work infrequently or for only a short spell; some work primarily as building substitutes in one school, while others float to schools across the district (and potentially to other districts); some fill daily absences across many subjects while others fill longer-term absences or vacancies. Only 13% of substitutes work 10 days or less, suggesting that the group is relatively engaged in schools. In Table 3, we divide 2023 substitute teachers into



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four categories – those who work more or less than the mean number of days (64) and those who work in one school or across many schools. More than half of substitutes (63%) work across multiple schools within the year and half of their days are spent filling daily absences rather than vacancies. Approximately 20% of substitutes work exclusively in one school and fill an open vacancy. Like permanent teachers in the district, substitutes work in schools serving mostly students of color (94% of students) and economically disadvantaged students (83%), and a large proportion of MLL students (38%).

Substitute teachers bring a diversity of experiences and identities to their work. First, a greater proportion of substitutes than permanent teachers in 2023 are male (40% versus 29%) and people of color (44% versus 22%). Substitutes in 2023 are 36 years old on average, younger than the teacher workforce overall but older than new, novice teachers (who are 30 years old on average). These differences support anecdotal evidence that for many individuals, the substitute role represents a career change. Indeed, 26 of 28 survey respondents reported that they had been employed prior to substitute teaching. Almost half of respondents had previously worked in education, while the other respondents had a variety of past experiences, from retail to community organizing to oyster farming. Our statewide administrative data shows that a very small number of substitutes (1%) had previously worked as teachers in other districts in the state. Though we did not ask explicitly about personal connections to the district, two survey respondents mentioned in their open responses that they had been students in the district and that this was part of their motivation for working in the district. These responses may suggest that at least some substitutes have personal connections to the community.

***Few Substitute Teachers Enter the Role to be Permanent Teachers in the District.*** As we mention above, we think about substitutes as falling into three groups: 1) Those who are not

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interested in becoming permanent teachers, but who enter substitute teaching for other reasons;

2) Those who are open to the idea of becoming a permanent teacher, but are not yet certified; and

3) Those who enter the substitute role because they intend to become permanent teachers, and

want to get a foot in the door into the district. As above, we leverage the application data to

capture how many substitutes apply to permanent teaching positions before the start of the school

year, which represents a proxy for being in the third group. Of the 623 substitute teachers who

we observe between 2019-20 and 2022-23 (the only years we can see application data), 67 of

them (11%) applied to teaching positions before the start of the school year in which they

subbed. Of these, 9 (13%) eventually become teachers, suggesting that the substitute pool is not

made up primarily of substitutes who would have preferred to be permanent teachers but did not

get hired.

For all three groups of substitutes, we could imagine that the role is short-term, given the low degree of commitment (substitutes can select which day they want to work) and low barriers

to entry (the only requirements to become a substitute are a bachelor's degree and a background check) as well as some substitutes' ambitions to move into permanent roles. Indeed, we find that

on average, substitutes who started in 2015 spent two years in the role. Several survey

respondents spoke about the substitute teaching role as being temporary, describing the

motivation to become a substitute as a career transition or stopgap, such as "a way to pay off my

mortgage" or "a way to try out teaching." The flexibility of the role also allowed substitute

teachers to try out teaching without fully committing; as one teacher explained, "The seasonal

nature of my work meant that I had time in the winter to explore other avenues of employment."

Unlike the TA role, which includes a year-long contract, the substitute role is temporary by

design and substitutes may not intend to stay in the role long-term.

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### **How Do TAs and Substitutes Become Permanent Teachers, and How Has This Changed Over Time?**

While TAs and substitutes both work directly with students in schools, their profiles, roles, and connection to the school community are quite different. These differences have implications for their transitions into permanent teaching positions as well as their outcomes. The pathway to permanent teaching is different for TAs and substitutes because of differences in their educational attainment, their relationships to the school they work in, and the extent to which the district has formalized efforts to recruit them into permanent teaching roles.

*Very Few TAs Become Permanent Teachers.* Across the nearly 10 years we examine, just 24 TAs (3% of all TAs in our sample) transition into classroom teacher roles. While TAs are typically the target of GYO programs, supporting their transitions into teaching positions requires significant investment from the district because most TAs typically do not have BAs. When they become teachers, most TAs (82%) initially enter on an emergency certificate. Emergency certificates, for which districts apply to the state on behalf of the teacher, are valid for only one year. To convert the emergency certificate into a permanent teaching certificate, potential teachers must enroll in or complete a teacher preparation program and pass required licensure exams.

Though they make up a small number of new teacher hires overall, the proportion of TAs who become teachers has grown substantially in recent years, due in part to district efforts to support TAs in fulfilling requirements to obtain teacher certification. For example, in 2015, just one first-year teacher was a former TA, compared to 12 in 2023.

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***TAs Who Become Permanent Teachers Typically Do So After Many Years in the District, and Often in the Same Schools Where They Worked Previously.*** The TAs who transition into teaching do so after many years in the district, perhaps in part because of the BA barrier. Nearly all (20 of 24 TAs) do so after at least five years of working in the district (the median number of years worked in the district before transitioning into teaching is 13 years). In Figure 3, we present the results from the competing-risks regression survival model, which illustrate the probability of an individual TA or substitute teacher becoming a permanent teacher by a given year of experience in the district. The figure clearly illustrates both that very small proportions of TAs become teachers, as we describe above, and also that they do so slowly; most TAs who become teachers do so after at least three years in the district.

TAs often become teachers in the same school where they worked as a TA, perhaps as a result of the relationships, support, and institutional knowledge they have built within their schools after many years. Of the 24 TAs who became teachers during our study period, 15 of them (63%) did so in a school where they had worked previously. TAs who become teachers teach in schools serving large proportions of students of color, MLL, and economically disadvantaged students (Table 4). These patterns reflect both the demographics of the district overall and the tendency for TAs to become teachers in the same schools where they worked previously, which also serve large proportions of students of color.

***Substitute Teaching Is a Large and Growing Pathway into Permanent Teaching in the District.*** In contrast to the TA pathway, which has been a concerted effort on the district's part and has yielded 24 new teachers in total, the substitute teacher pathway has emerged organically and brought many more (168) new teachers into the role between 2015 to 2023. During the

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panel, 16% of substitutes become permanent teachers. In 2023 alone, 34 people came in through the substitute pathway, representing 16% of all newly hired teachers.

The proportion and counts of substitutes who become teachers over time has changed in recent years. As we show in Figure 2, the proportion of substitutes becoming teachers increased steadily up until 2019, then peaked and decreased when a large influx of new substitutes entered the district. At the same time, the raw counts of substitutes becoming teachers has increased in recent years. This finding likely reflects the increase in the total number of substitutes in the district during the pandemic years, who may be different from the substitutes who entered pre-pandemic, as well as increases in the number of open teacher positions in the district in these years.

### ***Former Substitute Teachers Become Permanent Teachers More Quickly than TAs.***

Unlike TAs, we find that substitute teachers who become teachers do so quickly. Substitutes who become teachers spend two years in the district on average before becoming teachers, and most (80%) of substitutes who become teachers do so within three years. The finding that larger proportions of substitutes become permanent teachers than TAs, and that they do so more quickly, bears out in the competing-risks survival analysis. As we show in Figure 3, about 20% of substitutes become teachers by their 20th year of working in the district, with 10% having done so within two years. Note that the raw rates differ from our survival analysis models because some substitutes who do not transition to teaching roles leave the district, while the competing-risks models focus on the probability of transitioning for teachers who stay.

The quick transitions we observe in the first year of substitute teaching reflect the large proportions of substitutes who move mid-year. In fact, 49% of substitutes who become permanent teachers do so mid-year, and they typically move into positions that had been vacant

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since the beginning of the year (72% of mid-year movers). For example, in 2023 16 substitutes transitioned to teaching roles in the middle of the year (47% of those who become teachers). All of them became teachers in the same school where they had been a substitute teacher. Most (11) of these mid-year movers move into teaching positions that had been open since the beginning of the year. This data point suggests that, faced with large numbers of vacancies, schools are frequently turning to subs to fill positions mid-year.

We fit a multinomial logit discrete time-hazard model to understand to what extent observable individual or school-level characteristics are related to the probabilities of TAs and substitutes remaining in a non-teaching position, becoming a teacher, or exiting the district. Although the results from the multinomial logit model suggest that most observable characteristics are not related to the probability of substitutes becoming permanent teachers, we do find some suggestive evidence that older substitutes are less likely to become permanent teachers (Table A2). Younger substitutes in particular may be exploring teaching as a potential career path.

***Substitutes May Learn More About the Permanent Teaching Role and the District Through Their Subbing Experience.*** Survey data corroborates evidence from teacher applications presented above suggesting that a new pool of teachers enter through substitute roles. Of the 28 survey respondents who entered permanent teaching roles, seven (25%) reported that they were not interested in becoming permanent teachers when they started subbing, nine (32%) reported that they were potentially interested, and just 12 (38%) reported that they were planning to become permanent teachers. These responses suggest that most survey respondents who transitioned to teaching roles had entered without a clear idea that they would become permanent teachers. Certification information echoes this theme, as 68% of substitutes who

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become teachers entered on an emergency certificate and did not have traditional training as teachers.

We do not find that observable school characteristics as measured by student demographics are related to the probability of substitutes becoming teachers (Table A2), in that all substitutes work in schools serving large proportions of MLL students and students of color (Table 2). For those who were not initially interested in becoming teachers, the reasons for eventually doing so were widespread, from “Financial” to “I wasn’t finding any acceptable pharmacist jobs, so I thought about becoming a science teacher.” Several described the way that substitute teaching increased their interest. One said, “I became a permanent teacher because I fell in love with education. I had a natural aptitude to teach.” Another respondent, who was not initially interested in becoming a permanent teacher and who had not previously worked in education prior to working as a substitute explained, “I found that I REALLY enjoyed working in the classroom and being part of a school community. It felt like a natural fit.” Taken together, this evidence suggests that working as a substitute served as a magnet attracting some teachers to the classroom.

***Most Substitutes Who Become Permanent Teachers do so in Schools They Have Worked in Previously.*** As with TAs, substitute teachers’ transitions to permanent roles depend on a two-way match between teacher and school. Nearly two-thirds (62%) of substitutes who become teachers do so in schools that they worked in previously. And, substitute teachers who work consistently in one school are more likely to become teachers than those who work across many different schools (Table 3). Almost all (88%) survey respondents who took jobs in a school where they had worked as a substitute said that their experience helped them get the job. They described building networks and relationships: one person described being recruited by

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administrators to apply to a permanent teaching position within the school, saying “I subbed for a couple of days, and admin was happy with me so they asked me to interview for the position.”

Another reported, “As a substitute teacher, I created lesson plans, had a classroom management plan, so I took teaching students very seriously. The administration team noticed and worked with me to be hired as a permanent teacher.”

During the time that substitute teachers spend in their buildings, principals can observe teachers in action and may make note of the teachers that seem to be a good fit for the school, for when they do have an opening. We use the application data to explore the extent to which former substitutes differ from other external applicants in terms of being offered and hired into a teaching role. We fit a logistic regression model that yields the odds ratio of being offered a position and being hired as a function of whether the person is a former TA, substitute, or external applicant, controlling for the total number of applications submitted, gender, and race. We find suggestive evidence that former substitutes have higher odds of being hired into teaching positions than other external applicants (Table 5). As one survey respondent explained, “I had already built strong relationships with students, as well as with my coworkers and administrators. My administrators also already had 2.5 months of evidence about my teaching by the time I interviewed for the job.”

Some survey respondents also described the ways that they developed a connection with a particular school or found a position that was an especially good fit: “I found a job [at a school] with an exceptional climate, and I knew I wanted to work there specifically.” Another reported, “Previously, I had been thinking about being a teacher but was overwhelmed by the lack of support in most [district] high schools. [This school] immediately felt different.” Substitutes may use the experience to find a school that is a good fit, and also to figure out which subjects and



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grades they enjoy most. Several survey respondents described trying different grade levels as a substitute teacher before settling on the one they liked the most and in which they decided to become a permanent teacher.

The survey responses make clear that administrators play an important role in supporting substitute teachers in transitioning into permanent teaching roles. As one teacher explained when reflecting on their experience transitioning from subbing into the permanent teaching role, “You need the right admin to do this successfully.” Another said, “Being a substitute teacher showed me how much I enjoyed working in a school. Had I not had that experience, I don’t think I would have pursued a permanent position. I was also fortunate to get a teaching job (with an emergency certification) and the staff at that school really helped me to overcome the certification process. My principal made the time for me to finish taking classes and encouraged me to take the steps to becoming a full time teacher.” Another said, “I think strong, supportive administrators are key! Especially for candidates like myself who have little formal teacher training, I felt confident that I could do this job largely because I trusted and looked up to my building administrators.”

### **How Does This Process Shape Staffing in the District?**

Former TAs and substitutes help to diversify the teacher workforce and fill vacancies in hard-to-staff subject areas. In 2022-23, the district needed to fill 255 vacancies by the start of the school year, and nearly half of these vacancies went unfilled. Former TAs and substitutes filled 25 of these vacancies, meaning up to 650 students (25 classrooms \* cap of 26 students per class) had a permanent teacher at the start of the school year who might not have otherwise. Former TAs and substitutes often fill vacancies in hard-to-staff areas; 20 out of 25 filled vacancies in SPED, ESL, or STEM classrooms. In the following sections, we explore in more detail the influence of TAs and then of substitutes on human capital in the district.

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***TAs Who Become Teachers Help to Diversify the Teacher Workforce and Fill Critical Vacancies.*** The districts' efforts to recruit TAs to become teachers are explicitly intended to increase teacher diversity, and this bears out in the data. As shown in Table 2, 30% of former TAs are Black, and 30% are Hispanic/Latino. By contrast, 10% of all district teachers (and 9% of other new novice teachers) are Hispanic/Latino and just 5% (and 9% of novices) are Black. Further, TAs who become teachers fill critical roles in SPED. As shown in Table 4, 25% of former TAs become SPED teachers (compared to 10% of new, novice teachers). And, they help to prevent SPED vacancies; in 2022-23, four out of the nine TAs who became teachers filled SPED vacancies. TAs have often worked in SPED positions prior to teaching, and so they are able to bring their expertise in working with this population to the SPED teaching role.

***Former TAs Are Very Likely to be Hired and Retained as Teachers.*** Former TAs may bring content expertise and knowledge of the school community to the teaching role, potentially boosting their probability of being hired and of retention. Given that they have often worked in the school prior to becoming a teacher, they may already have relationships with school leaders who see them as especially attractive in the hiring process. The results of our analyses that use application data reveal that, conditional on applying, former TAs have higher odds of being offered and hired into teaching positions than other external applicants (Table 5).

Relative to other new, novice teachers, former TAs are also much more likely to be retained in the district as teachers, helping to provide stability in their schools and prevent further vacancies. Almost all former TAs remain in teaching roles in the district after their first year of teaching (Table 6).

Taken together, these results suggest that investing in the TA to teacher pathway has yielded a diverse, committed group of individuals who fill important teaching roles within the

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district and provide continuity for students and families across time. At the same time, this pathway requires significant investment from the district for results that are not immediately realized as most TAs need several years to earn their BA. And, even with district partnerships and a concerted effort on the district's part to increase the number of TAs becoming teachers, the number of new teacher hires who are former TAs in SY 2023 is only 12. While this is more than double the number of people coming through this pathway in prior years, it still does not seem that TAs alone are converting in large enough numbers for this to be an easily scalable solution to teacher shortages.

***Former Substitutes Also Bring Diversity and Experience, and They Transition into Permanent Teaching in Greater Numbers.*** Substitutes who become teachers are quite diverse, and there are many more of them than TAs; the substitute pipeline yielded 67 teachers of color (and 28 male teachers of color) over the panel. As we show in Table 2, former substitutes are more racially diverse and more likely to be male than other new teachers. For example, 29% identify as Black or Hispanic/Latinx, compared to 18% of other new hires.

Because they have BAs and are already working in schools, often leading classrooms, substitute teachers are well-positioned to transition into permanent teaching roles. Nearly one-quarter of former substitutes who become teachers enter on a salary step greater than 1, suggesting that they may have prior teaching experience outside of the district. Substitute teaching experience may be helpful for the permanent teaching role; of the 28 substitute teachers who moved to permanent teaching roles that we surveyed, 23 reported that being a substitute teacher helped prepare them to manage student behavior as permanent teachers, and 21 reported that it helped prepare them to deliver instruction. Not only are they more familiar with the teaching role, but they may be more familiar with the school community after their substitute

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teaching experience; 16 of 17 substitutes who became teachers in a school they had taught as a substitute teacher agreed that substitute teaching helped them to become more familiar with the school community. As one survey respondent explained, “The best thing about my transition was that I already knew my students.”

Like former TAs, former substitutes who transition into teaching help to fill important holes in the district. They work in high-need content areas at similar rates to other new, novice teachers and in schools serving similar student populations (Table 4). Substitutes also play an important role in filling and preventing vacancies; in 2023, for example, former substitutes prevented 16 start-of-year vacancies (nearly twice as many as the vacancies prevented by TAs), 11 substitutes transitioned to teaching roles mid-year to fill vacancies that had been unfilled at the start of the year, and 7 substitutes transitioned to teacher roles that became vacant mid-year.

### ***Former Substitute Teachers Have Similar Retention Rates as Other Novice Teachers.***

While substitute teachers have more robust job previews and stronger pre-existing relationships than other novice teachers, these advantages do not lead to higher retention rates. In fact, former substitutes have quite similar retention rates to other new teachers (but not nearly as high as former TAs; Table 6). And, they have higher rates of moving back into non-teaching positions in the following year. For non-substitutes, this typically represents an upward move (i.e., into coaching), but for substitutes, this move typically represents a transition back into substitute teaching.

To further understand the extent to which former substitutes’ retention decisions differ from other novice teachers, we fit a series of regressions where the outcomes are exiting the district, moving back into a non-teaching role, or exiting the district. We include school and year fixed effects to account for time and school-specific factors that could influence teachers’

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decisions (Table A3). The results confirm that former substitutes have higher probabilities of moving into non-teaching positions than other novice teachers, but similar probabilities of exiting the district.

Substitutes' higher rates of movement back into non-teaching positions, but similar rates of exit, suggest that they want to keep working in the district with students but may face barriers to doing so. Survey respondents described the ways that passing certification exams were one such barrier. As one survey respondent explained, "I did get the job but I didn't get the help and support to keep my job...I was unable to pass my Praxis exam by a few points and due to that I lost my permanent job. I love working in the education field so much that I decided to stay in the district as a per-diem [substitute] teacher with the hope to pass my exam soon."

In particular, former substitutes who transition mid-year may be entering into more challenging contexts but also receive less support than their peers who enter at the beginning of the year. Substitutes who move mid-year are no different in terms of their observable individual characteristics than those who become teachers at the beginning of the year (Table A4) and do not become teachers in very different school contexts in terms of observable characteristics (Table A5). But, substitutes who transition to teaching roles mid-year have higher exit rates than their counterparts who start teaching in the fall (Table A6). One teacher who transitioned from substituting into permanent teaching mid-year described the unique challenges of this transition:

[As a substitute], there is less pressure to do 1/2 the job of a teacher, but once you are hired you were expected to already know everything, 'since you were a sub before.' I had much more freedom in my classroom for the first few months [as a substitute] because I was not a 'full time teacher', once being hired it was a complete 180. All new requirements, rules, and regulations were put in place, but no one to truly show you the ropes. I was left to fend for myself and figure it out since everyone assumed my time as a [substitute] was the same as being a full time educator. Being a substitute does not prepare you to be a full time teacher like everyone likes to think it does. It actually provides a false sense of calm and confidence that gets shot right down the second you are hired full time.

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Some administrators found creative ways to support substitute teachers who transitioned into permanent positions; as one survey respondent explained, “I had the opportunity to go to a new-hire week-long summer PD in the year between the per diem substitute teaching and permanent teaching. That was helpful. There should be training like that for people like me who transition from per diem to permanent in the beginning/middle of the school year.”

***Substitute Teaching May Also Offer Pathways into Permanent Teaching in Other Districts Within the State.*** Though not all substitutes become permanent teachers in the district, a large proportion of substitutes continue to work in schools in the state in some capacity. Of substitute teachers who worked in 2020-21, the majority remain in the state’s public education system two years later. By 2022-23, 59% remain in the district as substitute teachers or other non-teaching staff, 16% are working as permanent teachers in the state, and 25% have left the state’s public education system entirely. Of the substitute teachers who do not transition into teaching in the study district, 55 end up teaching in other districts in the state. As a result, substitute teaching may serve as a way to draw individuals into working in schools in the state, and that the district could consider formalizing this as a pathway into teaching.

### **Discussion and Conclusion**

There is substantial interest in recruiting school staff to become teachers, but the evidence on how well these programs work and for whom is limited. We study these pathways in a mid-size urban district during the pandemic era. First, we show that the TA-to-teacher pathway has yielded diverse cohorts of teachers who fill hard-to-staff subject areas and remain in the district long-term, but that the number of teachers who come through this pathway is quite small. These findings align with other empirical studies regarding characteristics of TAs, their rates of

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transition into teaching, and their outcomes as teachers (Camp et al, 2024b; Clewell & Villegas, 2001; Fortner et al., 2015; Laski, 2024; Theobald et al., 2023).

Second, we demonstrate that substitute teachers serve as a larger and more substantial source of new teacher supply than TAs for the district, even in the wake of district efforts to recruit more TAs into teaching. Though substitutes are understudied and rarely discussed in the context of GYO programs, many transition into permanent teaching positions. Seven times as many substitute teachers move to permanent roles than do TAs. Like former TAs, former substitute teachers who become permanent teachers are more racially diverse than the overall teacher workforce. Additionally, they are more likely to be male, diversifying the workforce in terms of both race and gender.

The process of becoming a teacher differs for TAs and substitutes, in terms of their timelines and the barriers they face. For the district, helping TAs to acquire BAs requires a significant amount of time and money, but the TA pathway yields a cadre of committed teachers who are very likely to be retained. In contrast, substitutes already hold BAs, and so the initial transition into teaching is easier and faster, but they remain as teachers in the district at similar rates as other novices. While the upfront cost associated with the TA pathway is significant, the higher turnover rate of substitute teachers who transition into teaching means that the district will eventually need to invest time and money to replace these teachers. One policy implication of these findings is to provide more support for substitutes during their transition into the classroom.

We are unable to describe the effectiveness of school staff who become teachers. Fortner et al. (2015) and Laski (2024) both find that former TAs are just as, if not more, effective than other teachers in terms of their value-added to students' test scores. We do not have access to

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analogous measures of student achievement, but we show that these candidates are in demand: principals are more likely to hire TAs if they apply for permanent roles. Future work should attend to the effectiveness of TAs and substitute teachers who transition into permanent teaching as well as the mechanisms that explain this relationship.

### **Implications**

Our results have implications for districts interested in developing pathways into permanent teaching for TAs and substitute teachers. First, intentionally cultivating the substitute teacher pathway is worthwhile, but requires thoughtful support on the part of the district. For example, given the relatively high number of teachers transitioning from the substitute role, districts should think strategically about substitute teacher school placements. For some employees, the substitute teaching experience convinces them to teach in the district or even in a particular school. Other substitutes ultimately become permanent teachers in other districts in the state, perhaps suggesting dissatisfaction with their school rather than the teaching profession itself. Though more challenging contexts will likely have more vacancies and need more substitute teachers, schools can work to make the substitute teaching experience a positive one and an authentic job preview demonstrating the potential of a permanent teaching position. Districts could, for example, communicate to school leaders that substitute teachers are a pool of potential permanent recruits, and encourage them to create supportive environments for substitutes within their schools.

Districts interested in building pathways into permanent teaching for substitutes may also want to think about how to better identify and develop substitute teachers in ways that lead them to stay for the long term. We find that substitute teachers tend to think of the job as short-term, and that those who transition into the permanent teaching role often have short spells in teaching.



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Encouraging substitutes with strong commitments to the school community, developed either prior to or during their substitute teaching experience, to become permanent teachers may yield a cadre of committed new teacher hires. Our conversations with district administrators suggest that some school leaders are already thinking strategically about this potential pathway, and some school leaders request particular substitutes for their building who they think are promising teachers. Districts could also invite substitutes to participate in district new teacher induction and in teacher professional development. Substitutes who receive more training may be more successful in the short term, and also better prepared to transition into permanent teaching.

Districts interested in recruiting TAs to become teachers should also be thoughtful about how to cultivate their pool of TAs and be realistic about how many new teachers this approach could yield. The pool of TAs who can become teachers quickly is shallow because few have BAs and because the TA role itself is hard to staff. A district that taps TAs who already hold BAs may realize an initial bump in the number of new teacher hires, but this is unlikely to be sustained given that the number of TAs who have college degrees is small in most contexts. In addition to supporting TAs in earning their BAs, districts hoping to cultivate a pool of potential teachers among their TAs may also want to provide them more support and training while in the TA role and ensure that the role itself is sustainable. These efforts could help to make the TA role more attractive and increase the size of the TA applicant pool, improve TA practice in the short term, and give TAs the tools to be successful in a future permanent teaching role.

Given that most former TAs and substitute teachers in the sample enter permanent teaching on emergency certificates, our results also speak to questions about emergency certification for teachers more broadly. Many districts have drawn on emergency-certified teachers in greater numbers in recent years, raising questions about the effectiveness and

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retention rates of teachers who enter through these pathways. The high retention rates of former TAs in our sample, almost all of whom enter on emergency credentials, provide suggestive evidence that alternative pathways can facilitate entry into teaching for committed individuals. Survey responses from former substitutes describing challenges converting the emergency certificate to a permanent teaching certificate also highlight the extent to which emergency certified teachers may need more support in meeting requirements.

Finally, we note that moving TAs and substitute teachers into permanent teaching roles may further drain the TA and substitute teacher pools, which are already quite shallow in many places (e.g., Kraft et al., 2022). These roles are critical for effective school operations. Districts and schools who are considering building a pathway for TAs and substitutes should develop plans to backfill those positions.

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**Notes**

<sup>1</sup> A small number of individuals (26) worked as both a TA and a substitute in our panel. Only two of these individuals transitioned to classroom teaching roles. We treat these teachers as substitutes because they hold BAs and make up the larger group of individuals who transition.

<sup>2</sup> In the past, the district employed long-term substitute teachers to cover for teachers on extended absences. These long-term substitutes differ from day-to-day substitutes in that long-term substitutes are certified as teachers. Given some confusion over the definition of long-term substitutes in the district over time, we focus attention on day-to-day substitutes who are not filling classrooms as a teacher of record. Thus, our analysis undercounts the number of substitutes who transition to permanent teaching roles.

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## Tables

*Table 1: Data Availability Across Years*

	2013- 14	2014- 15	2015- 16	2016- 17	2017- 18	2018- 19	2019- 20	2020- 21	2021- 22	2022- 23	2023- 24
<b>Longitudinal administrative data</b>	X	X	X	X	X	X	X	X	X	X	X
Position	X	X	X	X	X	X	X	X	X	X	X
School assignment	X	X	X	X	X	X	X	X	X	X	X
Salary	X	X	X	X	X	X	X	X	X	X	X
Individual characteristics	X	X	X	X	X	X	X	X	X	X	X
Education											X
Certification											X
Substitute teacher assignment								X	X	X	X
School-level characteristics	X	X	X	X	X	X	X	X	X	X	
State administrative data	X	X	X	X	X	X	X	X	X	X	X
<b>Applicant data</b>							X	X	X	X	
<b>Vacancy data</b>							X	X	X	X	

*Note.* The above table describes the data availability across school years, with each row/year cell that is available marked by an “X”.

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Table 2: Descriptive Table of Characteristics of Teachers, TAs and Substitutes, 2023

	Teacher s	TAs	TAs who do not become teachers	TAs who become teachers	Substitu tes	Substitu tes who do not become teachers	Substitu tes who become teachers
Individual Characteristics							
White	0.80	0.33	0.33	0.30	0.56	0.55	0.59
Black	0.05	0.21	0.20	0.30	0.17	0.17	0.12
Hispanic/Latino	0.10	0.39	0.39	0.30	0.15	0.15	0.17
Asian	0.03	0.05	0.05	0.10	0.04	0.04	0.05
Other Race	0.02	0.03	0.03	0.00	0.09	0.09	0.07
Female	0.72	0.87	0.87	0.80	0.60	0.60	0.66
Age	45.69	44.87	44.96	41.90	36.01	36.07	35.49
Years in district	14.77	13.46	13.45	13.80	2.01	2.05	1.66
Position Information							
Salary/wages	78922	31301	31260	32729	12853	12826	13020
Special Education position	0.18	0.56	0.56	0.40	-	-	-
Days worked as sub	-	-	-	-	64.27	64.13	65.10
Schools worked in as sub	-	-	-	-	4.22	4.43	2.92
Student Characteristics, School-Level							
Percent white students	0.07	0.08	0.08	0.06	0.06	0.06	0.07
Percent Black students	0.14	0.14	0.14	0.16	0.14	0.14	0.14
Percent Hispanic students	0.68	0.66	0.66	0.66	0.68	0.68	0.68
Percent Asian students	0.02	0.02	0.02	0.02	0.03	0.03	0.03
Percent economically disadvantaged students	0.82	0.81	0.81	0.84	0.83	0.83	0.82
Percent MLL students	0.37	0.35	0.35	0.30	0.38	0.38	0.37
Percent Special Education students	0.15	0.18	0.18	0.16	0.15	0.15	0.16
Retention Rates							
Exit district	0.13	0.12	0.12	0.10	0.43	0.47	0.10
Observations	1286	360	350	10	402	361	41
Proportion of sample	0.63	0.18	0.17	0.00	0.20	0.28	0.03

*Note.* Column 1 includes all permanent teachers working in district schools in 2023, Column 2 includes all TAs, Column 3 is a subset of TAs in Column 2 who do not become permanent teachers in the following year, Column 4 includes TAs who do become teachers in the following

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year, Column 5 includes all substitute teachers working within the school year, Column 6 is the subset who do not become permanent teachers the following school year, and Column 7 is the subset who do become permanent teachers in the following school year. We construct weighted average of school characteristics for substitutes using the number of days within the year they worked within a given school.

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Table 3: Substitute Data, 2023

	Average number of days	Average number of schools	Work only in vacancies	Proportion of days in vacancy	Become a teacher	Become a teacher mid- year (conditional on becoming teacher)	Count
Work within just one school, for more than the mean number of days	117	1	0.69	0.87	0.19	0.36	59
Work within just one school, for fewer than the mean number of days	20	1	0.49	0.58	0.24	0.62	53
Work across many schools, for more than the mean number of days	99	7	0.05	0.39	0.10	0	88

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Work across many schools, for fewer than the mean number of days	23	5	0.01	0.28	0.08	0.57	93
Overall	64	4.13	0.25	0.49	0.14	0.4	293

*Note.* The above table presents information about substitute teachers' work assignments in 2023. We categorize substitutes into one of the four groups in the row, and then present average characteristics and outcomes for each group. Row totals are displayed in the last column, and averages are displayed in the last row.

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*Table 4: Position and School Context in First Year of Teaching*

	New, novice teachers	Former substitutes	Former TAs
Proportion working in ESL/Bilingual teaching position	0.23	0.20	0.29
Proportion working in Special Education teaching position	0.10	0.09	0.25
Proportion working in STEM teaching position	0.33	0.32	0.08
Proportion working in any high-need position	0.66	0.61	0.63
Proportion white students	0.06	0.06	0.05
Proportion Black students	0.15	0.14	0.12
Proportion Hispanic students	0.69	0.69	0.72
Proportion Asian students	0.03	0.03	0.03
Proportion multi-race students	0.02	0.03	0.02
Proportion students eligible for FRPL	0.85	0.85	0.85
Proportion students multilingual learners	0.31	0.33	0.37
Proportion students with disabilities	0.15	0.15	0.14
Observations	461	168	24

*Note.* In the table above, we display position and school-level student characteristics of new, novice teachers, former substitutes, and former TAs in their first year as permanent teachers.



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*Table 5: Logistic Regression Showing Odds of Offer and Hire, 2023*

	Offered	Hired
Former substitutes	1.49 (0.46)	1.79 <sup>+</sup> (0.57)
Former TAs	3.49* (1.85)	2.91* (1.44)
Constant	0.39*** (0.06)	0.26*** (0.04)
Observations	617	617

*Note.* We display the odds ratio of being offered and hired into a teaching position conditional on applying, with standard errors in parentheses. The reference group is external applicants. An odds ratio greater than 1 indicates that the group is more likely than other external applicants to be offered or hired into a teaching position.

We include race and gender fixed effects and control for the number of applications submitted.

<sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

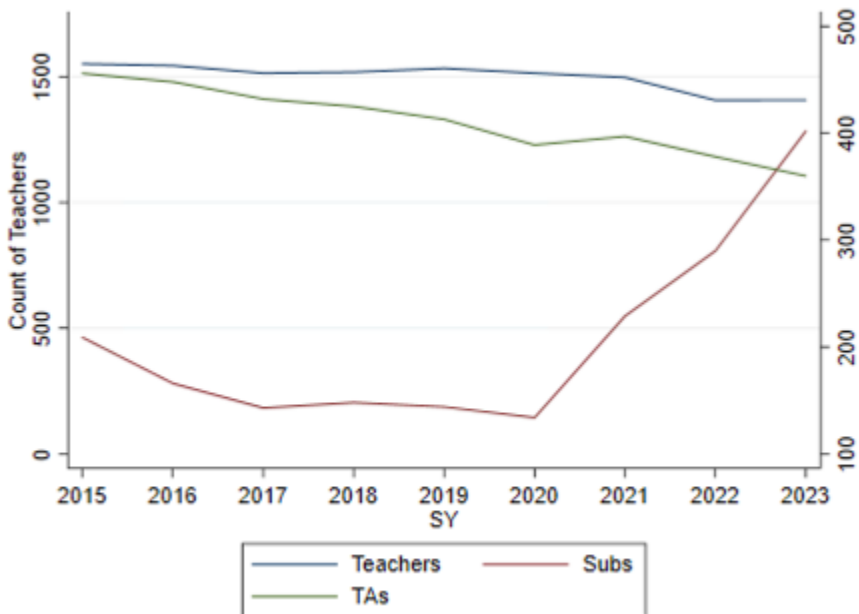
## PATHWAYS TO THE TEACHING PROFESSION

*Table 6: One-year Retention Outcomes by Group*

	New, novice teachers	Former substitutes	Former TAs
Exit district	0.22	0.20	0.08
Move to non- teaching position	0.02	0.14	0.08
Stay in teaching role	0.75	0.67	0.83
Observations	461	168	24

*Note.* The above table presents the retention outcomes of each group of first-year teachers labeled in the column header.

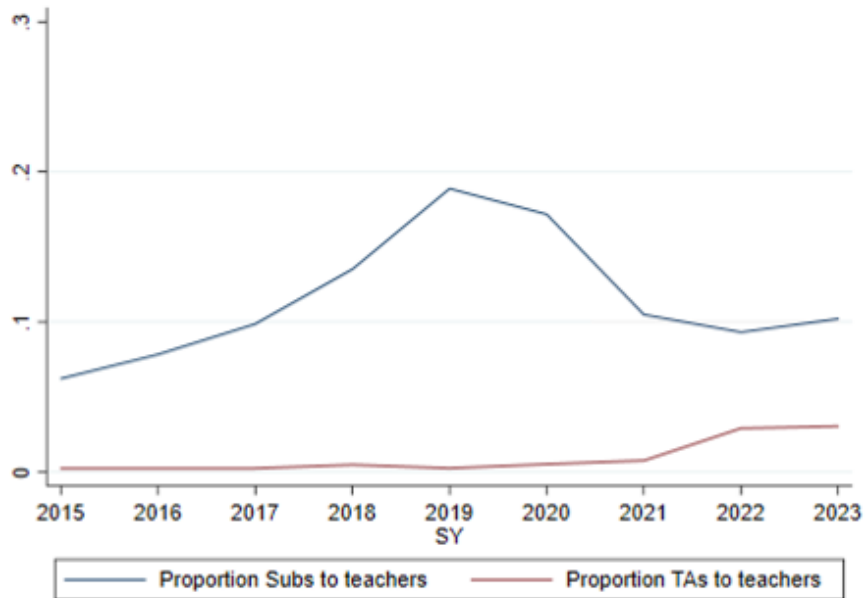
## PATHWAYS TO THE TEACHING PROFESSION

**Figures***Figure 1: Counts of Teachers, Substitutes, and TAs by School Year*

*Note.* The above figure presents the number of teachers, TAs, and substitutes without prior teaching experience in the district across time. The y-axis on the left represents the values for teachers, and the y-axis on the right represents the values for the other groups.

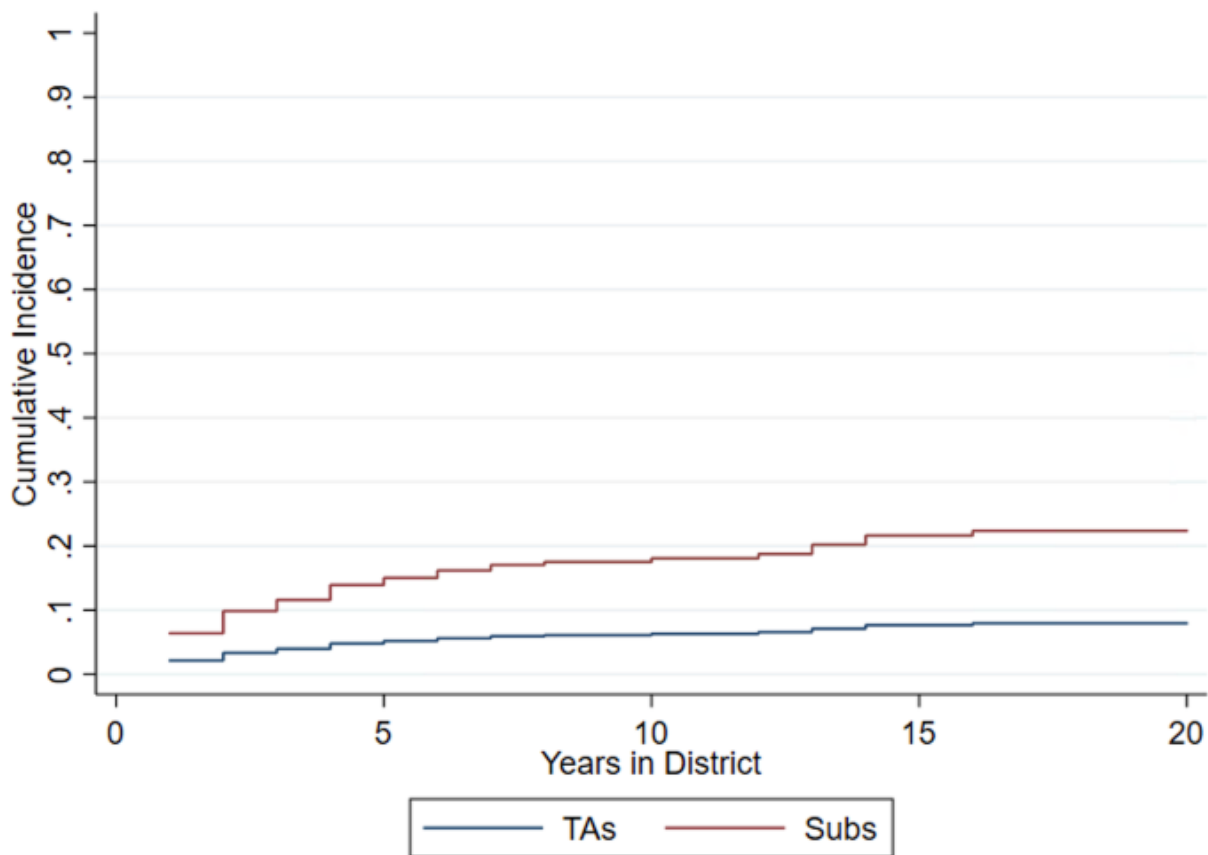
## PATHWAYS TO THE TEACHING PROFESSION

Figure 2: Rates of Becoming a Permanent Teacher



*Note.* The above figure describes year over year, what proportion of substitutes or TAs become teachers in the given school year (for mid-year movers) or in the following school year for those who transition between school years.

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*Figure 3: Cumulative Incidence of Becoming a Permanent Teacher*

*Note.* The above figure presents the results of the competing-risks regression that predicts the probability of TAs and substitutes becoming permanent teachers in the subsequent year as a function of years in the district, accounting for the competing risk that they exit the district before becoming a permanent teacher.

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**Appendix***Table A1: Racial Breakdown of Survey Respondents*

	Proportion of Survey Respondents	Proportion of Substitutes, Become Teachers
White	0.71	0.60
Black	0.11	0.13
Two or more races	0.04	0.05
Hispanic	0.14	0.20
Asian	0.00	0.02
Observations	28	168

*Note.* The table above presents the proportion of survey respondents (Column 1) and substitutes who become teachers (Column 2) in each racial/ethnic category.

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Table A2: Results from Multinomial Logit Discrete-Time Hazard Model

	TAs						Substitutes					
	(1) Remain in non- teaching role	(2) Become teacher	(3) Exit district	(4) Remain in non- teaching role	(5) Become teacher	(6) Exit district	(7) Remain in non- teaching role	(8) Become teacher	(9) Exit district	(10) Remain in non- teaching role	(11) Become teacher	(12) Exit district
Years in district	0.00** (0.00)	-0.00 (0.00)	-0.00** (0.00)	0.00** (0.00)	-0.00 (0.00)	- 0.00** (0.00)	0.02** (0.01)	-0.01+ (0.00)	-0.01* (0.01)	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Age 28 to 35	0.03 (0.03)	0.00 (0.01)	-0.03 (0.03)	0.02 (0.03)	0.00 (0.01)	-0.03 (0.03)	0.03 (0.04)	-0.00 (0.02)	-0.03 (0.03)	0.08 (0.07)	0.01 (0.05)	-0.09 (0.06)
Age 36 to 47	0.07* (0.03)	0.00 (0.01)	-0.07** (0.03)	0.06* (0.03)	0.00 (0.01)	- 0.07** (0.03)	-0.01 (0.04)	-0.04+ (0.02)	0.05 (0.04)	-0.02 (0.08)	-0.08+ (0.05)	0.10 (0.08)
Age 48 and older	0.07** (0.03)	-0.00 (0.01)	-0.07** (0.03)	0.07* (0.03)	-0.00 (0.01)	-0.07* (0.03)	0.14*** (0.04)	- 0.07*** (0.02)	-0.07* (0.03)	0.22*** (0.07)	-0.08+ (0.05)	-0.14** (0.05)
Female	0.02 (0.01)	-0.00 (0.00)	-0.01 (0.01)	0.02 (0.01)	-0.00 (0.00)	-0.01 (0.01)	-0.01 (0.03)	-0.01 (0.01)	0.02 (0.03)	-0.03 (0.06)	0.04 (0.04)	-0.01 (0.05)

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Black	0.00 (0.01)	0.00 (0.00)	-0.01 (0.01)	0.00 (0.01)	0.00 (0.00)	-0.01 (0.01)	0.12*** (0.03)	-0.03 (0.02)	-0.09** (0.03)	0.19* (0.09)	0.04 (0.05)	-0.23* (0.09)
Hispanic	0.02+ (0.01)	0.00 (0.00)	-0.02* (0.01)	0.02* (0.01)	0.00 (0.00)	-0.03* (0.01)	0.11** (0.04)	0.00 (0.02)	-0.11** (0.03)	0.06 (0.08)	0.04 (0.05)	-0.10 (0.07)
Asian	0.02 (0.03)	0.00 (0.01)	-0.02 (0.03)	0.01 (0.03)	0.00 (0.01)	-0.02 (0.03)	0.17+ (0.09)	-0.01 (0.05)	-0.16+ (0.09)	0.79 (40.02)	-1.11 (50.35)	0.32 (10.33)
Other race/ethnicity	0.06 (4.06)	-0.07 (4.35)	0.01 (0.29)	0.06 (2.16)	-0.06 (2.32)	0.01 (0.16)	0.11 (0.07)	0.02 (0.03)	-0.12+ (0.07)	-0.03 (0.09)	0.01 (0.06)	0.02 (0.08)
Prop Asian students				0.35+ (0.18)	0.02 (0.05)	-0.36* (0.18)				-0.93 (1.15)	0.75 (0.78)	0.17 (0.98)
Prop Black students				-0.03 (0.12)	0.02 (0.04)	0.01 (0.12)				0.57 (0.85)	-0.35 (0.58)	-0.22 (0.73)
Prop Hispanic students				-0.03 (0.10)	0.07* (0.04)	-0.04 (0.10)				0.59 (0.71)	0.06 (0.50)	-0.65 (0.60)



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Prop multirace students				-0.50*	0.15 <sup>+</sup>	0.34				0.53	-1.54	1.01
				(0.23)	(0.09)	(0.21)				(1.53)	(1.10)	(1.26)
Prop FRPL students				-0.02	-0.03	0.05				-1.11*	0.23	0.88 <sup>+</sup>
				(0.09)	(0.03)	(0.09)				(0.55)	(0.35)	(0.50)
Prop SWD				-0.08	-0.01	0.08				0.22	0.13	-0.35
				(0.06)	(0.02)	(0.06)				(0.43)	(0.31)	(0.35)
Prop MLL students				-0.13*	0.00	0.13*				0.40	-0.18	-0.22
				(0.06)	(0.02)	(0.06)				(0.39)	(0.27)	(0.34)
Observatio ns	3075	3075	3075	3075	3075	3075	1424	1424	1424	289	289	289

*Note.* The table above presents the results from the multinomial logit discrete time-hazard models above that model the probability of remaining in a non-teaching role, becoming a teacher, or exiting teaching. We include individual characteristics and school-level characteristics. In the first three columns, we display results for TAs with only individual characteristics, and in Columns 4-6 we add time-varying school characteristics. Then, we do the same for substitutes in Columns 7-12. Note that the number of observations in columns 10-12 is smaller than in 7-9 because we only have substitute school information in recent years. We include age as a categorical variable, where the reference category is staff age 27 and younger. The reference category for the race/ethnicity variable is white staff. Standard errors in parentheses.

<sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

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*Table A3: Regressions Predicting Retention Outcomes*

	(1) Exit district	(2) Move to non- teaching role	(3) Stay in teaching role
Former substitutes	-0.02 (0.04)	0.10*** (0.03)	-0.08 <sup>+</sup> (0.04)
Former TAs	-0.15* (0.06)	0.03 (0.05)	0.12 <sup>+</sup> (0.07)
Constant	0.18*** (0.05)	0.02 (0.02)	0.80*** (0.05)
Observations	653	653	653
$R^2$	0.02	0.05	0.03
Adjusted $R^2$	0.01	0.03	0.02
F	2.52	2.50	3.44
DF model	9	9	9
DF residual	43	43	43

*Note.* The above table presents output from a regression model predicting probability of the retention outcome in each of the columns. The reference group is new, novice teachers. We include year fixed effects, as well as school fixed effects. Standard errors clustered at the school level. Standard errors in parentheses.

<sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

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*Table A4: Characteristics of Mid-year Movers and Non-mid-year Movers, 2023*

	TAs, do not move mid- year	TAs, move mid-year	Substitutes, do not move mid-year	Substitutes, move mid- year
White	0.50	0.00	0.68	0.47
Black	0.17	0.50	0.09	0.16
Hisp	0.33	0.25	0.14	0.21
Asian	0.00	0.25	0.09	0.00
Other race/ethnicity not listed	0.00	0.00	0.00	0.16
Female	0.67	1.00	0.64	0.68
Age	38.50	47.00	35.68	35.26
Years in district	14.33	13.00	1.32	2.05
Salary/wages	33792.94	31134.98	16542.86	9126.32
Work in special education position	0.33	0.50	-	-
Days subbed	.	.	82.71	45.63
Count of schools as sub	.	.	3.55	2.22
Prop white students	0.04	0.09	0.07	0.07
Prop Black students	0.16	0.16	0.14	0.14
Prop Hispanic students	0.68	0.63	0.68	0.69
Prop Asian students	0.02	0.02	0.03	0.02
Prop econ dis students	0.86	0.80	0.82	0.83
Prop MLL students	0.32	0.28	0.36	0.38
Prop students with IEP	0.14	0.19	0.16	0.17
Observations	6	4	22	19

*Note.* The table above presents average characteristics of substitutes and TAs who become permanent teachers. The first column presents average characteristics for TAs who do not move mid-year in 2023 (but instead show up as teachers the following year), the second column presents characteristics of TAs who begin the 2023 school year as TAs and move into the permanent teaching role mid-year, the third column presents characteristics of substitutes who do not move mid-year (but show up as permanent teachers the following year), and the fourth column presents the average characteristics of substitutes who become permanent teachers mid-year.

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*Table A5: Position Information in First Year Teaching, Mid-year Movers and Non-mid-year Movers*

	Former substitut es	Former substitut es, non- mid-year	Former substitut es, move mid-year	Former TAs	Former TAs, non-mid	Former TAs, move mid-year
Proportion working in ESL/Bilingual teaching position	0.20	0.22	0.18	0.29	0.37	0.00
Proportion working in Special Education teaching position	0.09	0.13	0.05	0.25	0.26	0.20
Proportion working in STEM teaching position	0.32	0.27	0.38	0.08	0.11	0.00
Proportion working in any high-need position	0.61	0.62	0.61	0.63	0.74	0.20
Proportion white students	0.06	0.05	0.06	0.05	0.04	0.07
Proportion Black students	0.14	0.14	0.15	0.12	0.12	0.13
Proportion Hispanic students	0.69	0.69	0.69	0.72	0.73	0.70
Proportion Asian students	0.03	0.03	0.03	0.03	0.03	0.02
Proportion multi-race students	0.03	0.02	0.03	0.02	0.02	0.04
Proportion students	0.85	0.85	0.85	0.85	0.84	0.86

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eligible for FRPL						
Proportion students multilingual learners	0.33	0.32	0.34	0.37	0.38	0.32
Proportion students with disabilities	0.15	0.15	0.15	0.14	0.14	0.15
Observations	168	86	82	24	19	5

*Note.* The table above presents average characteristics of first-year teachers who previously worked as substitutes or TAs by transition time. The first column presents average characteristics for all former substitutes, the second column presents average characteristics for all former substitutes who began the year as a teacher (rather than moving mid-year), the third column presents characteristics for all former substitutes who became permanent teachers mid-year, the fourth column presents average characteristics for all former TAs, the fifth column presents average characteristics of former TAs who began their first year teaching as a teacher (rather than moving mid-year), and the last column present average characteristics of former TAs who became teachers mid-year.

## PATHWAYS TO THE TEACHING PROFESSION

*Table A6: One-year Retention Outcomes, Mid-year Movers and Non-mid-year Movers*

	New, novice teachers	Former substitut es	Former substitut es who do not move mid-year	Former substitut es who move mid-year	Former TAs	Former TAs who do not move mid-year	Former TAs who move mid-year
Exit district	0.22	0.20	0.14	0.26	0.08	0.05	0.20
Move to non- teaching position	0.02	0.14	0.12	0.16	0.08	0.05	0.20
Stay in teaching role	0.75	0.67	0.74	0.59	0.83	0.89	0.60
Observations	461	168	86	82	24	19	5

*Note.* The above table presents the retention outcomes of each group of first-year teachers labeled in the column header.