# Developing Effective School Leaders

## A Cross-District Study of Principal Pipelines

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PACE
*Policy Analysis for California Education*

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# Contents

## Executive Summary

This report examines how five California CORE member districts built principal pipelines to develop effective school leaders. The study, a collaborative effort between CORE-PACE and university researchers, aims to describe the policies, procedures, and practices that make up participating districts' efforts to establish and maintain principal pipelines and understand the role of principal pipelines in attaining key objectives, including diversifying school leadership, retaining excellent school leaders, and improving student outcomes.

The data for the study were drawn from district-provided internal staffing and professional development records (2015–22) and interviews with district administrators during the 2022–23 school year.

Key findings include:

- **Principal pipelines have grown substantially.** Over the past decade, principal pipeline programs for aspiring leaders have become central to districts' talent-management strategies.
- **The formal teacher-leader role is an increasingly critical stepping stone.** New school leaders are increasingly likely to have served in a formalized teacher leadership role, such as Teacher on Special Assignment (TOSA).
- **Principal pipelines have increased racial and gender diversity in school leadership.** However, this growth does not yet fully represent the districts' diversifying student populations.
- **Aspiring leader programs support promotion and retention of school leaders.** School leaders who went through a district-sponsored aspiring leader program were promoted more quickly and were far more likely to still be employed in the district after 3 years.
- **Persistent challenges threaten the sustainability of principal pipelines.** Districts faced common challenges with expanding and sustaining their principal pipelines, including funding uncertainties and competing priorities.

Districts can further strengthen their principal pipelines by ensuring they are aligned across the full educator career span, recruiting strategically into TOSA and assistant principal positions, treating pipelines as a retention tool as well as a preparation tool, and reassessing equity goals once pipelines have had more time to mature.

# Introduction

In 2022, five California CORE member districts initiated a collaborative investigation of their principal-pipeline systems with PACE and researchers at the University of Virginia and the University of Utah. This study had two primary aims:

- to describe the policies, procedures, and practices that constitute participating CORE districts' efforts to establish and maintain pipelines for new principals; and
- to estimate the effect of principal pipelines on important district and school goals, including
    - diversifying the principal pipeline along lines of race/ethnicity and gender,
    - increasing retention of new principals,
    - matching new principals to schools strategically, and
    - ensuring new principal effectiveness.

This report provides the summative cross-district analysis from the study. It is intended to help districts better understand the progress and accomplishments of their pipeline programs as well as plan for continuous program improvement.

This report is a retrospective look at the development and movement of certificated employees into school leadership in recent years, with data in some cases going back to 2012. As such, *the findings of this report may not reflect the current state of CORE districts' pipelines*. All districts reported making continuous improvements and changes to their pipeline programs. Some of the trends we identify may be historical rather than indicative of districts' current progress.

## The Importance of Principal Pipelines for School District Success

Principal pipelines are a set of linked talent-management strategies and structures for improving principal recruitment, training, hiring, placement, and ongoing support (Anderson et al., 2023). Recent initiatives have shown that principal pipelines are wide-ranging, cost-effective tools for school improvement (Gates et al., 2019). While many districts in California and elsewhere have had principal pipeline programs for years, several districts have a renewed interest in understanding how best to design their programs to maximize effects on student learning.

Formal district principal pipelines typically encompass more than one component, or "connection," in the pipeline. Table 1 summarizes the most common components of a principal pipeline and contrasts typical district practice with best practices gleaned from research and practice.

**Table 1.** Common Components of Principal Pipelines: Typical and Best Practices

| Pipeline component | Typical practice | Best practice |
|---|---|---|
| **Grow your own (GYO)** | Districts take a passive approach to the leader supply. | Districts actively seed future teachers and leaders by creating internal programs to incentivize and attract existing talent (e.g., high school seniors, paraprofessionals). |
| **Recruitment** | Future principals are "tapped" by district leaders.<br><br>Teachers do not have a clear understanding of the process for becoming a principal in their district. | All aspiring principals have multiple opportunities to apply to programs that allow them to learn and test leadership roles.<br><br>Leadership pathways are visible, clear, and frequently communicated by school and district leaders. |
| **Preservice training** | Aspiring leaders enroll in a leadership preparation program run by a local university or organization that *may* be aligned with the district's expectations. | Districts have strong input into leadership preparation programs, which may be offered in-house or with a university or organizational partner. |
| **Hiring and placement** | Aspiring leaders monitor the district job board for vacancies and apply for those they are interested in.<br><br>The hiring process is determined by each individual district supervisor or site leader. The aspiring leader may interview with only one person.<br><br>New leaders are haphazardly matched to sites. | Districts and district leaders regularly share job vacancies directly with eligible aspiring leaders.<br><br>Districts have multimeasure hiring processes that include (at minimum) standard interview questions, a performance task, and a rating rubric. The aspiring leader interviews with a panel of school and district employees and community members, sometimes more than once.<br><br>New leaders are strategically matched to sites according to their expertise and strengths. |
| **Ongoing support** | In-service leaders may seek out professional learning or guidance from colleagues and supervisors.<br><br>Professional learning is one-size-fits-all.<br><br>New principals receive professional learning (induction) and support. | Districts provide in-service leaders with systematic, sequenced, job-embedded support.<br><br>Professional learning is differentiated by principal needs.<br><br>All principals receive professional learning and ongoing support aligned with their career stage. |

## Methodology

We used a mixed methods approach to answer the research questions with data from five urban school districts in California. Data came from four sources: interviews with district leaders, district staffing data, pipeline participation data, and CORE-PACE California data extracts (see Figure 1). First, we conducted interviews, which began in 2022 and were completed by the end of 2023. Second, our research team worked alongside partners at PACE and in each of the five participating districts to collect school-level and district-level administrative staffing data as well as district-level pipeline program data.

**Figure 1.** Sources of Study Data

| | |
|---|---|
| **District leader interviews** | • Researchers at the Univeristy of Utah conducted semistructured interviews with one to two district administrators who were involved in leadership development and training from each district.<br>• Administrators were asked about aspiring leader program features, hiring, retention, and other related aspects of their roles. District leaders also shared related documents. |
| **District staffing data** | • Districts provided administrative staffing data, which included demographic and employment information related to job titles, job tenure, and employment dates. |
| **Pipeline participation data** | • Districts provided administrative pipeline data, which included information related to formal pipeline program participation. |
| **CORE-PACE California data extracts** | • CORE-PACE provided school-level data (based on CALPADS), which included student demographics, social-emotional measurements, achievement scores, attendance, and proportion of free or reduced-price lunch, among other variables. |

All data sources combined yielded a full sample of approximately 272,671 person-by-year observations. To follow changes in districts' school leader workforce, we used multiple consecutive years of district staffing and pipeline participation data. Table 2 shows the specific range of available data provided by each district. The varying structures and length of districts' data introduced two limitations to the study. First, while the provided data allowed for rich analysis of trends within districts, it did not allow for valid comparisons across districts. Second, some districts' data windows were too short to observe the full cycle of principal-pipeline implementation. For example, some districts were unable to provide baseline staffing data prior to pipeline implementation or had implemented pipelines too recently to follow principals' careers for a sufficient length of time. As a result, the study team could not obtain plausibly causal estimates of the effects of district pipelines. We urge district officials to exercise caution when interpreting the descriptive patterns presented in this report, which do not allow for inferences about "what works" in each district pipeline. Results provide high-level patterns, themes, and considerations for how pipelines have unfolded in participating CORE districts within a specific window of time.

**Table 2.** Available Years of Internal Staffing and Pipeline Data, by District

| District | Staffing data | Pipeline participation data |
|---|---|---|
| **A** | 2012–23 | 2012–23 |
| **B** | 2015–22 | 2016–21 |
| **C** | 2017–23 | 2017–23 |
| **D** | 2003–21 | 2018–24 |
| **E** | 2013–24 | N/A |

We used descriptive and inferential statistics to analyze the data and address the outlined research aims. A more detailed description of the data preparation and analysis process can be found in Appendix A.

## District Deidentification

No districts are identified in the findings of this report. Most numerical analyses contained in this report are combined and therefore *do not identify specific districts*. In figures where districts are disaggregated, they are identified by a letter pseudonym (e.g., District A).

## A Note on Terminology

Districts operated multiple programs for aspiring leaders under a variety of names, titles, and structures. For consistency, we refer to these programs as *pipeline programs* when speaking in the aggregate. For programs targeted towards specific positions, such as assistant principal (AP), we occasionally use the terms *aspiring AP program* or *AP pipeline program*.

## Findings

Guided by the research aims listed in the Introduction, the study yielded three sets of results:

- **Form and function of CORE district principal pipelines** examine the purpose and goals of district pipelines, their features and implementation, and common pathways to leadership that emerged across districts.
- **Diversity and representation in CORE district principal pipelines** describe how principal pipelines have shaped the racial/ethnic and gender diversity of each district's school leader workforce and how districts can further diversify their leader workforce.
- **Effectiveness of CORE district principal pipelines** details how well district pipelines are accomplishing their intended outcomes of improving retention of school leaders, strategically matching school-leader placements within buildings, and ensuring effectiveness of new principals.

### Form and Function of CORE District Principal Pipelines

**Goals for principal pipelines.** District administrators in the participating CORE districts expressed several common goals for their principal pipelines. Importantly, no two district pipelines looked the same. Implementation of each common goal varied as each district developed and refined its pipeline around its unique local needs, geography, and community makeup.

Commonly expressed goals for principal pipelines included creating formal, aligned pathways to school leadership; building a bench of high-quality aspiring principals and APs; developing a cadre of equity-oriented principals; and aligning principal training with California licensure and performance expectations. In this section, we describe each goal in detail and summarize cross-district strengths and considerations as districts continue to improve their pipelines.

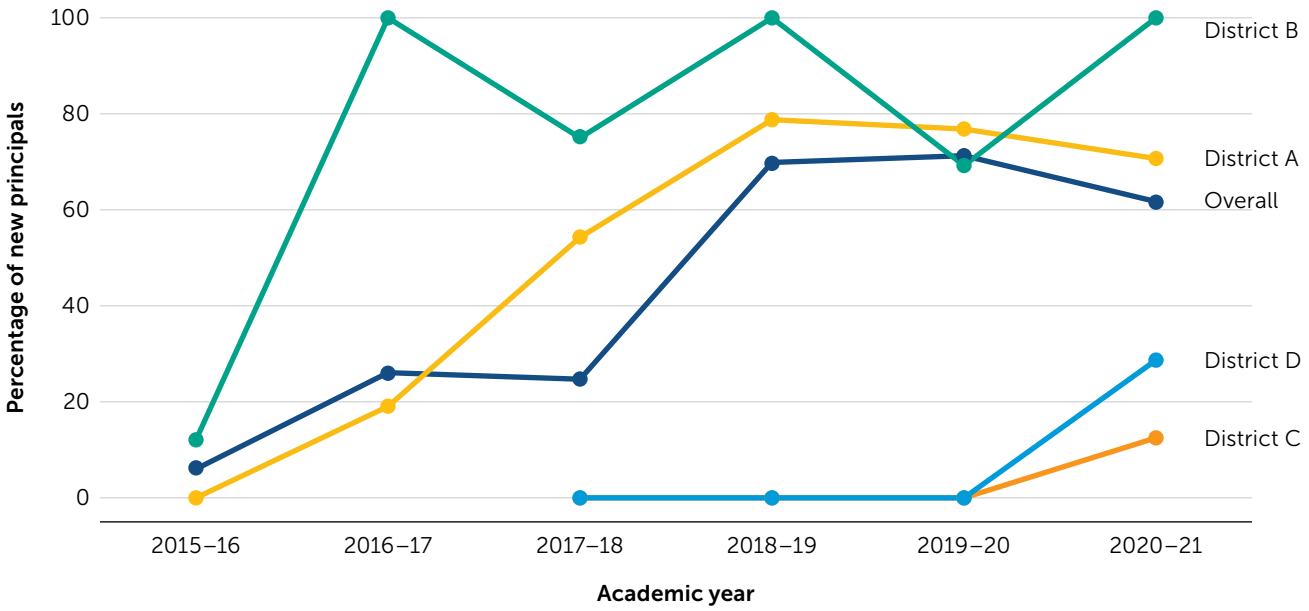
***Creating formal, aligned pathways to school leadership.*** District administrators shared that the central goal of the principal pipeline program was to establish clear, structured pathways for educators to move into school leadership roles. These pathways were intentionally designed to provide a coherent, aligned progression from teacher to AP to principal, with each step involving targeted professional development, mentorship, and leadership training. In formalizing these pathways, districts ensured that aspiring leaders had access to the right resources, guidance, and opportunities to develop the necessary skills and knowledge. These aligned pathways also helped create a seamless transition into leadership roles, promoting a consistent, well-prepared cadre of school leaders equipped to address the unique challenges of each district while adhering to statewide standards and expectations for school leadership.

| CORE district strengths | Considerations |
|---|---|
| Districts worked to make pipeline programs and leadership pathways visible and accessible to school staff. Some districts offered programs that allowed teachers to explore futures in school leadership without making a commitment. | In some districts, teacher and principal pipelines operated in parallel as two separate tracks. In some cases, different departments oversaw each pipeline. Districts that want to align their pipelines should try to integrate teacher-pipeline efforts (such as paraprofessional to teacher) with principal pipelines to ensure that qualified teachers are well positioned to make the "jump" into leadership. |

***Building a bench of high-quality aspiring principals and APs.*** Principal pipelines helped create a robust talent pool of aspiring school leaders well prepared for the complex demands of education leadership. By identifying and developing high-potential teachers and APs, districts were ready to fill vacancies for school-leader positions. This preparation includes targeted professional development, leadership training, and mentoring, which equip these future leaders with the knowledge and skills to improve student outcomes and foster a positive school culture.

Figure 2 shows the proportion of new principals each year in each district who had participated in a pipeline program. Across districts, only about 5 percent of new principals in the 2015–16 school year had participated in a pipeline program. By 2020–21, that number had risen to 55 percent, with two districts (A and B) filling most of their principal vacancies with pipeline-program participants.

**Figure 2.** Percentage of New Principals Who Participated in an Aspiring Leader Program From 2015–16 to 2020–21, By District




*Note.* Pipeline program participation data were provided for four districts from 2015 to 2022; *N* = 2,850. District E is excluded because it did not have a formal principal pipeline.

| CORE district strengths | Considerations |
|---|---|
| Districts with principal pipelines reported that they relied less on personal connections and "tapping" when recruiting aspiring leaders. Districts also adjusted spots in aspiring leader programs according to projected vacancies, which allowed them to be selective about applicant quality. | Some districts noted that local geography and history limited their internal leader labor pools, particularly relating to needs for administrators with specialist backgrounds and racially diverse administrators. In addition to internally tracking potential leader candidates, districts may need to leverage external networks and relationships to recruit high-quality leaders. |

***Developing a cadre of equity-oriented principals.*** Equity was not just about increasing principal diversity. CORE districts focused on preparing school leaders who prioritized equity in their decision-making and leadership practices. This initiative included embedding equity-focused modules in leadership training programs and providing common tools to analyze and address systemic inequities. Training modules focused on using data strategically to identify disparities, implementing culturally responsive practices, and leveraging community knowledge and resources. This focus on equity aligns with broader district goals of reducing achievement gaps and ensuring that all students have access to high-quality education.

| CORE district strengths | Considerations |
|---|---|
| Districts reported that equity training increased leaders' awareness of systemic barriers and better prepared them to support underserved student populations. Leaders developed concrete strategies for fostering inclusive and supportive school climates. | Some districts registered concern that external training providers (e.g., university preparation programs) were not always sufficiently aligned to the district's vision of equity leadership. Districts and external partners should regularly calibrate expectations for delivery of equity-focused leader training. |

***Aligning principal training with statewide licensure and performance expectations.*** CORE districts aligned their principal pipelines with California's two-phase principal licensure expectations, which mandates that preservice principals (a) earn a preliminary administrative services credential and (b) complete a job-embedded principal induction experience. To comply with state credentialing and performance expectations, all five districts maintained partnerships with accredited preparation programs, such as university-run academies. These programs provided leveled training according to the competencies outlined in California Administrator Performance Expectations and California Professional Standards for Educational Leaders. Districts also linked new aspiring leader programs to existing principal induction programs. California requires all preliminary Administrative Services Credential holders to participate in a 2-year induction program in order to obtain a Clear Administrative Services Credential.

| CORE district strengths | Considerations |
|---|---|
| Licensure alignment ensured that principal-pipeline candidates met the state's rigorous preservice and in-service standards to clear their credentials while receiving training tailored to each district's needs. | Induction program costs remain a challenge statewide (Wechsler et al., 2024). In CORE districts that did not provide in-house credentialing or financial support, the path to licensure was lengthy and costly, which potentially limited access for aspiring leaders with fewer financial resources. Administrators also noted that navigating multiple layers of regulatory compliance was time-consuming. |

**Challenges with developing and sustaining principal pipelines.** Overall, CORE districts were actively engaged in developing and supporting future school leaders, but the level of formality and resources dedicated to these efforts varied. Some districts reported multiple, fully developed, formal pipeline programs while others were still developing and refining programs or had not yet taken steps to implement a formal pipeline. Despite these different stages of program development, four common challenges emerged across the five districts (Table 3).

**Table 3.** Districts' Challenges With Principal Pipelines

| Challenge | Action needed |
|---|---|
| **Recruitment and retention:** Many districts expressed difficulties with attracting and retaining qualified candidates, particularly for site-level positions. Factors included competition from other districts and industries, the high cost of living, stress, and workload. At least one district noted that community brain drain, characterized by high outmigration of talented individuals, was a major concern for both the teacher and leader talent pool. | Develop (or strengthen) low-commitment information sessions or workshops to expose potential candidates to leadership pathways and programs. Districts in unstable labor markets can find ways to strategically attract out-of-district talent, such as through partnerships with universities and associations or incentive programs. |
| **Funding fluctuations:** Limited or uncertain funding resources affected the scope and capacity of district pipeline programs. These concerns may become more acute over the next few years as districts grapple with declining student enrollment and the end of pandemic-era relief funding. | Incorporate short- and long-term fiscal projections into pipeline and vacancy planning, using external consultants if necessary. |
| **Inconsistent transparency and accessibility:** Districts with less formalized approaches continued to face challenges with creating transparent recruitment and selection processes. "Tapping"—the practice of relying on individual administrators' recommendations to identify future school leaders—continued in some cases, even when pipeline programs were present. | Continue to make aspiring leader programs public and accessible, and remove hurdles like fees and trainings outside work hours. |
| **Principal wellness support:** Districts recognized that the pandemic had severe implications for schools that are still reverberating as chronic absence, learning loss, and student socioemotional challenges. Districts should consistently evaluate program content to ensure that programs equip school leaders to handle these issues. | Provide ongoing support and development for new administrators (in and beyond induction)—especially for those in challenging school contexts—to prevent burnout and turnover. |

**Common features of CORE district pipelines.** We interviewed key central office leaders in participating districts and reviewed public and internal documents to learn about the defining features of their principal pipeline programs. All districts described engaging in purposeful, systemwide activities to improve the quality of current and future principals. Four of the five districts reported having a formal principal pipeline at the time of the interviews. Table 4 tabulates pipeline design and features across the five participating CORE districts.

**Table 4.** Design and Features of Participating CORE District Principal Pipelines

| District | District A | District B | District C | District D | District E |
|---|---|---|---|---|---|
| **Recruitment** | | | | | |
| GYO programs | ✓ | ✓ | ✓ | ✓ | |
| Multiple aspiring leader programs | ✓ | ✓ | | | |
| Universal recruitment | ✓ | ✓ | ✓ | | |
| **Preservice training** | | | | | |
| Aspiring leader training run mainly or completely in-house | ✓ | ✓ | ✓ | | |
| Aspiring leader training run with one or more partners | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Hiring and placement** | | | | | |
| Hiring eligibility screener/in-basket exam | ✓ | | | | |
| In-house credentialing | ✓ | Planned | | | |
| Standardized hiring process | ✓ | ✓ | ✓ | | |
| **Ongoing support** | | | | | |
| New principal induction | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ongoing principal support | ✓ | ✓ | ✓ | ✓ | ✓ |

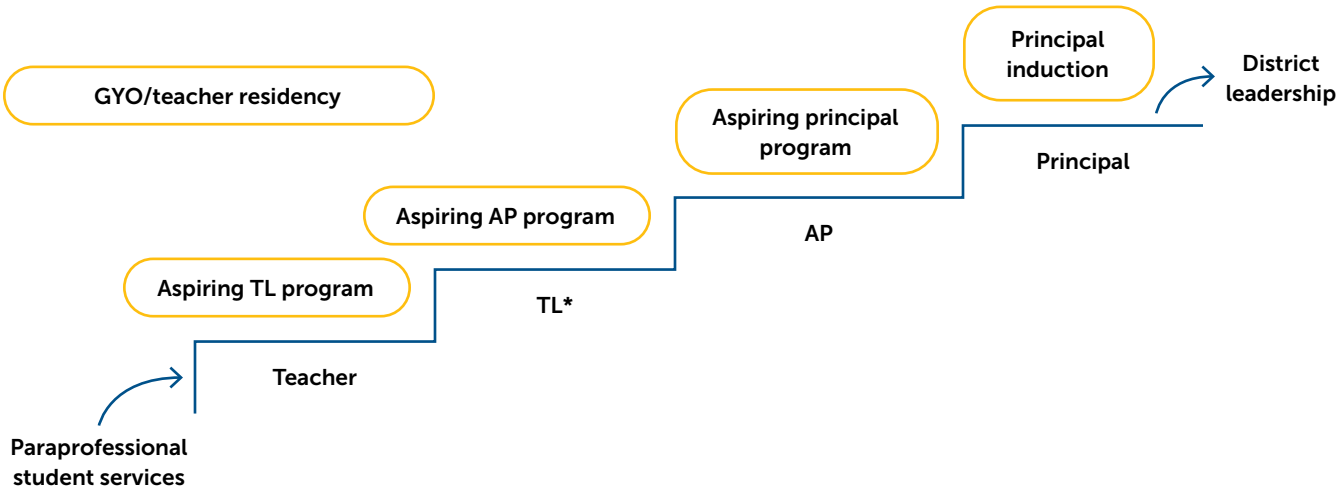
**Common pathways to leadership.** Although each district described its pathway differently, a "typical" pathway existed across all districts: Teachers often received their first taste of leadership through teacher leadership activities or formal roles such as Teacher on Special Assignment (TOSA) or instructional coach. Teacher leaders (TLs) had opportunities to apply for district-run aspiring leader programs designed to prepare them for a career as a school leader.

Districts focused on the following when designing their pipeline pathways:

- **Districts worked to align their principal pipelines to their teacher pipelines.** All districts had established pathways to recruit and support teachers through induction and mentoring. Some districts had similarly robust principal pathways that mirrored many aspects of the teacher pipeline, including recruiting from within the district (GYO), in-house training with a cohort, and working with a coach or mentor.
- **TLs linked the teacher and principal pipelines.** All districts noted that teacher leadership experience was an informal or formal prerequisite to becoming a school leader. The increasing importance of teacher leadership as a way station between teaching and leadership is an emerging change: The average AP was 6 percent and the average principal 17 percent more likely to have held a TL role in 2022 than in 2016.
- **Equity was embedded within all district programs.** All districts prioritized the development of equity-minded leaders and specifically embedded equity training into their pipeline programs. Equity considerations manifested in district pipelines in two ways: (a) using formal pipelines to increase the racial/ethnic diversity of future school leaders and (b) providing explicit programming in aspiring leader programs to develop an equity mindset among future school leaders.
- **Training experience and opportunities for aspiring leaders varied across districts.** Although most districts offered at least one program to aspiring leaders, the programs differed greatly in format, length, and focus. Some districts also offered multiple aspiring leader programs that together represented more of a lattice approach to leadership than a pipeline. District B ran 23 pipeline programs, which included programs for paraprofessionals and aspiring district leaders. District A provided multiple options to certificated employees—for example, teachers had the option of applying for two different aspiring leader programs, one for TLs and one for APs, depending on their specific qualifications and goals.

Figure 3 represents the "typical" pipeline path described by district leaders in interviews, whether currently in place or planned. In the typical path, teachers progressed through teacher leadership and then to school leadership roles.

**Figure 3.** The Typical Pathway to Leadership in CORE Districts



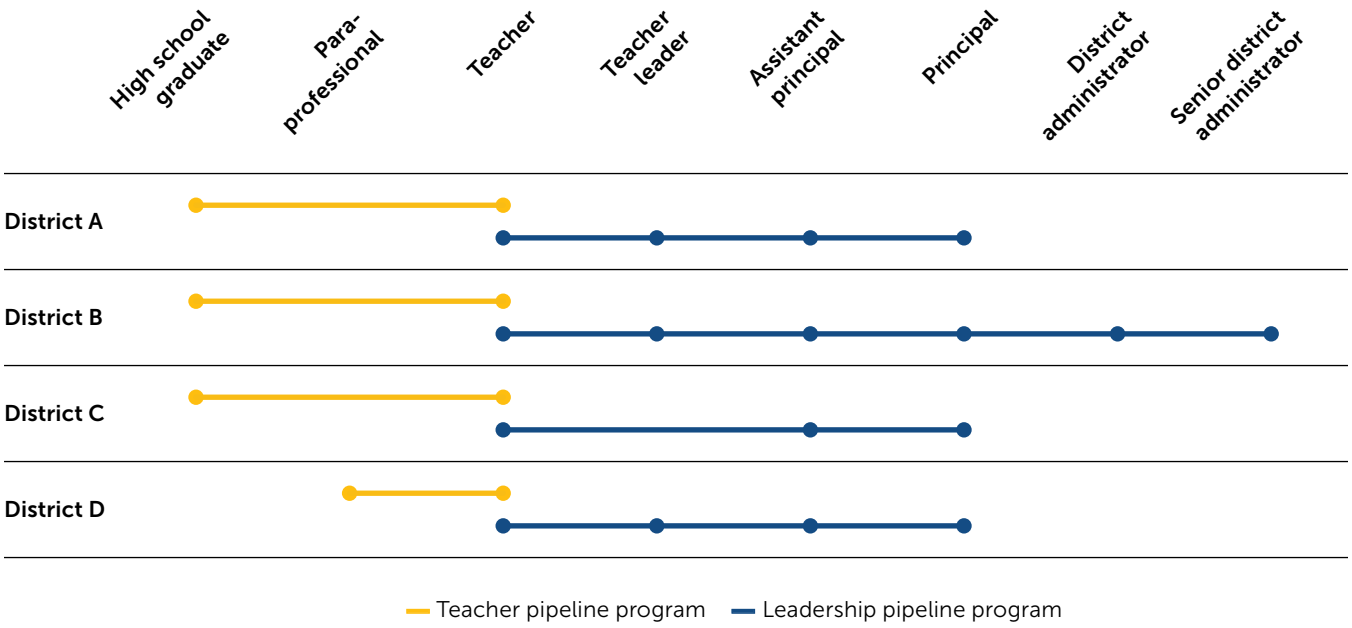

* Includes TOSA, instructional coach, and other TL roles.

*Note.* The figure is not representative of all paths to leadership, which vary across and within districts depending on individual circumstances. Programs outlined in yellow are commonly offered at various stages in the educator career pipeline to advance promising individuals to leadership. GYO = grow your own; AP = assistant principal; TL = teacher leader; TOSA = Teacher on Special Assignment.

Despite having a similar understanding of what a pipeline might look like, districts did not have identical pipeline paths at the time of our interviews. Some districts had formal programs to pipeline paraprofessionals to teachers, for example, while others did not. Other districts with more than one program were still working to bring programs into alignment. For example, District C had a teacher residency program to grow teachers from existing local employees and an aspiring school leaders' program, but these programs were run separately.

In Figure 4, we identify each district's pipeline base (the earliest entry point into the pipeline) and summit (position where pipelines top out). Although we show teacher pipeline and leadership pipeline programs separately, some districts expressed that they viewed their programs as a full career pipeline or career lattice that could, in theory, support an individual with moving from preteaching to high-level district leadership.

**Figure 4.** Base-to-Summit Pipeline Progression by District (as of 2023)




## The TOSA Role: A Critical Stepping Stone to School Leadership

Many future school leaders begin as Teachers on Special Assignment (TOSAs). Although TOSA roles vary by district, leaders consistently view this experience as a key signal of leadership potential, and in some districts, formal teacher leadership experience is required for advancement.

The TOSA role functions as an important stepping stone in the principal pipeline. On average, TOSAs spend 6.5 years in the role; 57.2 percent of APs and 42.2 percent of principals in our sample had previously served as TOSAs. TOSA positions also support leadership diversification: Women and people of color are slightly more likely than White men to become TOSAs. Black, Latinx, and Asian American women TOSAs are more likely to become an AP in a given year, compared to White men. These patterns suggest that TOSA roles can accelerate leadership pathways for teachers of color.

However, White women and Latinx women TOSAs are less likely than White men to be promoted to AP, and White women TOSAs are significantly less likely to participate in aspiring leader programs. The root of these disparities is unclear and cannot be determined from our data.

To strengthen TOSA roles as leadership pathways, districts can:

- proactively recruit TOSAs into aspiring leader programs;
- monitor entry, duration, and exit patterns to identify bottlenecks;
- regularly gather feedback from TOSAs about career goals; and
- recognize that teacher leadership may be a long-term career path for some educators who are not interested in becoming full-time school administrators.

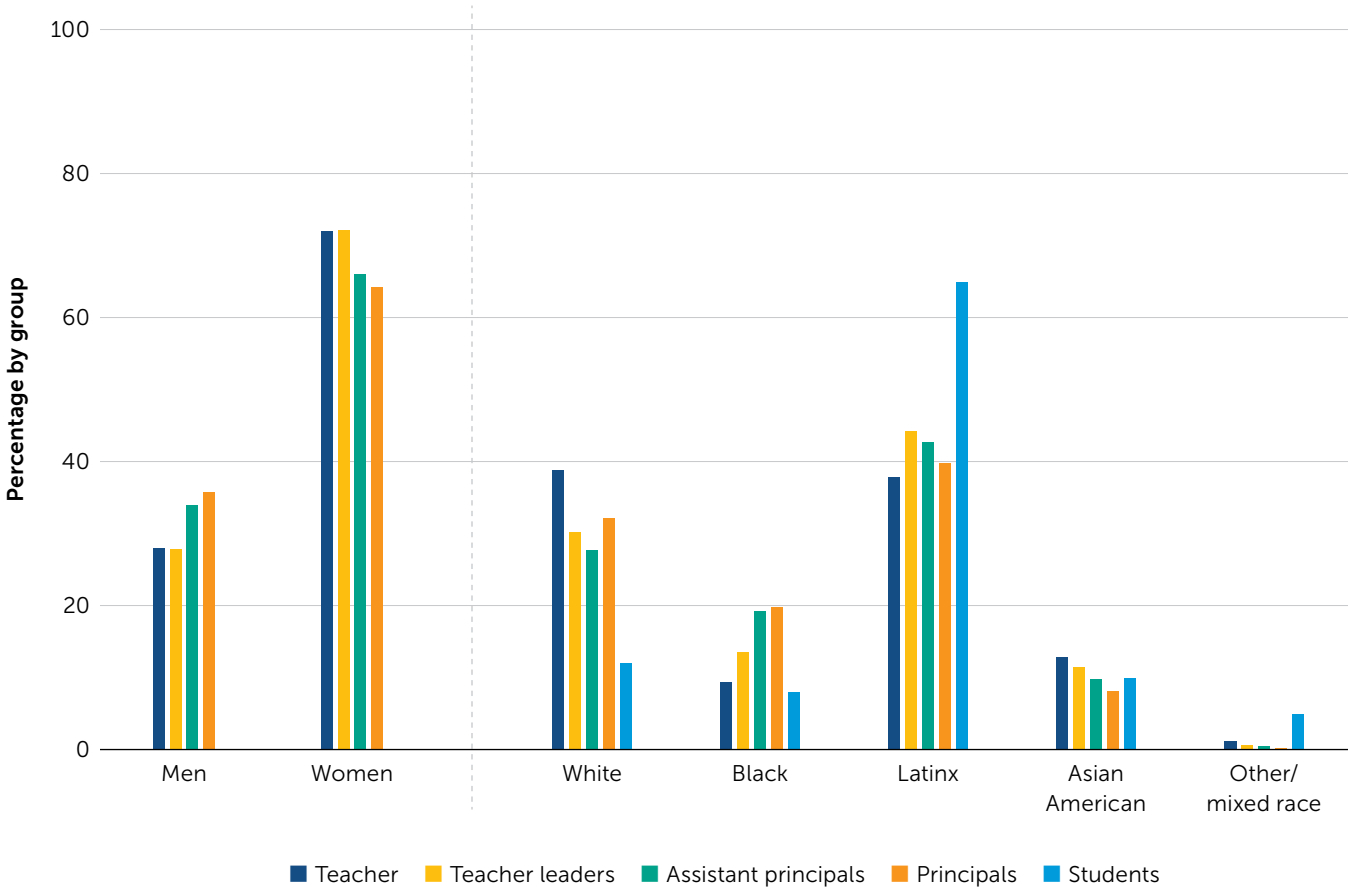
## Diversity and Representation in CORE District Principal Pipelines

The five participating districts prioritized building a race- and gender-diverse school leader workforce. Analysis of districts' staffing data confirmed that districts made progress in recruiting more diverse leader candidates into their principal pipelines over time.[1]

Figure 5 shows the pooled racial/ethnic and gender makeup of teachers, TLs, APs, and principals compared to the student body across the five districts from 2015 to 2022. In all districts, a plurality of APs and principals were White, reflecting the racial makeup of the overall teacher workforce. Representation of Black, Latinx, Asian American, and other/mixed race individuals followed distinctive patterns across the pipeline that cannot be neatly summarized. Notably, slightly greater shares of TL, AP, and principal roles were filled by leaders of color compared to the teacher workforce. For example, about 65 percent of principals were people of color, compared to 60 percent of teachers. These patterns may be due in part to district leaders' intentional efforts to remove barriers to the principalship for racially underrepresented candidates.

[1] To prevent identification of individual districts, graphics in this section show pooled averages across districts.

**Figure 5.** Measures of Diversity in CORE Districts




*Note*. Data are aggregated across the five participating CORE districts, 2015–22; *N* = 324,516. "Other/mixed race" includes American Indian, Native Hawaiian/Pacific Islander, two or more races, and unspecified. Race and gender totals may not sum to 100 percent due to missing or unreported data.

Figure 5 also highlights potential gaps in the racial composition of school leaders. Asian American and other/mixed race individuals are slightly less likely to be represented in leadership roles. Additionally, Latinx individuals remain underrepresented compared to the student population: Latinx students made up nearly two thirds of the student body across the five districts.

District leaders were aware of this challenge, not just in terms of hiring for race and gender diversity but also for representation across school types and experience profiles. Many noted the difficulty of hiring for leader representation from within a teaching workforce that was nonrepresentative of the student body to begin with. One district leader noted: "There is diversity, but not to the degree that would match our demographics, and that's kind of what we're looking at—for that representation for our students."

Another district leader echoed this challenge:

> *When we first started the leadership pipeline … I would say 80 percent of the folks who applied were White, female from the elementary level. We did not have secondary background. We did not have men, and we did not have diversity. We did not have leaders of color. And the board is saying, we need you to [increase leader diversity]. It's like, I'm totally with you, but I also have an applicant pool that is coming from our teaching ranks.*

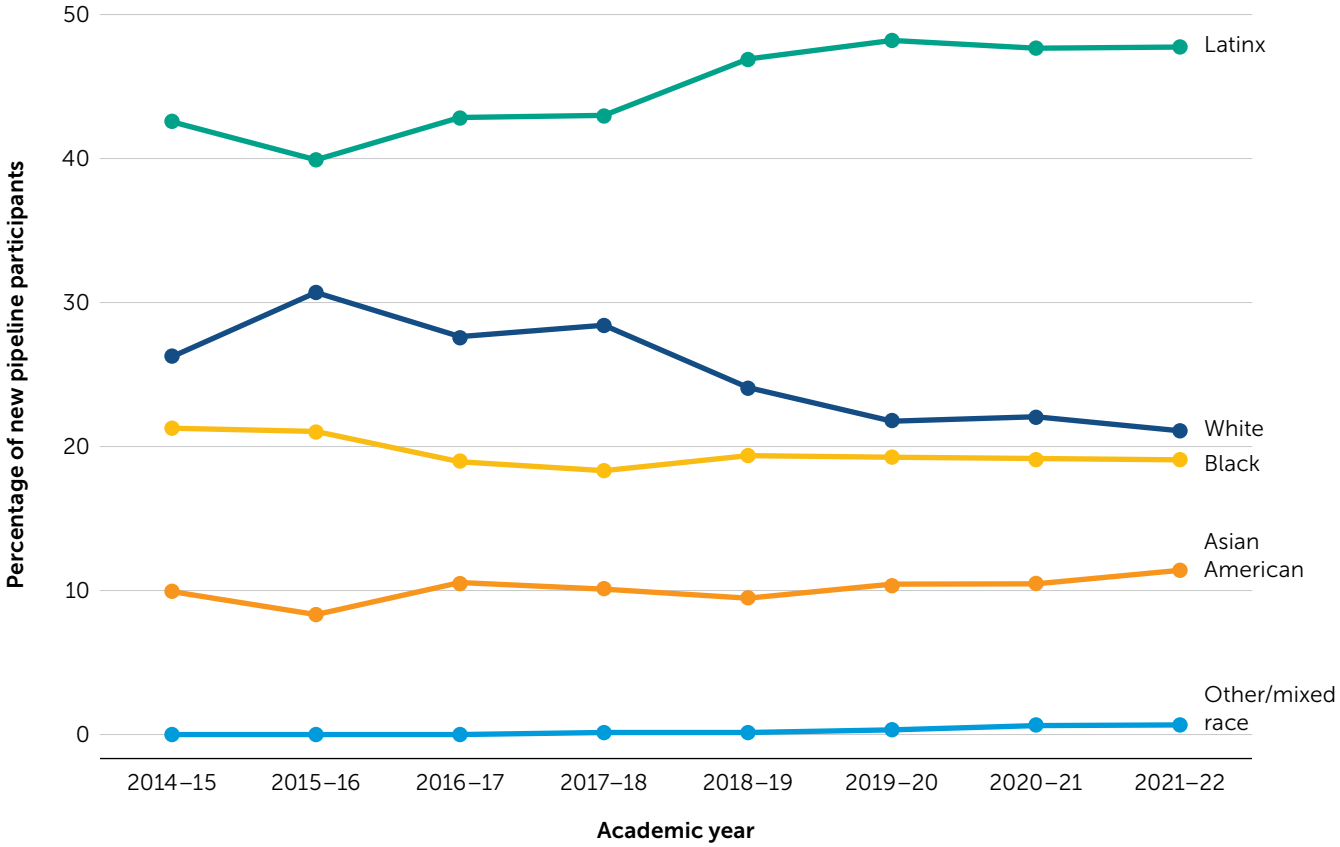
Mirroring national trends, women made up the majority of school administrator positions in the participating CORE districts. Sixty-three percent of principal positions were held by women, slightly more than the national average of 57 percent (Taie & Lewis, 2023). At the same time, women were slightly less likely than men to be promoted into leadership when accounting for representation among teachers and TLs.

**Principal pipelines to promote a diverse leader workforce.** As reflected in Figure 5, the education workforce within participating CORE districts was race and gender diverse, but this diversity was not evenly distributed across roles. In interviews, leaders in all districts identified principal pipeline programs as a vehicle for increasing racial/ethnic representation among future leaders.

***Recruiting and training racially diverse school leaders.*** By 2015, four districts in the study (A, B, C, and D) had a formal leadership program in place. (District E did not have a formal pipeline program but reported engaging in many activities associated with pipeline programs, including targeted recruitment and succession planning.)

Figure 6 shows the racial/ethnic makeup of pipeline-program participants across the five study districts over a 7-year period beginning in the 2014–15 academic year. All districts showed increases in the percentage of leaders of color participating in aspiring leader programs. Notably, the percentage of Latinx participants grew from 43 percent in 2014–15 to 47 percent in 2021–22. The percentage of Asian American and other/mixed race participants grew slightly, and participation from Black educators stayed relatively flat. These numbers suggest that districts may have been responsive to the lack of representation among Latinx, Asian American, and other/mixed race individuals reflected in the overall workforce composition (see Figure 5).

**Figure 6.** Racial Diversity of Educators Participating in Pipeline Programs, 2014–15 to 2021–22



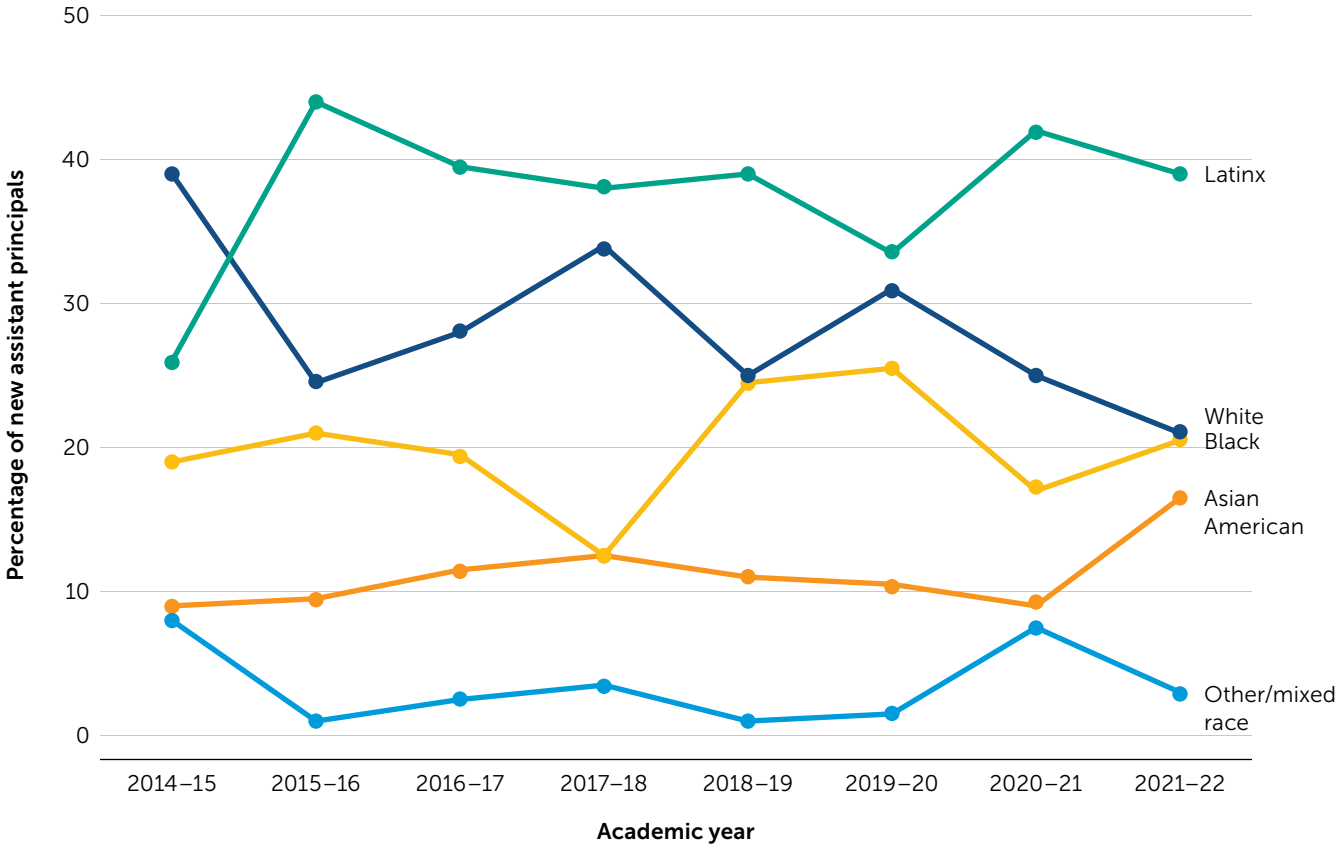

*Note.* Pipeline-program participation data were provided for four CORE districts (A, B, C, and D), 2014–22; *N* = 2,850. District E was excluded because it did not operate a formal pipeline program. "Other/mixed race" includes American Indian, Native Hawaiian/Pacific Islander, two or more races, and unspecified. Race and gender totals may not sum to 100 percent due to missing or unreported data.

All districts reported expanding their principal pipeline programs (in terms of number of pipeline programs and/or number of accepted candidates) during this period. Although this is not reflected in Figure 6, it suggests that the pool of aspiring leaders of color grew in terms of both proportion *and* absolute size across districts.

***Hiring diverse school leaders.*** Targeted recruitment efforts into pipeline programs coincided with modest increases in racial diversity of APs and principals across the five districts. These trends suggest that districts' intentional focus on diversifying their leadership pipelines may be translating into more diverse leadership teams, although many factors beyond pipeline programs—including broader hiring practices, labor market conditions, and demographic shifts—likely contributed to these changes.

Figure 7 presents the racial demographics of newly hired APs in each year. Beginning in 2015–16, Latinx leaders represented a plurality of newly hired APs, ranging from 33 percent to 44 percent of new APs each year thereafter. The percentage of new AP hires who were Black or Asian American also noticeably increased in 2021–22. It is unclear whether this pattern was sustained in future years.

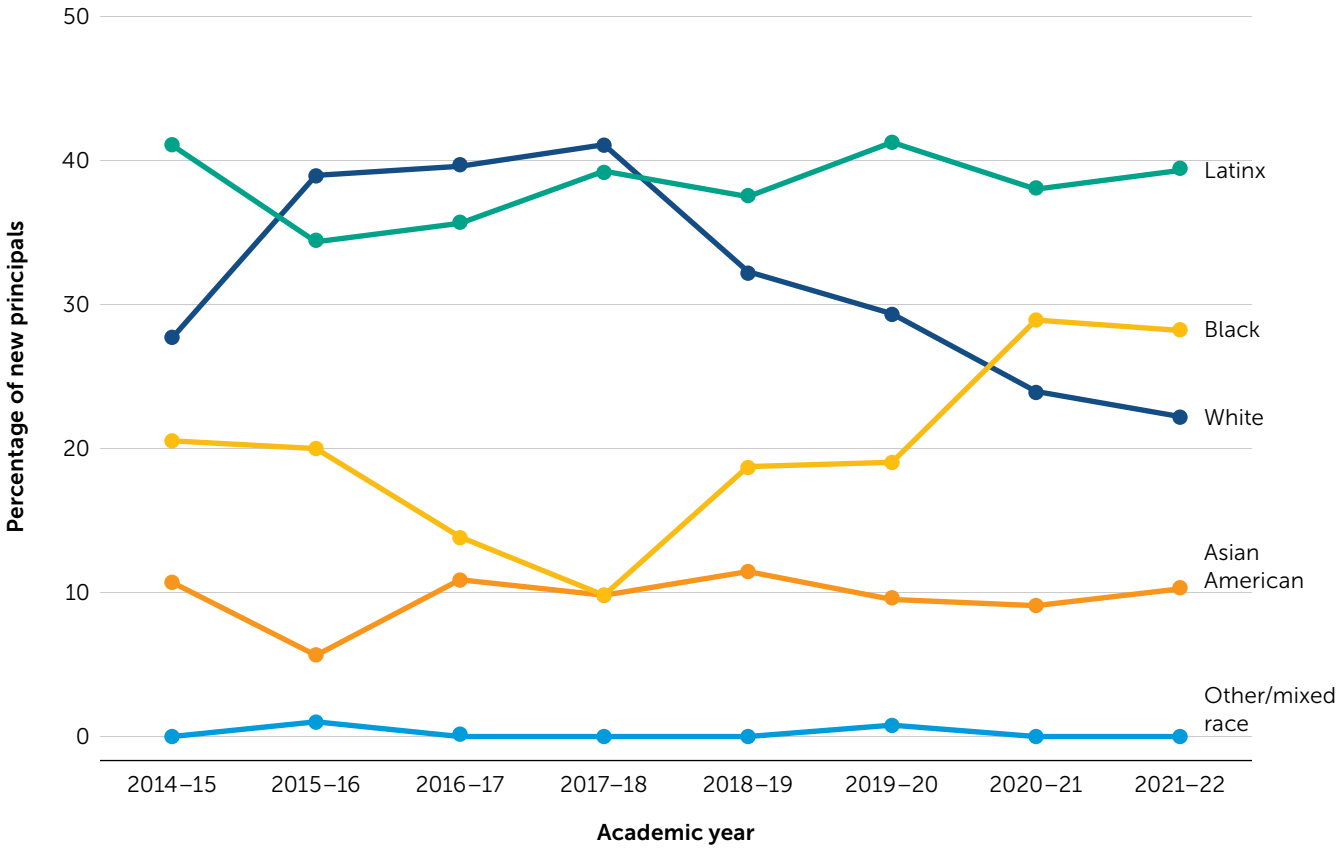
**Figure 7.** Racial Diversity of New Assistant Principals, 2014–15 to 2021–22




*Note.* An individual is considered a "new assistant principal" for the first year their job code is classified as assistant principal. The figure includes all new assistant principals ($N$ = 674) hired across five CORE districts each year. "Other/mixed race" includes American Indian, Native Hawaiian/Pacific Islander, two or more races, and unspecified.

Figure 8 reflects smaller shifts in the racial diversity of newly hired principals. Most noticeably, the percentage of newly hired Black principals began to tick upward in 2018–19, with Black principals representing 27 percent of all new principal hires in 2021–22. The proportion of new principals who identified as Latinx, Asian American, or other race fluctuated each year but changed little overall.

**Figure 8.** Racial Diversity of New Principals, 2014–15 to 2021–22




*Note.* An individual is considered a "new principal" for the first year their job code is classified as principal. The figure includes all new principals ($N$ = 460) hired across five CORE districts each year. "Other/mixed race" includes American Indian, Native Hawaiian/Pacific Islander, two or more races, and unspecified.

These shifts in leadership demographics occurred during a period when districts were actively working to diversify their pipelines and, in some cases, removing financial and structural barriers to leadership preparation. For example, at least two districts provided in-house administrative certification training at no cost to candidates. Although we cannot definitively attribute these demographic changes to pipeline programs alone, the timing and magnitude of increases in leaders of color, particularly Black leaders, align with districts' stated goals and targeted recruitment efforts.

## Special Educators: Less Likely to Become School Leaders

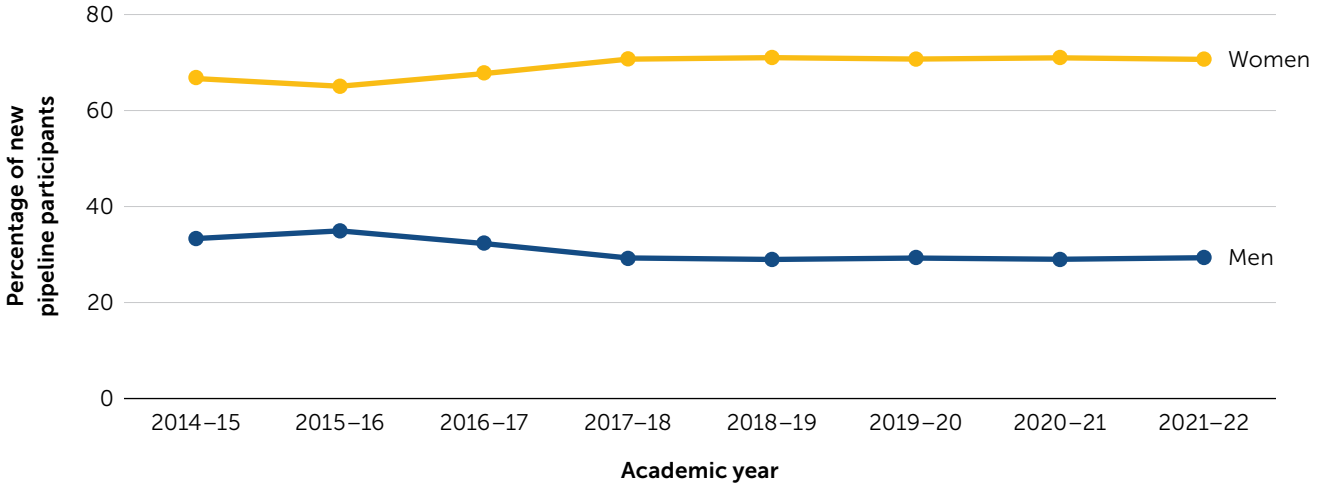
Effective school leadership requires knowledge of special education law and inclusive teaching practices. In California, about 14 percent of students are identified as needing special education services (Ripma et al., 2026).

About 17 percent of teachers and TLs in our sample had special education experience. Yet only 8 percent of TLs who participated in an aspiring leadership program had any special education experience. Educators with a special educator background at any level were less likely to be promoted into leadership roles, regardless of whether they participated in a district principal pipeline program. These findings suggest that school leaders—particularly principals—may have limited background in supporting students with disabilities and their teachers.

To encourage diversity in teaching experience for future leaders, districts should make targeted efforts to recruit special education teachers into leadership opportunities and audit leader recruitment and training processes to ensure that special education teachers are not being inadvertently discouraged or excluded. Districts can also provide sitting leaders with specific training to bolster their knowledge and skills in supporting students with disabilities.

**Gender diversity in school leadership.** Unlike racial diversity, gender representation in pipeline programs remained relatively stable over time. Figure 9 presents the gender trends for pipeline-program participants. Women consistently made up approximately 65–71 percent of pipeline-program participants across years. This stability suggests that women's participation in pipeline programs has remained consistently strong. Pipeline participation rates of men and women are on par with the gender breakdowns of districts, suggesting that districts' recruitment practices are gender equitable.

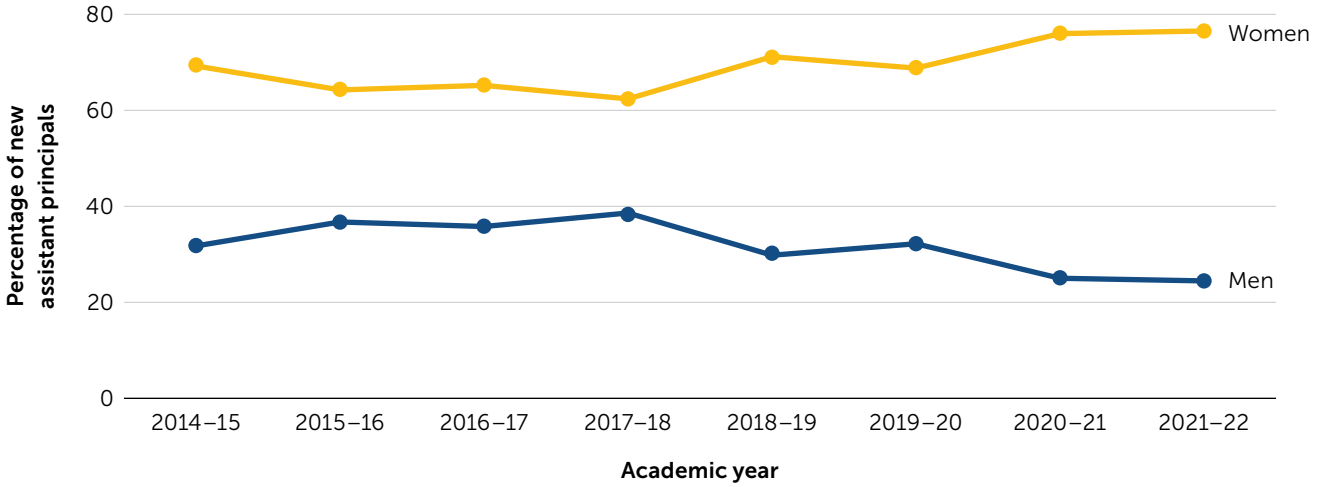
**Figure 9.** Participation in Pipeline Programs by Gender, 2014–15 to 2021–22




*Note.* Pipeline-program participation data were provided by four CORE districts (A, B, C, and D), 2015–22; *N* = 2,850. District E was excluded because it did not operate a formal pipeline program.

Equitable gender recruitment into pipeline programs may have contributed to more equitable hiring of women into leadership roles. Across all districts, women make up 70–78 percent of teachers but typically represent 60–70 percent of APs and principals. Figure 10 presents the gender trends for newly hired APs. Among CORE districts, the share of women among newly hired APs grew from 69 percent in 2014–15 to 74 percent in 2021–22.

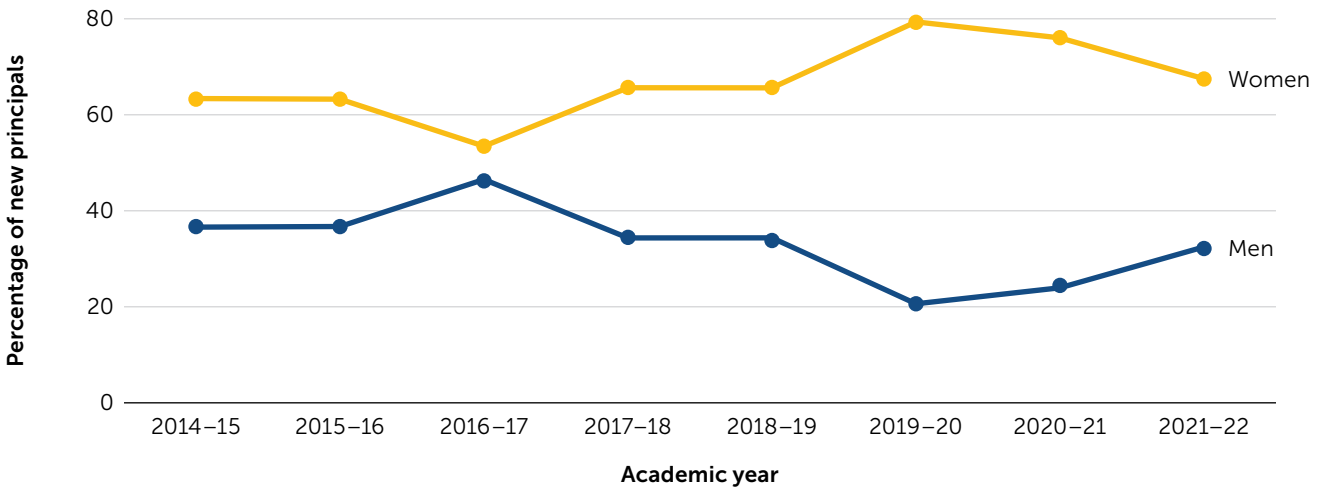
**Figure 10.** Gender Share of New Assistant Principals, 2014–15 to 2021–22




*Note.* An individual is considered a "new assistant principal" for the first year their job code is classified as assistant principal. The figure includes all new assistant principals hired each year aggregated across the five participating CORE districts, 2014–22; *N* = 674.

Figure 11 presents the gender trends for newly hired principals. Among new principals, women's representation increased from 62 percent in 2014–15 to 68 percent in 2021–22. While other factors may have contributed to the higher share of women among newly hired principals, this growth in the representation of women does coincide with the introduction of several new pipeline programs. This suggests that formal pipeline programs opened the door for more women to advance to school leadership after 2014–15.

**Figure 11.** Gender Share of New Principals, 2014–15 to 2021–22

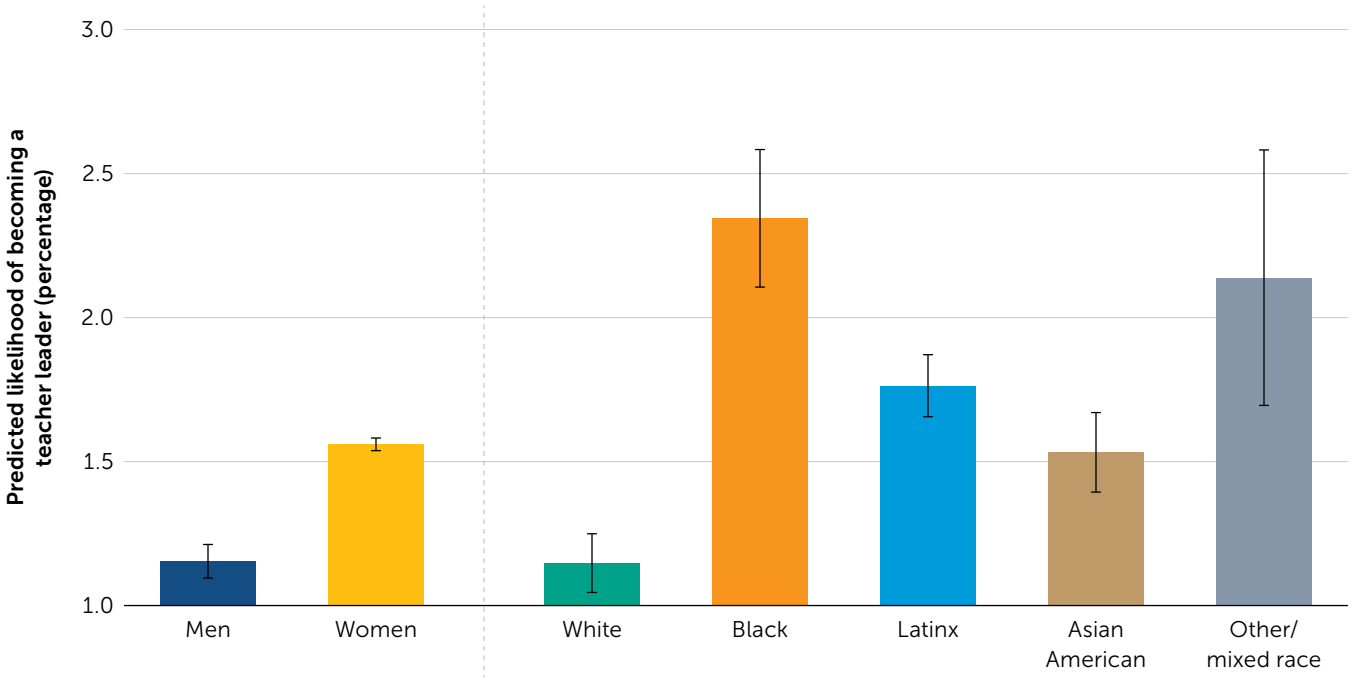



*Note*. An individual is considered a "new principal" for the first year their job code is classified as principal. The figure includes all new principals hired each year aggregated across the five participating CORE districts, 2014–22; *N* = 460.

**Predicted likelihood of promotion to leadership.** Beyond examining descriptively who enters pipeline programs and who gets hired into leadership positions, we analyzed whether race and gender were associated with the likelihood of advancing through different stages of the leadership pipeline, controlling for factors like school demographics. Notably, these analyses control for other variables that might predict promotion, such as years of experience or the type of school a leader worked in. This allows for apples-to-apples comparisons that illuminate whether there are systematic differences in aspiring leaders' career progression.

Figure 12 presents the predicted probabilities of teachers advancing to teacher leadership. Women and people of color were significantly more likely than men and White educators to advance from teaching positions into TL roles (such as TOSA or instructional coach positions) in a given year. These differences are small since the majority of teachers each year do not become TLs. However, this pattern suggests that women and teachers of color are successfully becoming TLs, an important stepping stone to school leadership in many districts.

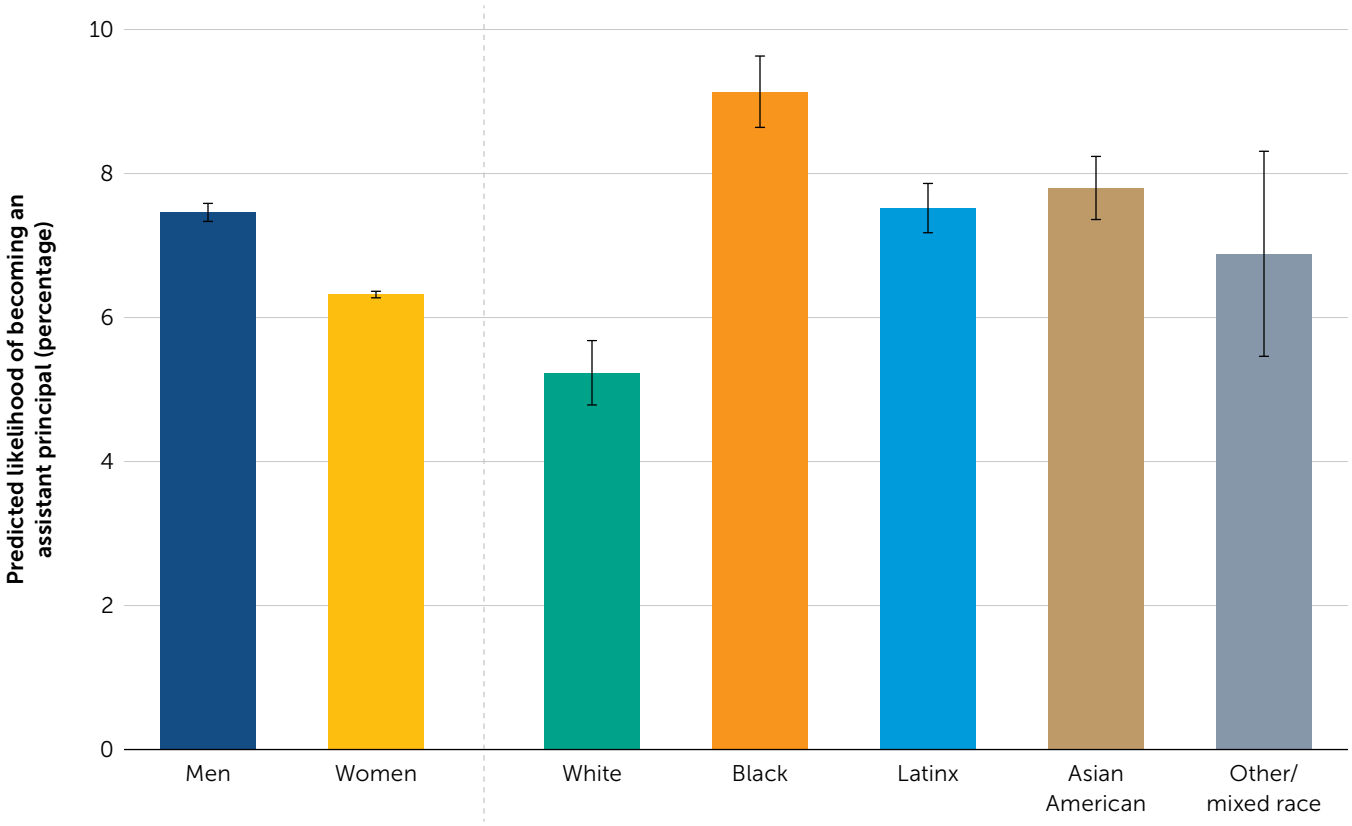
**Figure 12.** Predicted Probabilities of Promotion to Teacher Leadership




*Note.* Predicted probabilities of advancing to teacher leadership hold all other variables at their means. The figure includes all teachers aggregated across four participating CORE districts (A, B, C, and E), 2015–22; *N* = 210,301. District D was excluded because it did not provide data on TOSAs.

Next, we examined predicted promotion of TLs into AP roles (Figure 13). This is a crucial juncture in the movement from teaching to administrative leadership. As with promotion to teacher leadership, TLs of color are significantly more likely than White TLs to be promoted to AP. Black TLs are significantly more likely than Latinx, Asian American, and other/mixed race TLs to become APs. However, women in TL roles were about 15 percent less likely to become APs than men with comparable professional backgrounds.

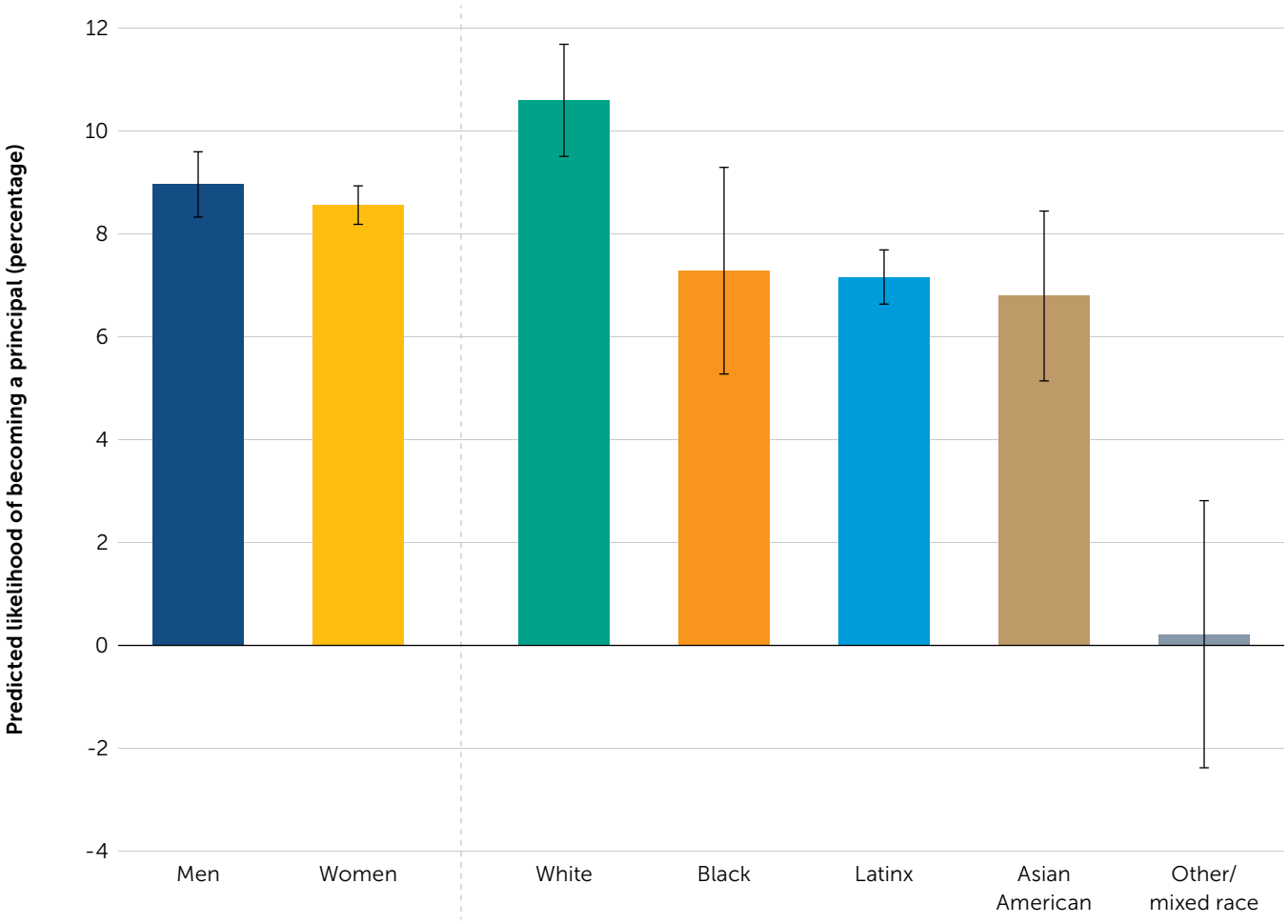
**Figure 13.** Predicted Promotion of Teacher Leaders to Assistant Principal




*Note.* Predicted probabilities of advancing to the assistant principalship hold all other variables at their means. The figure includes all teacher leaders aggregated across four participating CORE districts (A, B, C, and E), 2015–22; *N* = 12,914. District D was excluded because it did not provide data on TOSAs.

Between 2015 and 2022, White APs were slightly more likely to be promoted to the principalship compared to women and people of color (Figure 14). For example, a White AP had a 10.5 percent chance of being promoted to a principal role in a given year, while a Black, Latinx, or Asian American AP with a similar professional background had about a 7 percent chance. This pattern represents a reversal from earlier career stages, where educators of color showed equal or higher rates of promotion.

**Figure 14.** Predicted Promotion of Assistant Principals to Principals




*Note.* Predicted probabilities of advancing to the principalship hold all other variables at their means. The figure includes all assistant principals aggregated across the five participating CORE districts, 2015–22; *N* = 4,756.

Taken together, these predicted probabilities of advancement suggest that each type of promotion up the pipeline—from teacher to TL, TL to AP, and AP to principal—is distinct. The race and gender makeup of each talent pool varies, and decision-making processes and criteria for promotion do too. According to interviews, district leaders carefully considered the specific succession and hiring needs of each level. These needs changed from year to year and even from site to site, depending on school context.

Districts also noted that their principal pipeline programs often changed before their hires did. For example, one district leader noted:

*In the last few years of the pipeline, we are looking for diversity of all kinds, you know: diversity in background, diversity in gender, diversity of ethnicity. And so we have had such a different group now, much more reflective of our students. If you look at our overall numbers in the district, we still have a ways to go. But if you look specifically of the graduates coming out of our two pipelines, they are much more reflective of our student population.*

The slow shift in recruiting historically underrepresented leaders to aspiring leader programs may provide insight into why educators of color are more likely to be hired as TLs and APs but less likely to become principals. The persistence of this pattern should be reexamined once program graduates have had sufficient time to move through the pipeline.

## Effectiveness of CORE District Principal Pipelines

In this final section, we assess indicators of district principal pipelines' success. The available data allowed us to evaluate three key goals of principal pipelines:

- **promoting** qualified candidates to principal positions,
- **matching** new principals to specific school sites based on their background and experience, and
- **retaining** effective principals in principal positions.

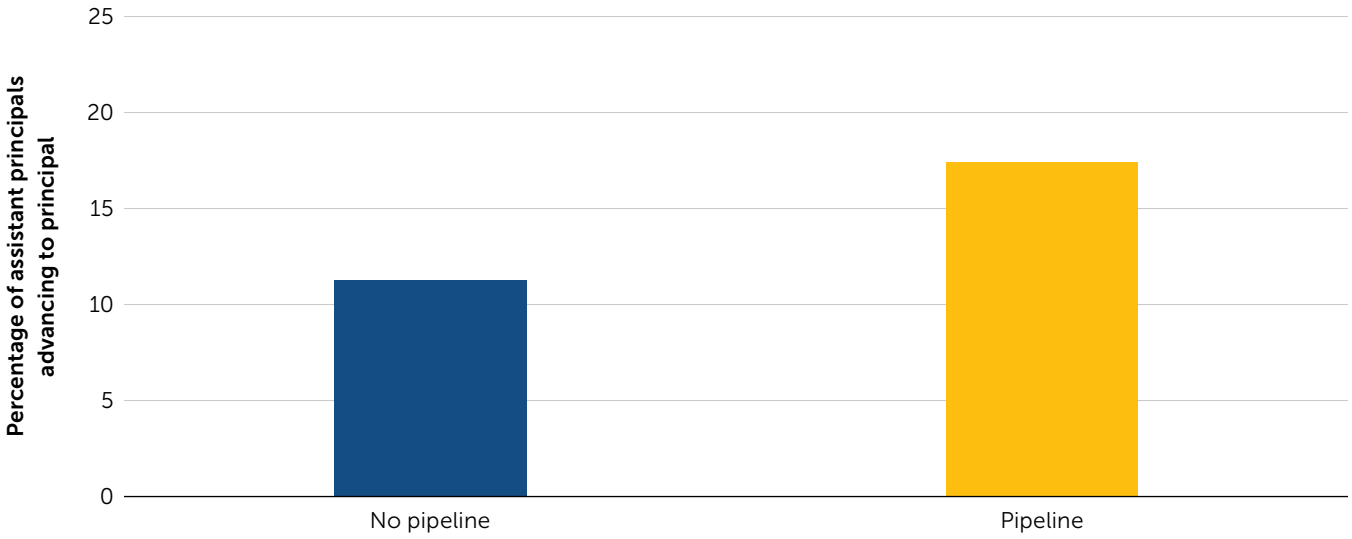
Because of data limitations, we could not assess program participants' effects on schools or students, although we found evidence that suggests a small effect on student attendance (see Appendix B). These are important success indicators that should be considered in future research.

**Promoting qualified candidates to principal positions.** We compared the likelihood of promotion from AP to principal among candidates who had participated in a district aspiring leader program compared to candidates who did not. Here, we refer to aspiring leader programs as *pipeline programs* and leader candidates who participated in any aspiring leader program[2] as *pipeline candidates*.

APs who participated in an aspiring leader program were significantly more likely to become principals in the district within 3 years (Figure 15). Pipeline-program participants had a 17 percent chance of promotion to principal (about one out of every six program participants), while nonparticipants had an 11 percent chance of promotion (about one out of every ten nonparticipant APs). For context, this means that about one in six pipeline-program participants became principals within 3 years.

[2] To allow for cross-district comparisons, we label candidates as pipeline candidates if they participated in any district-run aspiring leader program at any time prior to promotion. Some districts in our sample indicated which aspiring leader programs candidates had participated in and the approximate dates. Others indicated that a candidate had participated in an aspiring leader program but did not provide the date of participation and/or did not indicate the type of aspiring leader program.

**Figure 15.** Advancement Within 3 Years of Assistant Principals to Principals




*Note.* The figure includes all newly hired assistant principals across four participating CORE districts (A, B, C, and D), 2015–22; *N* = 2,340. District E was excluded because it did not operate a formal pipeline program.

This pattern aligns with districts' goals of creating clear pathways to school leadership. Pipeline programs appear to be identifying and preparing enough APs who are ready to take on principal roles within a reasonable time frame to maintain a healthy leadership pipeline. It's important to note, however, that we cannot determine whether pipeline training itself results in faster advancement or whether pipeline programs select candidates who would have advanced quickly regardless. Districts may prioritize pipeline participants for principal vacancies, or pipeline participants may be more proactive in seeking advancement opportunities.

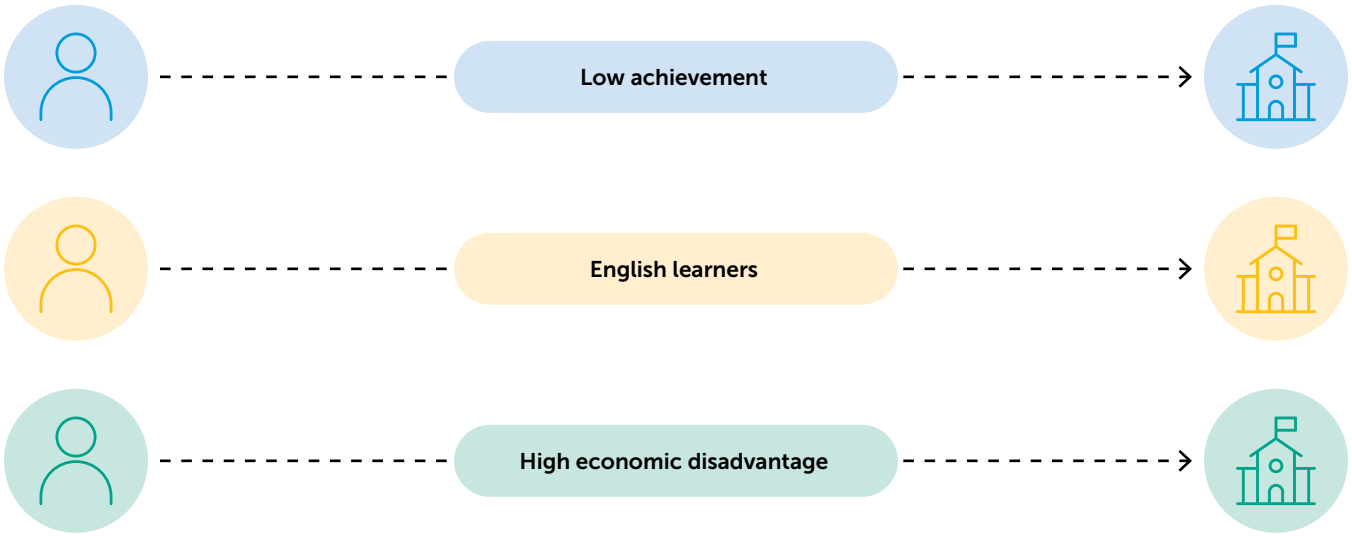
The combination of stronger principal retention and efficient AP-to-principal progression suggests that pipeline programs are functioning as intended.

**Matching new principals to schools.** District leaders often aim to place new principals in schools where their prior experience will be an asset. Our analysis examined whether pipeline participation influenced how well new principals were matched to schools similar to those where they had previously worked.

Across districts, we found that prior experience in schools with similar demographics was a strong predictor of principal placement. New principals were typically placed in schools with demographic and achievement profiles similar to schools where they had previously worked (Figure 16):

- Principals with prior experience in schools with low math or English language arts achievement were more likely to be placed in schools with similar achievement levels.
- Principals with prior experience in high English learner (EL) schools were more likely to be placed in high EL schools.
- Principals with prior experience in high free or reduced-price lunch (FRPL) schools were more likely to be placed in high FRPL schools.

**Figure 16.** Placement of New Principals by Student Demographic Profile




Several district leaders described the hiring and placement process as an intentional effort to place principals with direct experience and backgrounds working with underserved students. One leader noted the importance of having principals "who look like and are from the places where our least served students are from."

District leaders also noted that matching and specialization were secondary to developing foundational leadership skills that would be transferable across a variety of school contexts, such as the ability to lead a team. One central office administrator explained:

> *So we build general [skills], thinking about different district programs, thinking about leadership skills, thinking about our school leadership framework. Our goal is that whether you are a pre-K or adult ed principal, the skills we are building through the program will support you anywhere within the continuum. … But when you're applying for your position, you really want to look at that actual flyer for the school to see if it matches your why and who you are.*

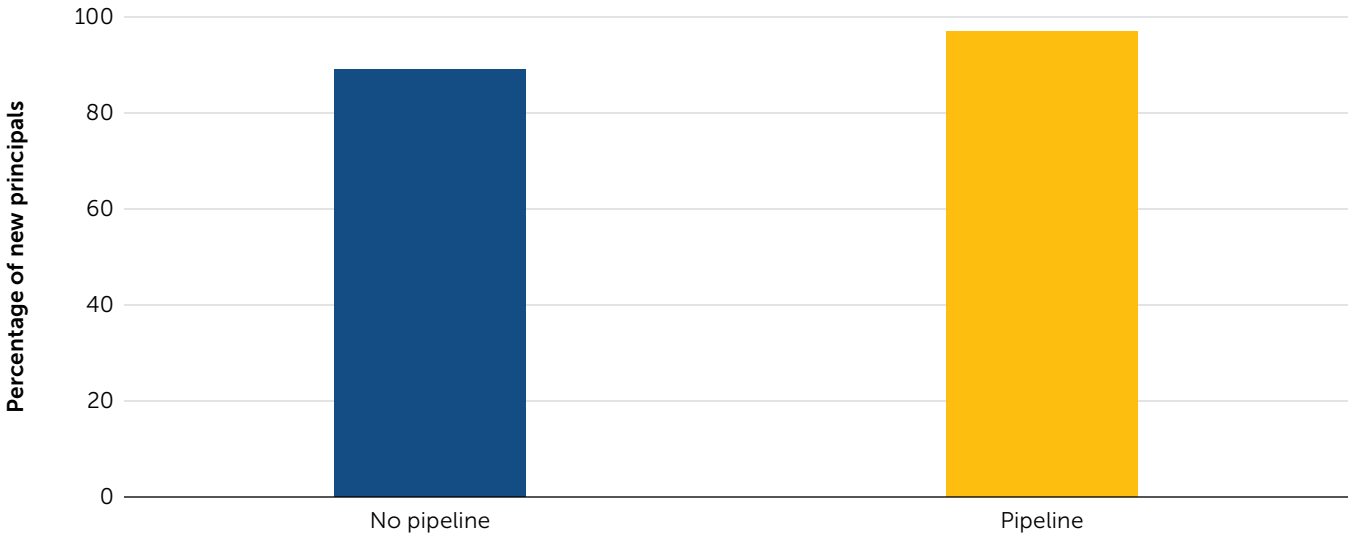
This district leader viewed the role of the district as ensuring that principals received general, aligned skills through direct training, while aspiring principals were responsible for determining which schools might fit their particular skills and mindsets.

Pipeline-program participation did not significantly change these matching patterns except in the case of students with disabilities. Both pipeline and nonpipeline principals were placed in schools that matched their prior experience at similar rates. One notable exception was that pipeline-program participants were more likely to be placed in schools serving high percentages of students with disabilities.

**Retaining effective principals.** One key goal of principal pipelines is to improve the retention of new school leaders. We examined whether pipeline-program completion was associated with leader retention in their districts and whether pipeline participation affected the speed at which APs advanced to the principalship.

Pipeline-program participants who became principals were far more likely to remain in the district than principals who did not participate in an aspiring leader program (Figure 17). Among newly hired principals who did not participate in a pipeline program, 85 percent were retained in their districts for at least 3 years. Among principals who participated in a pipeline program, 97 percent were retained in their districts for that same time, a statistically significant difference. However, pipeline-program participants were also more likely than nonparticipants to move schools during this time (not shown).

**Figure 17.** District Retention of New Principals for 3 Years




*Note*. The figure includes all newly hired principals across four participating CORE districts (A, B, C, and D), 2015–22; *N* = 1,943. District E was excluded because it did not operate a formal principal pipeline program.

Even though this result is correlational, it strongly indicates that participation in an aspiring leader program helps retain school leaders. In addition to providing crucial knowledge and skills, these programs prepare principal candidates to navigate the role within their *specific* district context by familiarizing them with district leadership frameworks and policies and by building principals' networks with other leaders.

## Conclusion

The five CORE districts examined in this study represent some of California's largest and most complex urban school systems, and their experiences with principal pipelines offer important lessons for districts across the state and nation. Taken together, the evidence suggests that formal, well-resourced principal pipelines can meaningfully improve the preparation, diversity, and retention of school leaders.

The findings presented in this report lend themselves to several implications for district policy and practice surrounding principal pipelines:

- **Align pipelines across the full educator career span.** As districts continue to develop and formalize their principal pipelines, they should be attentive to potential silos or misalignment among existing pipelines. For example, districts can align GYO teacher efforts with their principal pipelines to architect a smooth, accessible pathway from teaching to leadership. Districts with well-developed principal pipelines may consider expanding upward to include central office administrator positions, creating a leadership lattice or potential career pathways.
- **Use the TOSA and AP roles strategically.** TL positions were a critical and occasionally underutilized lever for diversifying the principal pipeline. Districts can formalize TL-to-AP pathways by actively recruiting interested TOSAs into aspiring leader programs. At the same time, districts must be aware that not all TOSAs and APs will want to move up and should make space for individuals who would prefer to grow within the roles.
- **Address the special education gap.** As the proportion of students with disabilities grows in California schools, the lack of special education teachers moving into school leadership is worth addressing. Districts should audit their pipeline entry points to understand why special education teachers are underrepresented in school leadership and make efforts to recruit them into aspiring leader programs.
- **Leverage pipelines for leader retention.** The 3-year retention rate for principals who participated in a district principal pipeline program was 12 percentage points higher than for principals who did not participate in a district program. Given the high cost of principal turnover for schools and students, districts should lean into principal pipelines as a tool for retention, not just training. Aspiring leader programs do more than provide general skills: They often embed promising aspiring leaders in a cohort, build their

in-district professional networks, and provide district-specific context for "the way we do things here." These structures may increase program participants' commitment to the district in ways that one-off onboarding and orientations for new leaders cannot.

- **Give pipelines time to mature before reassessing equity goals.** While participating CORE districts made notable progress diversifying the *early stages* of the leadership pipeline, the makeup of the principal workforce was slower to change. Much of this is due to the longer timelines required before aspiring leaders move into the principalship. Districts should stick with their investments in principal pipelines. They can continue to perfect hiring processes by ensuring standardized use of rubrics, structured interviews, and performance assessments. District leaders could also explore developing multiyear succession plans and using available data to match principals to schools more strategically.

We close by emphasizing that the findings in this report capture a cross-section of a continuously evolving process of district and school improvement. Principal pipelines are not "out-of-the-box" interventions; instead, they change along with districts' strategic plans and priorities. Looking ahead, all districts can ensure the success of their principal pipelines through sustained investment, ongoing monitoring and reflection, and a commitment to effective leadership that allows all students to thrive.

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# Appendix A: Description of Coding and Analytic Procedures

## Data Cleaning and Merging

This technical appendix details the procedures used to clean, standardize, and merge administrative personnel records from the five California CORE school districts. These records contained information about employee demographics, positions, and school assignments across multiple academic years, although the temporal coverage varied by district.

Our data-processing approach began with standardization of variables across districts, was followed by quality control procedures, and finished with the appending of district-level data sets into a single data set. We started by standardizing variables across districts, which included developing common variable names and variable values. This was particularly challenging when developing a consistent classification system for positions from district-specific position titles. We discuss this issue specifically in the following section of this appendix.

We received a deidentified data set from PACE that had consistent identifiers within districts, so we had to create district-specific identifiers to enable merging of the data sets across districts. PACE also provided data with consistent school identification across the data sets. These school identifiers allowed us to merge the district personnel data with student data maintained by PACE. Demographic variables required harmonization as well, with particular attention paid to maintaining consistency in gender categories and aligning race/ethnicity classifications. While we flagged missing demographic data, we made the analytical decision not to impute these values and to case-wise delete these observations from our analyses.

For quality control, we used the available data to ensure we had a single person-by-academic-year observation for each individual. In cases where personnel were assigned to multiple schools, we developed standardized procedures for resolution. We used full-time equivalence assignments and assignments in neighboring academic years to assign a "primary" school assignment. Temporal consistency was a key focus, leading us to establish standardized academic year indicators and verify the sequential integrity of multiyear employment records.

Last, we merged the district-level data sets into a single analytic data set. The actual merge procedures were conducted sequentially, with careful verification of field alignment before each merge and maintenance of original district variables and values. We implemented rigorous quality control measures during this phase, including verification of record counts before and after each merge, checks for unexpected duplicate records, and validation of relationships between linked data elements.

## Coding Decisions

Particularly relevant to this analysis were differences across districts in position titles. We used the text-string versions of titles to create broader categories of positions. Given that each district maintained its own system for coding personnel positions, we developed a unified classification system to enable cross-district comparison. This process involved careful mapping of district-specific position codes and titles to standardized categories—paraprofessional, teacher, teacher leader (TL), assistant principal (AP), principal, school support staff, and district office—while preserving the ability to track career progression through various leadership roles. We conducted thorough checks of employment records to identify and resolve duplicate entries, verify the logical consistency of employment dates, and investigate unusual patterns, such as employment gaps or multiple simultaneous positions.

For most positions, it was relatively straightforward to assign position titles to broader categories. For example, districts might have a position title like "elementary teacher" or "secondary principal," and in these cases, classification was clear. Teacher, AP, and principal positions were generally simple to classify; however, TL position titles were particularly challenging to code. One advantage that the five California districts have over other administrative data is the use of the Teacher on Special Assignment (TOSA) position title. Although the specific duties of TOSAs are not clear from the position title, all districts consistently said that the TOSA position filled a TL role in schools, with some variation. For example, District A did not use the TOSA position title as widely. There were, however, several position titles like "instructional coach" that were consistently used for those filling TL roles. We checked with contacts in each district to ensure that we were appropriately classifying position titles to unified categories.

## Analytic Strategies

**Descriptive analyses.** Our descriptive analyses examined proportional trends in newly hired personnel pooled across districts, including the proportion of new hires who were participants in formal pipeline programs (Figure 2), the positions they held prior to being hired into leadership roles, and the race/ethnicity and gender of personnel advancing along the pipeline. We also estimated the mean demographic characteristics of personnel across position types to describe the typical demographic profiles of teachers, TLs, APs, and principals pooled across participating districts (Figure 5). To test whether demographic differences across positions were statistically significant, we conducted unpaired sample t-tests comparing positions adjacent along the pipeline.

Specific descriptive findings included an analysis of pathways to leadership, which revealed that the average AP was 6 percent and the average principal 17 percent more likely to have entered from a TL role in 2022 compared to 2016. We also conducted focused descriptive analyses examining the racial and gender diversity of educators participating in pipeline programs over

time (Figures 6–12), including trends in who was recruited into and trained through aspiring leader programs and who was subsequently hired into AP and principal positions.

Additionally, we explored specific subpopulations of particular interest to the research team and partner districts, including detailed analyses of who enters into and who advances out of TL roles (see "The TOSA Role" callout) and how teachers with experience in special education advance along the pipeline (see the "Special Education" callout). These focused analyses used the same descriptive methods described previously but concentrated on particular subsamples of the personnel data that addressed key district concerns about representation and career progression in specialized roles.

**Predicting advancement.** To examine whether demographic characteristics and pipeline participation were associated with career advancement through different stages of the leadership pipeline, we estimated linear probability models predicting transitions between adjacent career stages. Our analyses focused on three key transitions: (a) teacher to TL, (b) TL to AP, and (c) AP to principal.

The units of analysis for these models were person-year observations, allowing us to estimate the probability that an individual in a given position would advance to the next position in the following academic year. For each transition, we estimated the following model:

$$\begin{aligned} Advance_{isd(t+1)} &= \beta_0 + \beta_1 Pipeline_{isdt} + \beta_2 Female_{isdt} + \beta_3 RaceEth_{isdt} + \beta_4 Doctorate_{isdt} \\ &+ \beta_5 FRL\%_{sdt} + \beta_6 ML\%_{sdt} + \beta_7 SwD\%_{sdt} + \beta_8 Enrollment_{sdt} \\ &+ \beta_9 GradeLevel_{sdt} + \delta_d + \gamma_t + \varepsilon_{isdt} \end{aligned}$$

In this model, *Advance* is an indicator equal to 1 if individual *i* in school *s* and district *d* advanced to the next career stage in year *t + 1*. Individual-level predictors included *Female*, an indicator for gender (female = 1), and *RaceEth*, a set of indicators for racial/ethnic categories, with White as the reference group. We also controlled for *Doctorate*, an indicator for holding a doctoral degree.

School-level characteristics in year *t* included the proportion of students eligible for free or reduced-price lunch (*FRL%*), the proportion of multilingual learners (*ML%*), and the proportion of students with disabilities (*SwD%*). We also controlled for school enrollment measured in thousands (*Enrollment*) and school grade configuration (*GradeLevel*), which indicated whether the school was an elementary, middle, or high school. All models included district fixed effects ($\delta$) to account for time-invariant differences across districts and year fixed effects ($\gamma$) to account for temporal trends. Standard errors were clustered at the district level to account for within-district correlation.

We used linear probability models rather than logistic regression to facilitate straightforward interpretation of coefficients and to enable consistent estimation with fixed effects. Following estimation, we used Stata's margins command to calculate predicted probabilities of advancement for different demographic groups, holding all other variables at their means. These predicted probabilities are presented in Figures 13, 14, and 15.

**Predicting outcomes/effects.** We conducted three sets of analyses to examine the effectiveness of principal pipeline programs: descriptive analyses of retention patterns and regression analyses of strategic matching and student outcomes.

***Retention analyses.*** To examine whether pipeline participation was associated with improved retention of school leaders, we calculated descriptive retention rates for principals and APs. For principals, we identified all individuals entering their first year as a principal and calculated the proportion who remained in their districts 3 years later, comparing pipeline participants to nonparticipants (Figure 18). For APs, we similarly calculated the proportion who advanced to the principalship within 1, 2, and 3 years of entering the AP role. These analyses were purely descriptive and did not control for other factors that might influence retention or advancement.

***Strategic matching analyses***. To examine whether districts strategically matched new principals to schools based on their prior experience and whether this matching differed for pipeline participants, we estimated linear probability models predicting principal placement in schools with specific characteristics. These models took the following form:

$$
\begin{aligned}
&MatchedPlacement_{isd(t+1)} \\
&\quad = \beta_0 + \beta_1 Pipeline_{isdt} + \beta_2 PriorExperience_{isdt} \\
&\quad + \beta_3 (Pipeline \times PriorExperience)_{isdt} + \beta_4 Female_{isdt} + \beta_5 RaceEth_{isdt} \\
&\quad + \beta_6 Doctorate_{isdt} + \beta_7 FRL\%_{sdt} + \beta_8 ML\%_{sdt} + \beta_9 SwD\%_{sdt} \\
&\quad + \beta_{10} Enrollment_{sdt} + \beta_{11} GradeLevel_{sdt} + \delta_d + \gamma_t + \varepsilon_{isdt}
\end{aligned}
$$

In these models, the outcome variable indicated whether a newly placed principal was assigned to a school with high levels of a particular characteristic (e.g., high poverty, high multilingual learner enrollment, high special education enrollment, low achievement). The key predictors were *Pipeline*, indicating whether the principal had participated in a district pipeline program; *PriorExperience*, indicating whether the principal had prior experience in schools with similar characteristics; and the interaction between these two variables. This interaction term allowed us to test whether the relationship between prior experience and placement differed for pipeline versus nonpipeline principals. We included the same school-level controls, district fixed effects, and year fixed effects as in the advancement models. Standard errors were clustered at the district level.

***Student outcome analyses***. To explore whether schools led by pipeline principals showed different patterns in student outcomes, we estimated ordinary least squares (OLS) regression models predicting school-level outcomes. For continuous outcomes including average daily attendance, English language arts achievement (measured in standard deviations), mathematics achievement, and social-emotional learning scores, we estimated models of the form:

$$Outcome_{sdt} = \beta_0 + \beta_1 PipelinePrincipal_{isdt} + \beta_2 FRL\%_{sdt} + \beta_3 ML\%_{sdt} + \beta_4 SwD\%_{sdt} + \beta_5 Enrollment_{sdt} + \beta_6 GradeLevel_{sdt} + \delta_d + \gamma_t + \varepsilon_{isdt}$$

In these models, *PipelinePrincipal* indicated whether school *s* and district *d* in year *t* was led by a principal who had participated in a district pipeline program. Unlike the advancement models, we did not control for principal demographic characteristics, focusing instead on school-level characteristics that might confound the relationship between pipeline leadership and outcomes. These included the proportion of students who were eligible for free or reduced-price lunch, multilingual learners, or students with disabilities as well as school enrollment and grade-level configuration. We included district and year fixed effects to account for district-specific factors and temporal trends. Standard errors were clustered at the district level.

As noted in the main text, these outcome analyses should be interpreted with considerable caution. The research design does not support causal inference, as we cannot rule out selection bias or other confounding factors that might explain differences between schools led by pipeline and nonpipeline principals. Additionally, outcome data were not collected consistently across all districts and years, limiting the generalizability of findings. These results are exploratory and descriptive in nature.

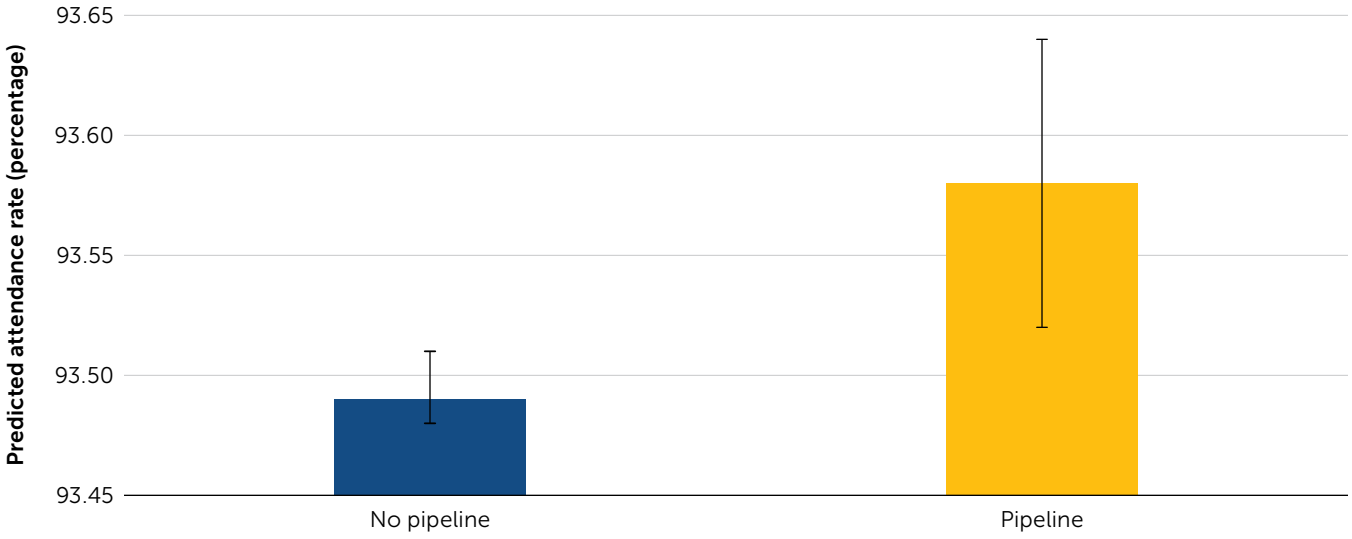
## Appendix B: Effects of Principal Pipelines on Student Outcomes

We examined whether schools led by pipeline participants showed different patterns in student outcomes compared to schools led by nonpipeline principals. Our analysis controlled for school characteristics and district context, but *these findings should be interpreted with considerable caution*. We cannot determine whether pipeline programs caused these outcomes. Additionally, outcome data were not collected consistently across all districts and years, limiting our ability to draw firm conclusions. These results are exploratory and preliminary in nature.

### Attendance

Schools led by principals who participated in pipeline programs had slightly higher average daily attendance rates: approximately 0.1 percentage points higher than schools led by nonparticipant principals (Figure B1). While this is statistically significant, it represents a very small difference. For example, in a school of 500 students, this would translate to roughly one additional student present on any given day. The practical significance of such a modest effect is unclear.

**Figure B1.** Predicted Attendance Rates for Principals




*Note.* Predicted attendance rates hold all other variables at their means. The sample is composed of principals aggregated across four participating CORE districts (A, B, C, and D), 2015–22; *N* = 5,400. District E was excluded because it did not operate a formal pipeline program.

### Academic Achievement

We examined whether schools led by pipeline principals showed different patterns in academic achievement compared to schools led by nonpipeline principals. Our analyses did not reveal statistically significant differences in English language arts or mathematics achievement between schools led by pipeline and nonpipeline principals. Similarly, we found no significant differences in social-emotional learning outcomes.

Given these null findings, districts should not interpret the attendance result reported in the previous section as strong evidence that pipeline programs substantially improve student outcomes. Furthermore, many pipeline principals were relatively new to their roles during the study period, limiting our ability to observe longer term impacts. To understand whether and how pipeline programs affect student outcomes, districts would need to conduct more systematic evaluations with consistent data collection over longer time periods.

## Author Biographies

**Laura K. Rogers** is an associate professor of education in the School of Education and Human Development at the University of Virginia. Her research interests include district organizational conditions for developing and retaining effective school leaders.

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