Do Local-Level Principal Preparation Programs Prevent Principal Turnover?

Evidence from the 2008–2009 Schools and Staffing Survey (SASS) Principal Follow-Up Survey

Sarah McKibben

The demonstrated importance of effective principals for high student achievement, coupled with a dearth of highly qualified, experienced principals who stay in high-needs schools, creates a matter of national urgency for schools and districts to devise programs and policies that not only increase principal quality but also improve the retention of those principals where they are most needed. This study applies multinomial logistic regression to a sample of 5,000 public school principals from the 2008-2009 National Schools and Staffing Principal Follow-up Survey. With that, it examines the impact of school- or district-level principal pre-service training programs on three possible principal turnover outcomes: principals staying in the same school, moving to become principal of another school, or leaving the principal profession. The analysis finds no effect of such programs on principal turnover, which suggests that schools and districts cannot assume local training programs of just any type or quality will help them retain principals, but perhaps the quality of training is more important than simply having access to it.

Introduction

Principals are second only to teachers as school-based influences on student achievement; their impact appears to be greatest in high-needs schools.[1] Given that high school math and reading achievement levels have flatlined nationwide since the early 1980s, while racial achievement gaps have mostly widened during that time frame, the nation cannot afford to ignore the importance of quality school leadership for raising achievement and closing gaps in individual schools. [2]

1 Grissom, Jason A., and Susanna Loeb. "Triangulating Principal Effectiveness How Perspectives of Parents, Teachers, and Assistant Principals Identify the Central Importance of Managerial Skills." ***American Educational Research Journal*** 48, no. 5 (2011): 1091–1123.

2 Rampey, Bobby D., Gloria S. Dion, and Patricia L. Donahue. "NAEP 2008: Trends in Academic Progress. NCES 2009–479." ***National Center for Education Statistics*** (2009).

Less-experienced, less well-qualified principals are more likely to manage low-achieving and high-poverty schools; these schools are also more likely to turnover principals at higher rates and have thinner pools of replacement applicants.[3] This trend is especially concerning given the exceptional influence of principals on school quality and subsequent student achievement.[4] More specifically, principal turnover is associated with teacher turnover, decreases in teacher quality, and lower rates of student achievement.[5] Longitudinal data from Illinois and North Carolina show that principals in majority-minority schools—those in which more than half the student body is of non-Caucasian background—are more likely to transfer or leave the profession altogether.[6] Meanwhile, an emerging body of research suggests that high-quality principals systematically use lower-quality schools as stepping stones to build experience and move into better schools,[7] while low-quality principals simply transfer to low-quality schools,[8] each doing so at the expense of equity. It is a matter of national urgency, therefore, for schools and districts to devise programs and policies that not only increase principal quality, but also keep effective principals in the highest-need schools.

3 Papa, Frank C., Hamilton Lankford, and James Wyckoff. "The Attributes and Career Paths of Principals: Implications for Improving Policy." ***Teacher Policy Research Center*** (2002); Gregory F. Branch., Eric A. Hanushek, and Steven G. Rivkin. "Principal Turnover and Effectiveness" (Paper presented at meetings of the American Economics Association, San Francisco, January, 2009); Marguerite Roza. "A Matter of Definition: Is There Truly a Shortage of School Principals?." (2003).; Ed Fuller and Michelle Young. "Tenure and Retention of Newly Hired Principals in Texas." (Paper presented at meeting of the American Educational Research Association, San Diego, April, 2009); Frank Papa, Jr. "Why do Principals Change Schools? A Multivariate Analysis of Principal Retention." ***Leadership and Policy in Schools*** 6, no. 3 (2007): 267–290.

4 Hallinger, Philip. "Leadership for Learning: Lessons from 40 Years of Empirical Research." ***Journal of Educational Administration*** 49, no. 2 (2011): 125–142; and Robinson, Viviane MJ, Claire A. Lloyd, and Kenneth J. Rowe. "The Impact of Leadership on Student Outcomes: An Analysis of the Differential Effects of Leadership Types." ***Educational Administration Quarterly*** 44, no. 5 (2008): 635–674; Linda Darling-Hammond, Debra Meyerson, Michelle LaPointe, and Margaret T. Orr. ***Preparing Principals for a Changing World: Lessons from Effective School Leadership Programs***. Jossey-Bass, 2009; Philip Hallinger and Ronald H. Heck. "Reassessing the Principal's Role in School Effectiveness: A Review of Empirical Research, 1980–1995." ***Educational Administration Quarterly*** 32, no. 1 (1996): 5–44.; Gregory F. Branch., Eric A. Hanushek, and Steven G. Rivkin. ***Estimating the Effect of Leaders on Public Sector Productivity: The Case of School Principals***. No. w17803. National Bureau of Economic Research, 2012.

5 Fuller, Ed, Michelle Young, and Bruce D. Baker. "Do Principal Preparation Programs Influence Student Achievement through the Building of Teacher-Team Qualifications by the Principal? An Exploratory Analysis." ***Educational Administration Quarterly*** 47, no. 1 (2011): 173–216.

6 Gates, Susan M., Jeanne S. Ringel, Lucrecia Santibanez, Cassandra Guarino, Bonnie Ghosh-Dastidar, and Abigail Brown. "Mobility and Turnover among School Principals." ***Economics of Education Review*** 25, no. 3 (2006): 289–302.

7 Béteille, Tara, Demetra Kalogrides, and Susanna Loeb. "Stepping Stones: Principal Career Paths and School Outcomes." ***Social Science Research*** (2012).

8 Cullen, Julie B., and Michael J. Mazzeo. "Implicit Performance Awards: An Empirical Analysis of the Labor Market for Public School Administrators." University of California, San Diego (December 2008); Branch, Hanushek, and Rivkin. 2009.

Aspiring Principal Programs

Research suggests that formal pre-service training programs for aspiring principals, if done well, should be an essential piece of a district's plan to develop and retain effective principals. However, poor-quality programs that leave principals ill-prepared for the challenges of the principalship only put more pressure on incoming principal abilities and can impede student achievement growth.[9] Principal preparation programs take many forms: traditional university-based degrees and certificates, alternative certifications operated by nonprofits, or specifically tailored programs developed to suit a particular district. Though more than 95 percent of America's almost 200,000 kindergarten to twelfth grade (K-12) principals graduated from a university-based preparation program, alternative programs for principals have proliferated over the past decade.[10] District and school administrators increasingly recognize a need to diversify from conventional university-based programs that are criticized for their lack of selectivity, rigor, and practice-based curriculum.[11]

In fact, what was once merely an alternative has become mainstream: more than a quarter of all states have adopted some form of alternative certification for school leaders[12] and nearly half the states operate a principal academy for ongoing professional learning.[13] At least forty-six states have adopted leadership standards, with which principal pre-service programs are aligned. This is a fundamental first step toward increasing the quality of pre-service programs at scale.[14] Recently begun research is investigating the impact of particular components of principal preparation programs on participant outcomes[15] and the advent of principal evaluation systems now allows the direct study of effectiveness, rather than merely perceived effectiveness.

Aspiring Principal Programs and Turnover

Though the impact of an aspiring principal program on student achievement is conditional on the quality of both the candidate and the program, it is unclear whether such programs also influence principal turnover. While

9 Davis, Stephen., Linda Darling-Hammond, Michelle LaPointe, and Debra Meyerson. "School Leadership Study: Preparing Successful Principals." ***Review of Research*** (2005).

10 Cheney, Gretchen R., and Jacquelyn Davis. ***Gateways to the Principalship: State Power to Improve the Quality of School Leaders***. Center for American Progress, Oct. 2011.

11 Corcoran, Sean P., Amy Ellen Schwartz, and Meryle Weinstein. "Training Your Own the Impact of New York City's Aspiring Principals Program on Student Achievement." ***Educational Evaluation and Policy Analysis*** 34, no. 2 (2012): 232–253; Stephen Davis, Linda Darling-Hammond, Michelle LaPointe, and Debra Meyerson, 2005.

12 Elmore, Richard. F. "Building a Knowledge Base for Educational Leadership." ***Education Week***, January 30, 2008, 28.

13 Long, Arika and Angela Baber. ***Statewide Leadership Academies: A 50-State Report***. Evaluation Commission of the States, September, 2006.

14 Shelton, Sara. ***Preparing a Pipeline of Effective Principals: A Legislative Approach***. National Conference of State Legislatures, September, 2012. www.ncsl.org.

15 Pounder, Diana G. "Leader Preparation Special Issue: Implications for Policy, Practice, and Research." ***Educational Administration Quarterly*** 47, no. 1 (2011): 258–267.

many studies explored the impacts of principal pre-service programs on a variety of outcomes, ranging from student achievement to self-efficacy, a review of the literature discovered that none of the studies investigated turnover links. This study seeks to answer the question of what beneficial impacts locally offered aspiring principal preparation programs have on principal turnover outcomes. It also contributes a first step toward answering a more critical question, which demands data on program quality and principal effectiveness ratings: do high-quality aspiring principal programs reduce turnover for effective principals without also reducing turnover for ineffective principals?

That question is beyond the scope of data available for this evaluation, but the initial question merits an impact evaluation all its own: does participation in local-level development programs for aspiring principals reduce the likelihood that participants change schools or leave the principal profession? I hypothesize that participation will reduce the likelihood that a principal leaves the profession and will have no significant effect on the likelihood that a principal changes schools during the 2008–2009 school year. I posit no effect on changing schools for two reasons. First, the data does not indicate whether a participating principal attended a program run by the school versus a district, nor does it indicate if a principal moved within or outside his or her district. Choosing to change schools within a district presents a case in which a district-level program might have worked even though the result suggests turnover. Second, school "leavers" are fundamentally different from "movers" and "stayers" in that they do not wish to continue in the profession for which preparation programs are designed. Thus, while such a program should impact leaving, its impact on moving would be harder to discern.

Methods

Data

This impact evaluation uses the nationally representative National Center on Education Statistics School and Staffing Survey (SASS) for 2007-2008 and the subsequent Principal Follow-up Survey of 2008–2009.[16] The SASS collects survey data on a host of questions relevant to the condition of education. It matches data from districts, schools, principals, and teachers to subsequent leadership turnover outcomes reported by schools with principals who participated in the 2007–2008 SASS. Though the SASS has been conducted in cross-sectional cycles since the 1987–1988 school year, and has used many of the same survey questions, the first Principal Follow-Up Survey was added for 2008–2009 to track the sample from the 2007–2008 Principal Questionnaire. Therefore, for the first time, researchers can use two-period data from the SASS to examine influences on principal

16 National Center for Education Statistics. 2009. "***2007–2008 Schools and Staffing Survey, 2008-2009 Principal Follow-up Survey***." Data file and code book. U.S. Department of Education, Institute for Education Sciences, NCES website: http://nces.ed.gov/surveys/sass/.

turnover. Though the SASS includes private school data, this evaluation uses only public school, including charter school, data.

For this study, a random sample of 5,000 public school principals who responded to the subsequent Follow-Up Survey from 4,000 districts during the 2007–2008 school year was drawn from a larger sample of 10,000 principals (response rate of 79.4 percent) for feasibility of computation, given computer limits. Individual schools are selected from this frame using stratified probability sampling, then each corresponding principal and district is mailed a questionnaire accordingly. The sampling frame for public traditional and charter schools was built from the 2005–2006 Common Core of Data (CCD) school survey, a universal survey of all K–12 schools in the United States.

Analytic Strategy

Using individual principals as the unit of analysis, this evaluation uses multinomial logistic regression (see appendix A for full specification) to evaluate the impact of participation in an aspiring leader program on the likelihood of falling into three discrete turnover outcomes: school stayers, school movers, and profession leavers. The model includes state-level fixed effects to control for time-invariant differences among states in the panel data. Standard errors are robust to clustering at the state level in order to account for serial correlation among principals practicing in the same state. Clustering at the state level also controls district-level serial correlation for districts that contributed more than one school to the sample of principals.

Measures

Outcome. The outcome of interest, in lieu of principal effectiveness data on student achievement, is turnover during the 2008–2009 school year. Turnover is defined as departure from the school of practice from the previous year. The SASS collapses fourteen response categories from the Follow-up Survey into three discrete outcomes: stayers, movers, and leavers. Stayers (j=1) are principals who remained at the same school over the course of the survey. Movers (j=2) refers to principals who moved schools but remained principals. Leavers (j=3) exited the principal profession. This final category encompasses all other outcomes available to respondents, including moving up to district administration or returning to teaching, for example. One possible shortcoming inherent in collapsing a number of outcomes into the leavers category is that this practice sacrifices valuable leaver subgroup information that might compromise measurement validity when the outcome of policy interest is undesirable turnover.

Predictor. A dummy predictor represents those answering in the affirmative to the survey question "Did you participate in any district or school training or development program for ASPIRING school principals?". Of the 5,000 public school principals sampled in the 2007–2008 SASS, 56.7 percent answered that

they participated in such a program (see Table 1). However, the underlying definition of what exactly constitutes an aspiring principal program remains somewhat subjective based on local context. The survey question implicitly excludes university-based programs, as well as state-provided programs, but the format of the school or district program could vary from a weekend seminar or intensive apprenticeship to a coursework experience. Nevertheless, a clearly defined practical divide exists between state-level or unaffiliated preparation programs and programs sponsored by a school or district, which allows for some confidence in the measurement reliability and validity of the independent variable.

Principal-level Controls. Time-invariant controls for principal attributes include age and dummies for race and gender. Time-varying characteristics include educational attainment—two dummies for a master's degree and doctorate, respectively; tenure as a principal overall and in current school, in years; status as principal with concurrent teaching duties; logged base salary; and status as a novice principal.

School-level Controls. School location and region dummies are the only time-invariant controls for schools, while time-varying dummies include charter status and Title I funding. Continuous time-varying controls include minority student demographics, such as percentage black and Hispanic; student-teacher ratio, as in the student number reported in relation to one teacher; free and reduced-price lunch percentage, and a logged student enrollment count.

District-level Controls. The model controls for principal job security policies, union strength, and school budget resources. The presence of a tenure system for principals is a dummy variable for which a positive value indicates a tenure track. Both the teacher and principal union variables consist of two dummies: positive values for a meet-and-confer dummy indicates the presence of a legally non-binding union contract arrangement, while the same for a collective bargaining dummy indicates legally binding agreements. The degree of variation in union influence varies strongly among even collective bargaining states and districts, so while reliability is strong, measurement validity using these dummies is less so. Yet, few more valid proxies of union strength exist. Two logged school budget variables for total district expenditures on instruction and support services are taken using the 2007 fiscal year school budget data from the Local Education Agency Fiscal Survey, a component of the CCD. Additionally, forty-nine state dummies were included in this study in order to capture state fixed effects; Alabama was dropped to avoid collinearity.

Results

Descriptive Results

Table 1 summarizes weighted averages and standard deviations for all variables in the model. The results showed that 81 percent of the sampled principals stayed in their school in the observed year, 7 percent changed schools, and 12 percent left the profession. The most typical sampled principal is a white male approaching 50 years of age who has been a principal for almost eight years, four of those in his current school; holds a master's degree in school leadership; and is paid about $85,000 annually. The most typical school in the sample receives Title I funds and serves a suburban, largely white student population of about 600 students, half of whom receive free or reduced-price lunch. While 60 percent of the districts in the sample report collective bargaining agreements with teachers' unions, only 20 percent had the same for principals' unions, and less than one-third had principal tenure tracks. Sampled districts spend, on average, $272 million on instruction and $129 million on support services.

Table 1: Descriptive Statistics for Sampled Principals' Characteristics

Variable	*Mean*	*S.D.*
Principal Characteristics		
Stayer	81.2%	-
Mover	6.9%	-
Leaver	11.9%	-
Participated in school or district aspiring principal program	56.7%	-
Age	48.6	8.9
Black	10.3%	-
Hispanic	6.2%	-
Male	49.7%	-
Master's Degree in Education Administration	87.1%	-
Doctorate degree or professional degree	8.1%	-
Total years of experience as principal	7.6	6.9
Total years of experience as principal in this school	4.3	4.8
First year as principal	8.7%	-
First year as principal in this school	17.4%	-
Still teaching	2.0%	-
Base salary ($)	85,208.64	19.542.40

Variable	*Mean*	*S.D.*
School Characteristics		
Urban area location	21.6%	-
Urban fringe location (suburban)	49.8%	-
Rural area location	28.6%	-
Proportion of free/reduced lunch students	45.0%	28.2%
Title I school	55.5%	-
Charter school	1.9%	-
Proportion of black students	14.0%	22.7%
Proportion of Hispanic students	17.1%	25.3%
Student enrollment	573.11	439.21
Student-to-teacher ratio	14.0	4.5
Made adequate yearly progress for school year 2006–07	77.1%	-
District Characteristics		
Total current expenditures on instruction ($)	272,000,000	1,330,000,000
Total current expenditures on support services ($)	129,000,000	464,000,000
Teacher union collective bargaining agreement	60.1%	-
Principal union collective bargaining agreement	19.2%	-
Principal tenure system in place	27.8%	-
N	5,000*	

Notes:
Sampled-principals are public school principals who taught in a regular school and had a normal response principal follow-up survey in PFS 2008–2009.

All estimates above represented weighted averages.

*Observations rounded for data privacy purposes.

Logistic Regression Results

Analysis of the data reveals that participation in school or district principal pre-service programs had no impact on principal retention during the 2008-2009 school year. The lack of effect was robust using both a multinomial logit model and three logit models (see Appendix B for logit outcomes). Calculated relative risk ratios suggest, counterintuitively, that those participating in an aspiring principal program were 11 percent more likely to change schools and only marginally less likely to leave the profession. However, the standard errors and p values for these estimators are significantly large and no inference can be made from these estimates other than that they indicate no impact.

Table 2: Multinomial Logit Modeling: Relative Risk Ratios and Average Partial Effects

Variable	Stayer APE	Mover RRR	Mover APE	Leaver RRR	Leaver APE
Participated in school or district aspiring principal program	-0.005 (0.018)	1.110 (0.203)	0.006 (0.011)	0.992 (0.127)	-0.002 (0.012)
Principal Characteristics					
Age	-0.005 (0.001)***	0.998 (0.151)	-0.001 (0.001)	1.057 (.007)***	0.005 (0.001)***
Black	0.025 (0.038)	0.576 (0.206)	-0.034 (0.021)	1.053 (0.354)	0.009 (0.032)
Hispanic	0.030 (0.057)	0.388 (0.118)***	-0.059 (0.017)	1.26 (0.685)	0.029 (0.052)
Male	-0.064 (0.015)***	1.444 (0.243)**	0.019 (0.011)*	1.64 (0.270)***	0.045 (0.016)***
Master's Degree in Education Administration	-0.017 (0.028)	1.15 (0.250)	0.008 (0.013)	1.11 (0.259)	0.009 (0.022)
Doctorate degree or professional degree	-0.080 (0.023)***	1.633 (0.425)*	0.026 (0.016)	1.82 (0.440)**	0.054 (0.023)**
Total years of experience as principal	-0.001 (0.002)	0.971 (0.276)	-0.002 (0.002)	1.03 (0.011)***	1.03 (0.011)***
Total years of experience as principal in this school	0.003 (0.003)	0.965 (0.038)	-0.002 (0.002)	.990 (0.016)	-0.001 (0.001)
First year as principal	-0.060 (0.040)	0.852 (0.381)	-0.015 (0.027)	2.16 (0.645)***	0.075 (0.028)***
First year as principal in this school	0.041 (0.029)	0.950 (0.345)	-0.000 (0.022)	0.655 (0.119)**	-0.040 (0.017)**
Still teaching	0.012 (0.048)	0.497 (0.291)	-0.045 (0.036)	1.33 (0.544)	0.032 (0.040)
Base salary (logged $)	0.026 (0.057)	1.923 (1.43)	0.045 (0.045)	0.506 (0.203)*	-0.070 (0.038)*
School Characteristics					
Urban location	0.017 (0.029)	0.973 (0.170)	-0.000 (0.012)	0.841 (0.249)	-0.016 (0.028)
Urban fringe location	0.016 (0.020)	0.925 (0.177)	-0.004 (0.011)	0.874 (0.142)	-0.012 (0.015)
Made adequate yearly progress for school year 2006–07	0.012 (0.023)	.806 (0.179)	-0.013 (0.013)	0.996 (0.169)	0.001 (0.016)
Proportion of free/reduced lunch students	-0.068 (0.048)	2.13 (0.894)*	0.044 (0.024)*	1.356 (0.484)	0.024 (0.033)
Title I school	-0.019 (0.015)	1.22 (0.250)	0.011 (0.013)	1.093 (0.126)	0.007 (0.011)

Variable	Stayer APE	Mover RRR	Mover APE	Leaver RRR	Leaver APE
Charter school	0.049 (0.103)	0.334 (0.373)	-0.068 (0.066)	1.12 (0.804)	0.018 (0.067)
Proportion of black students	-0.069 (0.046)	3.16 (1.718)**	0.069 (0.033)**	1.08 (0.419)	-0.001 (0.037)
Proportion of Hispanic students	-0.016 (0.042)	0.759 (0.352)	-0.019 (0.028)	1.412 (0.513)	0.035 (0.035)
Total current expenditures on support services	-0.061 (0.066)	1.358 (0.868)	0.015 (0.037)	1.650 (0.704)	0.046 (0.038)
Total current expenditures on instruction	0.066 (0.062)	0.715 (0.429)	-0.017 (0.035)	0.583 (0.237)	-0.050 (0.037)
Student enrollment	-0.023 (0.011)**	0.886 (0.114)	-0.010 (0.008)	1.39 (0.145)***	0.032 (0.010)***
Student-to-teacher ratio	0.003 (0.003)	1.018 (0.031)	0.001 (0.002)	0.957 (0.33)	-0.004 (0.003)
District Characteristics					
Teacher union agreement in place	-0.046 (0.028)	1.83 (0.526)**	0.036 (0.017)**	1.161 (0.270)	0.010 (0.022)
Principal union agreement in place	0.025 (0.044)	0.662 (0.214)	-0.025 (0.019)	0.968 (0.359)	-0.000 (0.035)
Principal tenure system in place	-0.010 (0.026)	1.35 (0.301)	0.019 (0.013)	0.933 (0.185)	-0.009 (0.018)
Observations	5,000*				

Standard Errors in parentheses and are robust to clustering at the state level
*** p<0.01, ** p<0.05, * p<0.1
*Observations rounded for data privacy purposes

Interestingly, a linear probability model (see Appendix C) using the interaction of total district budget spent on instruction and pre-service program participation, used here as a proxy for quality, yielded a significant ($p<.05$) effect of both participation and the interaction term. Findings show that the likelihood of a pre-service program participator staying in his or her school is 38.7 percentage points higher than those who did not participate and the likelihood of his or her leaving is 29.8 percentage points lower. Curiously, the impact of the interacted quality proxy term was negative, though practically negligible. This suggests that, for those who participated, as the level of district instruction expenditures increased, the likelihood of staying decreased marginally (2.3 percentage points) and the likelihood of leaving increased marginally (1.8 percentage points). The reason for such a surprising direction may be the use of district-level total instruction expenditures in this study, which is a rather blunt measure compared to per-pupil funding or another more direct measure of program quality.

Aside from the non-significant impact of the predictor, several independent variables did significantly impact principal turnover outcomes. Unsurprisingly, age

predicted leaving with strong significance, with a principal's likelihood of leaving the profession increasing by 5.7 percent for each additional year of age. Hispanic principals were 39 percent more likely to change schools than to stay during the observed period, while the effect of a principal being black did not impact turnover outcomes. Male principals were 6.4 percentage points less likely to stay than female principals and 4.5 percentage points more likely to leave the profession. Those with a doctoral degree were 82 percent more likely to leave the profession than to stay in a single school during the studied period, though holding a master's degree had no impact on turnover. Total years of experience as a principal had a practically negligible but strongly significant effect. Consistent with national turnover literature, first-time principals were 116 percent more likely to leave the profession than to stay. Interestingly, principals who were not necessarily novices but were new to their schools were 35 percent less likely to leave.

Among school characteristics, only school poverty, the proportion of black students, and overall enrollment affected turnover. A 1 percent increase in the number of free and reduced-price lunch students led to a 4.4 percentage point increase in the chance of a principal changing schools. Likewise, a 1 percentage point increase in the number of free and reduced-price lunch students led to a 6.9 percentage point increase in the chance of a principal switching schools. Increasing the number of students enrolled in a school by 1 percent led to a 3.2 percentage point increase in the likelihood of a principal leaving the profession. Among district characteristics, only the effect of teachers' unions was significant: principals in districts with collective bargaining teachers' union agreements were 83 percent more likely to move between schools than to stay in one place. Principal tenure systems and union strength did not impact turnover.

Discussion

This analysis sought to reveal any beneficial impacts of locally offered aspiring principal preparation programs on principal turnover outcomes, and it finds no significant treatment effect. However, those seeking to derive actionable conclusions from these results should proceed cautiously, given a number of methodological limitations that may compromise validity. Selection bias could be a factor if unobserved characteristics systematically differentiate principals who participated in a pre-service program compared to those who did not. The data does not indicate whether a principal had access to a school or district pre-service principal program. Therefore, if systematic differences exist between participants and non-participants, it is impossible to isolate whether the root of any selection bias lies with the principals themselves or with the systems in which they operate without a deliberate and rigorous matching or synthetic control strategy.

The data also does not capture the quality of the pre-service program for those who did participate nor does the data provide principal effectiveness measures, both of which could alter the estimated treatment effect. The model attempts to proxy for quality by interacting school budgetary resources and participation

in a linear probability model (see Appendix C), but resources are certainly no guarantee for quality. Furthermore, the field has not yet solidified a common definition of a high-quality principal pre-service program. Further research might focus on determining any differences in turnover outcomes for participation in programs of various lengths, pedagogies, and curricula.

This analysis is also limited in that it only measures turnover for a single year, which may be one principal's tenth year and another principal's second year. It is possible that the effect of a pre-service training program is stronger for novice rather than for veteran principals, but I have not limited my sample to novice principals in the interest of discerning an overall effect. The data also does not represent whether a given principal participated in any training program that is neither associated with a school nor district nor associated with the completion of a master's or doctoral degree. Any effects of state-encouraged training modules, for example, are not represented.

Furthermore, a sensitivity analysis using linear probability modeling (LPM) adds a wrinkle to the seemingly consistent conclusions of the logistic models. Not only did the LPM find that program participation increased the likelihood of staying in the profession by 39 percentage points, a curiously large impact considering the non-impacts from other models, but also the coefficient for the interaction term intended to proxy for quality is significant and counterintuitively suggests that quality increases turnover. Using a blunt, district-level measure for instruction budgeting may be partially responsible for that interaction effect, but the results diminish the confidence with which it can be concluded that program participation has no impact on turnover. Given these caveats, policy makers and practitioners should focus less on the presence of principal preparation programs and more upon the content and pedagogy employed.

Future research could help to close these gaps in actionable conclusions. Further research could examine whether training programs more strongly impact turnover in a principal's first or second year as opposed to later years. However, the most policy-relevant inquiries require data on principal effectiveness and program quality data, preferably in the same model. For example, perhaps principal preparation programs positively influence effectiveness but do little for turnover or perhaps only high-quality programs reduce turnover. Although difficult to achieve with available data, both variables could yield important insights. One could imagine a study dividing principals with similar effectiveness ratings into control and treatment groups based on aspiring program participation to isolate the impact of the program on turnover separate from student achievement.

In sum, education researchers are just beginning to decipher how to best leverage principal preparation programs to develop highly effective principals and to keep them where they are needed most. This analysis suggests that schools and districts cannot simply rely upon generic localized training programs to help them keep principals.

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Appendix A: Multinomial Logit Model

The multinomial logit model specifies the likelihood that a principal i stays in, moves from, or leaves his/her school during the 2008–2009 school year is estimated using:

$$Y_i = B_0 + B_1 Aspiring_i + B_2 PrincipChar_i + B_3 SchoolChar_i + B_4 DistrictChar_i + B_5 State_i$$

Where Y_i = the likelihood a principal [stays, moves, or leaves] his/her school in school year 2008–2009. Stayers are specified as the base category for estimation.

$Aspiring_i$ = Participation in a school or district-level development program for aspiring principals before assuming the principalship

$AspiringBudget_i$ = Interaction between participation in a program for aspiring principals and the school's budget for support services and professional development

$PrincipChar_i$ = Both time invariant and time-varying principal attributes (age, race, gender, highest degree earned, experience as principal, experience as principal in current school, first year principal, first year principal in current school, currently teaching, base salary)

$SchoolChar_i$ = Both time invariant and time-varying school attributes (urban location, region, percent free/reduced-price lunch, Title I funding status, charter school status, student racial demographics, student enrollment, student-teacher ratio)

$DistrictChar_i$ = District attributes (tenure system for principals, teacher union status, principal union status)

$State_i$ = Dummy variables for the state in which a principal works (fixed effects)

Appendix B: Binomial Logit Models

Table 1C: Logit Models of Principal Turnover: Coefficients and Partial Effects

Variables	*Stayer Coefficients*	*Stayer APE*	*Mover Coefficients*	*Mover APE*	*Leaver Coefficients*	*Leaver APE*
Participated in school or district aspiring principal program	-0.046 (0.130)	-0.007 (0.019)	0.105 (0.178)	0.006 (0.011)	-0.017 (0.123)	-0.002 (0.012)
Age	-0.031 (0.009)***	-0.004 (0.001)***	-0.008 (0.015)	-0.000 (0.001)	0.055 (0.006)***	0.005 (0.001)***
Black	0.194 (0.268)	0.028 (0.039)	-0.560 (0.354)	-0.034 (0.022)	0.095 (0.331)	0.009 (0.032)
Hispanic	0.139 (0.430)	0.020 (0.062)	-0.977 (0.284)***	-0.059 (0.017)***	0.282 (0.534)	0.027 (0.052)
Male	-0.452 (0.108)***	-0.065 (0.015)***	0.308 (0.174)*	0.019 (0.011)*	0.465 (0.168)***	0.045 (0.016)***
Master's degree in Education Admin	-0.125 (0.195)	-0.018 (0.028)	0.124 (0.208)	0.008 (0.013)	0.095 (0.227)	0.009 (0.022)
Doctorate degree or professional degree	-0.548 (0.170)***	-0.079 (0.024)***	0.399 (0.272)	0.024 (0.016)	0.556 (0.245)**	0.054 (0.023)**
Total years of experience as principal	-0.016 (0.011)	-0.002 (0.002)	-0.035 (0.028)	-0.002 (0.002)	0.033 (0.011)***	0.003 (0.001)***
Total years of experience as principal in this school	0.013 (0.019)	0.002 (0.003)	-0.033 (0.038)	-0.002 (0.002)	-0.008 (0.015)	-0.001 (0.001)
First year as principal	-0.391 (0.315)	-0.056 (0.045)	-0.251 (0.438)	-0.015 (0.027)	0.783 (0.290)***	0.075 (0.028)***
First year as principal in this school	0.219 (0.223)	0.031 (0.032)	-0.003 (0.353)	-0.000 (0.022)	-0.427 (0.174)**	-0.041 (0.017)**
Still teaching	0.026 (0.359)	0.004 (0.052)	-0.743 (0.570)	-0.045 (0.035)	0.318 (0.411)	0.031 (0.040)
Base salary ($)	0.270 (0.397)	0.039 (0.057)	0.750 (0.737)	0.046 (0.045)	-0.724 (0.396)*	-0.070 (0.037)*
Urban area location	0.112 (0.198)	0.016 (0.028)	-0.008 (0.205)	-0.000 (0.012)	-0.169 (0.295)	-0.016 (0.028)

Variables	*Stayer Coefficients*	*Stayer APE*	*Mover Coefficients*	*Mover APE*	*Leaver Coefficients*	*Leaver APE*
Urban fringe location (suburban)	0.090 (0.142)	0.013 (0.020)	-0.064 (0.187)	-0.004 (0.011)	-0.131 (0.158)	-0.013 (0.015)
Made adequate yearly progress for school year 2006–07	0.096 (0.156)	0.014 (0.022)	-0.215 (0.213)	-0.013 (0.013)	0.015 (0.164)	0.001 (0.016)
Proportion of free/ reduced lunch students	-0.491 (0.347)	-0.071 (0.050)	0.716 (0.399)*	0.044 (0.024)*	0.245 (0.337)	0.024 (0.032)
Title I school	-0.116 (0.102)	-0.017 (0.015)	0.189 (0.207)	0.011 (0.013)	0.076 (0.117)	0.007 (0.011)
Charter school	0.304 (0.687)	0.044 (0.099)	-1.138 (1.088)	-0.069 (0.066)	0.182 (0.698)	0.018 (0.067)
Proportion of black students	-0.539 (0.331)	-0.077 (0.047)*	1.140 (0.545)**	0.069 (0.033)**	-0.027 (0.392)	-0.003 (0.038)
Proportion of Hispanic students	-0.127 (0.321)	-0.018 (0.046)	-0.331 (0.459)	-0.020 (0.028)	0.375 (0.367)	0.036 (0.035)
Total current expenditures on support services ($)	-0.454 (0.458)	-0.065 (0.066)	0.259 (0.602)	0.016 (0.037)	0.479 (0.397)	0.046 (0.038)
Total current expenditures on instruction ($)	0.492 (0.430)	0.071 (0.062)	-0.283 (0.566)	-0.017 (0.034)	-0.516 (0.381)	-0.050 (0.037)
Student enrollment	-0.152 (0.063)**	-0.022 (0.009)**	-0.154 (0.130)	-0.009 (0.008)	0.334 (0.107)***	0.032 (0.010)***
Student-to-teacher ratio	0.014 (0.020)	0.002 (0.003)	0.020 (0.031)	0.001 (0.002)	-0.043 (0.036)	-0.004 (0.003)
Teacher union collective bargaining agreement	-0.311 (0.197)	-0.045 (0.028)	0.590 (0.283)**	0.036 (0.017)**	0.113 (0.229)	0.011 (0.022)
Principal union collective bargaining agreement	0.171 (0.310)	0.025 (0.044)	-0.404 (0.306)	-0.025 (0.019)	-0.005 (0.362)	-0.000 (0.035)
Principal tenure system in place	-0.087 (0.182)	-0.013 (0.026)	0.304 (0.212)	0.018 (0.013)	-0.094 (0.188)	-0.009 (0.018)
R-squared	0.0482		0.0737		0.0836	
N	5,000*					

Standard Errors in parentheses and are robust to clustering at the state level.
*** p<0.01, ** p<0.05, * p<0.1
*Observations rounded for data privacy.

Appendix C: Linear Probability Models with Interacted Program Participation-School Budget Variables

Table 1B: Linear Probability Models of Principal Turnover: Coefficients

Variables	*Stayer*	*Mover*	*Leaver*
Participated in school or district aspiring principal program	0.387** (0.173)	-0.089 (0.067)	-0.298* (0.165)
Interaction: pre-service program participation and school budget	-0.023** (0.010)	0.006 (0.004)	0.018* (0.010)
Principal Characteristics			
Age	-0.004*** (0.001)	-0.001 (0.001)	0.005*** (0.001)
Black	0.031 (0.039)	-0.037* (0.022)	0.006 (0.032)
Hispanic	0.021 (0.057)	-0.047*** (0.010)	0.027 (0.054)
Male	-0.066*** (0.017)	0.020* (0.011)	0.046** (0.018)
Master's degree in Education Administration	-0.014 (0.026)	0.007 (0.012)	0.007 (0.020)
Doctorate degree or professional degree	-0.090*** (0.030)	0.025 (0.018)	0.064** (0.030)
Total years of experience as principal	-0.003 (0.002)	-0.002 (0.001)	0.005*** (0.002)
Total years of experience as principal in this school	0.003 (0.003)	-0.001 (0.002)	-0.001 (0.002)
First year as principal	-0.058 (0.044)	-0.017 (0.033)	0.075*** (0.025)
First year as principal in this school	0.033 (0.032)	0.005 (0.025)	-0.038** (0.015)
Still teaching	0.010 (0.047)	-0.033 (0.027)	0.023 (0.040)
Base salary (logged $)	0.041 (0.062)	0.042 (0.042)	-0.083 (0.050)
School Characteristics			
Urban fringe location	-0.001 (0.021)	-0.002 (0.011)	0.003 (0.021)

Variables	*Stayer*	*Mover*	*Leaver*
Rural area location	-0.013 (0.030)	0.000 (0.013)	0.013 (0.030)
Made Adequate Yearly Progress in school year 2006–07	0.015 (0.023)	-0.016 (0.014)	0.001 (0.015)
Proportion of free/reduced lunch students	-0.072 (0.051)	0.048* (0.028)	0.024 (0.033)
Title I school	-0.017 (0.015)	0.010 (0.012)	0.007 (0.012)
Charter school	0.030 (0.080)	-0.057 (0.036)	0.027 (0.065)
Proportion of black students	-0.085* (0.049)	0.081* (0.041)	0.004 (0.040)
Proportion of Hispanic students	-0.024 (0.051)	-0.025 (0.033)	0.048 (0.046)
Total current expenditures on support services ($)	-0.046 (0.063)	0.015 (0.035)	0.031 (0.036)
Total current expenditures on instruction ($)	0.066 (0.060)	-0.020 (0.032)	-0.046 (0.035)
Student enrollment	-0.021** (0.009)	-0.009 (0.008)	0.030*** (0.009)
Student-to-teacher ratio	0.002 (0.003)	0.001 (0.003)	-0.003 (0.002)
District Characteristics			
Teacher union agreement in place	-0.043 (0.026)	0.031** (0.013)	0.012 (0.021)
Principal union agreement in place	0.025 (0.044)	-0.024 (0.016)	-0.001 (0.036)
Principal tenure system in place	-0.012 (0.027)	0.020 (0.015)	-0.007 (0.017)
Constant	0.471 (0.636)	-0.341 (0.395)	0.870* (0.440)
N	5,000*		
R-squared	0.048	0.034	0.062
Standard errors in parentheses and are robust to clustering at the state level *** p<0.01, ** p<0.05, * p<0.1 *Observations rounded for data privacy.			

Note: Unboundedness in the outcome variable does occur in these models, though the number of predicted values falling outside of the [0,1] range—91, 442, and 466, respectively— is not large enough to compromise the use of the LPM.