

Pathways to the Principalship: An Event History Analysis of the Careers of Teachers with Principal Certification

Bradley W. Davis

University of Texas at Arlington
bwdavis@uta.edu

Mark A. Gooden

The University of Texas at Austin
gooden@austin.utexas.edu

Alex J. Bowers

Teachers College, Columbia University
bowers@tc.edu

ABSTRACT:

Utilizing rich data on nearly 11,000 educators over 17 academic years in a highly diverse context, we examine the career paths of teachers to determine whether and when they transition into the principalship. We utilize a variety of event history analyses, including discrete-time hazard modeling, to determine how an individual's race, gender, and their combination - among other characteristics - contribute to their likelihood of making this transition. We found that inequitable pathways to the principalship are not explained by systematic differences in personal and contextual characteristics along lines of race and gender, but rather, that the selection of school leaders may be a process influenced by systemic bias.

Keywords: principals, certification, race, sex, event history analysis

INTRODUCTION:

As the key visionary and instructional leader of a school, a principal is one of the largest school-level factors affecting student achievement. Among all school level variables, a principal's influence is significant, measurable (Branch, Hanushek, & Rivkin, 2012; Hallinger & Heck, 1998; Witziers, Bosker, & Krüger, 2003), and second only to that of the classroom teacher (Leithwood, Louis, Anderson, & Wahlstrom., 2004). Accordingly, there is value in documenting administrator career patterns at all segments of the leadership pipeline so as to inform policymaking and district decision-making.

Recent quantitative research has added to knowledge on the career experiences of school leaders. A great deal of this research has focused on principal turnover¹ and its effects. In particular, this research has found principal transfers to be associated with age, race, and gender (Gates et al., 2006), satisfaction and dispositions towards multiple aspects of the principalship (Boyce & Bowers, 2016) and also with student body characteristics and school performance (Baker, Punswick, & Belt, 2010; Loeb, Kalogrides, & Horng, 2010). Frequent principal turnover has also been associated with high teacher

turnover (Béteille, Kalogrides, & Loeb, 2012), negative impacts on campus climate (Mascall & Leithwood, 2010), and decreased student achievement (Béteille, Kalogrides, & Loeb, 2012).

Understanding principal turnover is certainly important, however, research on the matter considers only those educators who have already entered the principalship. A segment of the leadership pipeline about which there is scant quantitative research is that between leadership credentialing and initial transition into the principalship (Stevenson, 2006). Gates, Ringel, Santibañez, Ross, and Chung (2003) explain that while 99% of public school principals were once teachers, "very little is known about how, when, and why the transition occurs" (p. 25).

Using rich data, covering a wide expanse of time in a highly diverse context (the entire population-level data from Texas of all administratively certified teachers $N= 10,979$ over 17 academic years) we examine the career paths of teachers after they have obtained the credentials necessary to become school principals. Accordingly, we ask the following research questions: 1) Whether and when do classroom teachers with principal certification transition into the principalship? 2) To what extent do an individual's race/ethnicity², gender³, and combination of race/ethnicity and gender - among other characteristics - contribute to their likelihood of making this transition? For the sake of clarity, we define the principalship as being the chief administrator of a campus - the head principal. In pursuit of our research questions, we employ a variety of event history analyses, including life tables, visual displays of hazard, and a discrete-time hazard model.

Answering these research questions will address an underexplored segment of administrators' careers: the pathway to the principalship. Expanding knowledge of this portion of the leadership pipeline is important for two reasons cited by Stevenson (2006), as it: 1) provides a better understanding of which teachers make this transition, and 2) informs principal recruitment, selection, development, and retention efforts. Further, better understanding pathways to the principalship can provide important information about the role and impact of leadership preparation programs.

We also ask these research questions because they get to the heart of a very important matter: diversification of school leadership ranks. We propose a very simple argument for why

¹ This document is a pre-print of a manuscript published in the journal, *American Educational Research Journal*. Citation: Davis, B.W., Gooden, M.A., Bowers, A.J. (2017) Pathways to the Principalship: An Event History Analysis of the Careers of Teachers with Administrator Certification. *American Educational Research Journal*, 54(2), p.207-240. <http://journals.sagepub.com/doi/abs/10.3102/0002831216687530>

equitable race and gender representation amongst principals matters: there is no compelling reason that race and gender representation could not or should not be comparable through all stations of educators, from classroom aides to superintendents. As the critical importance of culturally responsive school leadership (Khalifa, Gooden, & Davis, 2016) grows more apparent, we encourage collective acknowledgement that the struggle for equitable employment opportunities for educators of all backgrounds is an essential element of the larger effort to dismantle achievement and opportunity gaps (Carter & Welner, 2013; Milner, 2012) that negatively affect minoritized students. Accordingly, our methodology allows us to determine who gets to become a principal, and to what extent the process is racialized and gendered. Further, we uncover the likelihood (whether) of transition into the principalship while also determining how long it takes (when) for this transition to occur, as well as how these measures of likelihood and time might differ for individuals of varying race and gender. Considerations of time are particularly important because any indication that certain groups become principals more quickly than others could be evidence of systemic bias that a simpler analytical approach would fail to uncover.

Moving forward, we begin with a review of relevant literature that sheds light on the teacher-to-principal transition. We then describe the paradigmatic perspective of critical quantitative inquiry and outline the ways it has informed our study. We next explain our methodology by detailing the variables, data structure, and analyses included in our study. Following the methodology section, are our findings, the latter of which informs our discussion. We conclude with an outline of implications for policy and future research.

Relevant Literature

There has been limited quantitative research on pathways to the principalship. In this section, we highlight this limited research by outlining the factors shown to influence teachers' movement into the principalship. We organize these factors thematically into the following groups: race and ethnicity, gender, age and experience, school characteristics, and time. Where applicable, each subsection begins with a review of studies utilizing national data, then transitions to individual state contexts.

Race and Ethnicity

At the national level, data from the three most recent, publicly available Schools and Staffing Survey (SASS) administrations indicate very modest diversification of principalship ranks in the United States. More specifically, the 2011-12 SASS results indicate that 80.3% of public school principals were White, which is slightly down from 80.9% in 2007-08 and 84.1% in 2003-04 (National Center for Education Statistics, 2016a, 2016b, 2016c). While these data reveal little about the transition process, one could infer that Whites are retiring at greater rates than principals of color and/or that educators of color have encountered more beneficial pathways to the principalship. But such an inference would not tell the full story, as it relies on a White/Non-White binary. Across these administrations of SASS, the percentage of Black principals started at 9.3% in 2003-04 and increased to 10.6% in 2007-08,

but then decreased slightly to 10.1% in 2011-12. Similarly, Hispanic principals started at 4.8% in 2003-04 and increased to 6.5% in 2007-08, and then increased again but slightly to 6.8% in 2011-12 showing an upward trend for all three periods. Our point both here and throughout the paper is that narrow perspectives of the school leadership pipeline, which are often reinforced by mainstream educational research, can obscure the asymmetry of pathways experienced by different groups of educators.

State contexts seem to support the notion that educators of color are experiencing increased likelihoods of becoming principals. Interestingly, Gates, Guarino, Santibañez, Brown, Ghosh-Dastidar, and Chung (2004) determined that African American educators were twice as likely as their White peers to become principals in North Carolina. A similar, longitudinal analysis performed by Ringel, Gates, Chung, Brown, and Ghosh-Dastidar (2004) suggested that Hispanic educators in Illinois were more likely than their White counterparts to become principals. This finding is supported by a more recent descriptive analysis by Brown and White (2010) that revealed White representation among Illinois principals had decreased slightly from 82.6% in 2001 to 80.8% in 2008.

DeAngelis and Kawakyu O'Connor (2012) found that Illinois educators of color with principal certification were significantly more likely than their White peers to apply for administrative positions. However, in a separate model determining the likelihood of being offered an administrative position, DeAngelis and Kawakyu O'Connor found no statistically significant difference between that of White respondents and respondents of color. The authors also found that respondents of color working in urban locales were "marginally" less likely to accept administrative job offers than their White respondents, however the statistical significance for that particular finding was $p \leq .10$.

Fuller, et al. (2007) estimated the probability of Texas teachers becoming a principal within 10 years of certification. They found that Hispanic certificate holders were more likely than their White peers to become principals, whereas all other groups did not have a statistically significant difference from Whites in their likelihood to become principals. However, a more recent study by Crawford and Fuller (2015) suggests the odds of Black educators and Latino educators in Texas becoming principals within 10 years of certification were lower than those of their White peers.

To summarize, the principalship, nationally, has seen rather modest racial diversification in recent years. Studies performed in North Carolina and Illinois suggest that educators of color have an advantageous likelihood of becoming a principal in relation to that of their White peers. The relationship between race and the probability of becoming a principal in Texas is less clear, and as evidenced by the Fuller et al. (2007) and Crawford and Fuller (2015) studies, is a figure that seems dependent upon population definition and variables considered. We provide clarity on the Texas context later on in our analysis.

Gender

In their analysis of the nationally representative School and Staffing Survey (SASS), Gates et al. (2003) revealed that female representation among all public school principals had increased from 25% in 1987-88 to 44% in 1999-2000. Data from the 2011-12 SASS indicate that female representation among all public school principals stands at 51.6% (National Center for Education Statistics, 2016c). While this is an encouraging trend in the gender diversification of the principalship ranks, it is important to note that as of the 2011-12 school year, 76.1% of teachers were female, meaning that females are severely underrepresented among school principals. We also note that in light of the assumed parity of 51.6%, that in the ranks of secondary principalship (long assumed to be reserved for men), women are still woefully underrepresented (Jean-Marie, 2013).

Ringel et al.'s (2004) previously cited Illinois study revealed that males were 2.5 times more likely than females to become principals. Gates et al.'s North Carolina (2004) study demonstrated that males were twice as likely as females to become principals. Fuller, et al. (2007) found that Texas females were 35% less likely than their male peers to become a principal. Crawford and Fuller (2015) later found that Texas females were only 51% as likely as their male peers to become a principal. Finally, according to Lankford, O'Connell, and Wyckoff (2003), female educators in New York were less likely than males to become a department chair or assistant principal, yet were equally likely to become a head principal. In contrast to all of these studies, DeAngelis and Kawakyu O'Connor (2012) concluded that gender did not play a statistically significant role in any of their models predicting the likelihood for educators to apply for, be offered, or accept campus administrative positions. Taken together, these studies demonstrate that although females account for an increasingly large share of the principalship ranks on a national level, in many state contexts, their likelihood of becoming a principal is substantially less than that of their male peers.

The intersections of race/ethnicity and gender

Of the aforementioned studies, only Gates et al. (2004) looked at the intersection of race and gender as a contributor to the odds of becoming a principal. Their model included a female * African American interaction variable which was determined to positively influence North Carolina educators' odds of becoming a principal. African American and female were each interacted with 7 or more variables, meaning that the female * African American variable's positive contribution to the overall model was highly conditional on other variables, making a straightforward understanding of its effect elusive. The under-exploration of the relationship between race/ethnicity and gender exhibited by quantitative studies investigating the teacher-to-principal transition is a major motivator of the present study.

Age and Years of Experience

Nationally, Gates et al. (2003) found the average age of new, public school principals had increased from 43 to 45 between the 1987-88 and 1999-2000 administrations of the Schools and Staffing Survey (SASS). In a similar finding stemming from

analysis of New York state data, Papa, Lankford, and Wyckoff (2002) found that the average age of first time principals increased from 44.1 to 45.6 between 1990 and 2000. Crawford and Fuller's (2015) finds that additional years in age increase the odds of Texas educators becoming a principal, but only up until a certain point where it begins to be associated with a decreased odds of becoming a principal.

Ringel et al. (2004) explained that Illinois educators' likelihood of becoming a principal increased with their experience, but decreased once that experience level greatly eclipsed that of the population average. Gates et al.'s (2004) study of North Carolina educators revealed high statistical significance between both years of experience and years of experience squared with the likelihood of becoming a principal. However, these were highly conditional main effects, as each variable was interacted with at least two other terms. Therefore the precise nature of how experience impacted one's odds of becoming a principal was not totally clear in their study. DeAngelis and Kwakyu O'Connor (2012) found that years of experience in education did not have a statistically significant relationship with Illinois educators' odds of applying for, being offered, or accepting an administrative position.

School Characteristics

Few studies have included controls accounting for the types of schools that aspiring principals are employed in. We outline a few exceptions here that consider school urbanicity and size. Gates et al. (2004) found that the conditional main effects of school urbanicity did not significantly affect North Carolina teachers' likelihood of becoming a principal. Ringel et al. (2004) determined that teachers from schools in rural Illinois were significantly more likely to become principals than those working in suburban and urban contexts. On a related note, they also found that teachers in smaller schools (as determined by total enrollment) were more likely to become principals than those from larger schools. Lankford, O'Connell, and Wyckoff (2003) concluded that New York teachers in urban settings were more likely to enter any administrative role (department chair, assistant principal, or principal) than those teachers outside of urban settings. This latter finding was not broken out by particular role assignment, so we cannot be sure if this finding would remain as such for the principalship alone. Ringel et al. (2004) also concluded that the proportion of students of color within a school was positively associated with a teacher's likelihood of becoming a principal in Illinois, where as Gates et al. (2004) found no statistically significant relationship. Finally, Fuller, et al. (2007) determined that the proportion of economically disadvantaged students in the school in which a teacher is employed has a positive relationship with the odds of that teacher becoming a principal.

Time to the Principalship

The literature tells us little regarding the amount of time it takes for a teacher to become a principal, once they have fulfilled the licensure requirements to do so. One notable exception comes from Bastian and Henry (2015) who found that, on average, 5.12 years pass between the time that North Carolina teachers complete their principal preparation program and the time that they first assume the principalship.

In summary, the literature reviewed here evidences the importance of individual and contextual characteristics as influences on pathways to the principalship. What is not clearly evidenced by these studies are the influences of the various intersections of race/ethnicity and gender. Further, we are unaware of any study that brings together all of the areas investigated/represented by the subsections of this literature review as variables when measuring the likelihood of teachers becoming principals.

Paradigmatic Perspective

We draw upon the tenets of critical quantitative inquiry. Practitioners of critical quantitative inquiry are known as *quantitative criticalists* (Stage, 2007; Stage & Wells, 2014). A quantitative criticalist is “a researcher who [uses] quantitative methods to represent educational processes and outcomes to reveal inequities and to identify perpetuation of those that [are] systematic” (Stage & Wells, 2014, p. 1). We employ quantitative methods to study the career paths of aspiring principals in order to make sense of the complexity characterizing these paths, particularly relative to different outcomes for individuals at the various intersections of race/ethnicity and gender.

Stage (2007) argues that quantitative criticalists are defined by the questions they ask, more so than the methods they use to answer them. In other words, methodological considerations are important, but quantitative criticalists’ efforts toward social justice are primarily channeled through the questions they ask. Consider our second research question as an example, in which we have an explicit interest in understanding the ways that race/ethnicity, gender, and their intersection mediate pathways to the principalship. This question is built upon our literature-supported presumption that race, ethnicity, and gender are meaningful mediators of the pathway to the principalship, as well as our assertion that there is a more complex story behind the connection to disproportionate placements than that provided in the literature.

Stage and Wells (2014) explain that the quantitative criticalist has three tasks: 1) to use large-scale data to represent inequitable processes, 2) to challenge prevailing approaches to quantitative work and expand its potential for advancing equity-oriented work, and 3) to “delve more deeply into institutional contexts” (p. 3). Our work for this paper satisfies these three tasks, respectively, as follows. First, the expansive nature of the data included in our analyses and the techniques with which we perform our analyses of said data very much represents a large-scale inquiry into the process of administrator selection/assignment already established as inequitable in the literature. Second, the manner by which we examine and interpret our quantitative results and visualize findings, particularly as these relate to the intersectionality of race/ethnicity and gender, represents a substantial departure from past educational administration research of this kind, as illustrated in the literature review. Third and finally, we consider the varying contexts in which aspiring school leaders are engaged, by including in our analyses a multitude of

variables accounting for school and student body characteristics.

In an evaluation of critical quantitative inquiry’s potential for contribution to the broader critical project, Baez (2007) implores quantitative criticalists to remain mindful of what “critical” actually means. He argues that certain research questions may be conduits to critical work, however their presence alone does not constitute criticality. That is to say, using quantitative methods to ask equity-oriented questions is not necessarily transformative. Instead, Baez argues, the work of quantitative criticalists should be judged by the extent to which it exposes and critiques the power of taken for granted institutional arrangements, as well as the extent to which it transforms, or makes possible, the transformation of such arrangements (p. 22). We share in Baez’ supportive skepticism and revisit these laudable expectations later on.

METHODS:

Population:

We use data obtained from the Texas Education Agency (TEA) and from the National Center for Education Statistics (NCES) Common Core of Data (CCD). The data from TEA covers four areas: demographics, certification, role assignment, and a host of campus descriptors. These areas allow us to not only determine when an educator first obtained principal certification, but also which campus and in what capacity (role) they were employed (e.g. classroom teacher, assistant principal, principal, etc.) in a given academic year. We complement each observation with time varying characteristics unique to each campus (e.g. relative achievement, enrollment, student characteristics). Finally, each observation contains an urban-centric campus locale code, which was merged from the CCD.

The population of interest for this study is the entire population of all Texas classroom teachers that obtained their initial administrator certification between the 1996-97 and 2005-06 academic years. We elected to restrict our study to this entry window so as to limit the amount of *censoring*, a hallmark of event history analysis, which we discuss in greater detail below. These educators are followed through the 2012-13 academic year, meaning that individuals are tracked for up to 17 academic years. Due to our primary interest for this study focusing on the career paths of campus-based educators, anyone that left the campus setting for a central office position was dropped from the data set. We did this for two reasons. First, we know from the literature that the overwhelming majority of new principals were in campus positions in the previous academic year (Gates et al., 2003; Papa, Lankford, & Wyckoff, 2002). We affirmed this holds true in the Texas context, as we determined that 91.5% of those entering the principalship in a given year were in a campus-based position during the previous year. The second reason we dropped those who went to district-level positions is because including educators not assigned to a campus would create missing data issues, as we would have no campus descriptors to bring in as controls (e.g. achievement, enrollment, locale, etc.). Our final data set contains 90,129 observations of $N=10,979$ unique individuals.

Because we have data covering the entire population of interest, means and standard deviation calculations are not estimates of population parameters, but rather direct calculations. Examining the entire population of data when available is recommended in education leadership studies such as the present one, as analyzing the full population as the sample provides a form of unbiased statistical inferences (Bowers, 2010). Further, examining the entire population across a state is recommended when examining policy-relevant matters (Bowers, 2010, 2015). The state of Texas is a particularly rich research setting, due to: 1) the vast size of its school system - 5,058,939 students in 8,555 schools across 1,228 districts in 2012-13 (Texas Education Agency, 2014); 2) the expansive variety of rural, suburban, and urban contexts across which its schools are spread, including two of the five largest metropolitan statistical areas in the United States: Houston and Dallas (Census Bureau, 2014), and 3) the impressive diversity of its student population; 70% children of color in 2012-13 (Texas Education Agency, 2014). Due to its comprehensive and longitudinal nature, our dataset provides a unique opportunity to examine the career movements of administratively certified teachers in Texas over a 17 year period, making our study one of the most extensive examinations of leadership career paths in the literature to date.

Variables

We drew on prior theory and the educational administration literature to inform our selection of variables. Race/ethnicity was coded as five dummy variables, one for each of the categories used in the study: White, Black, Latino, Asian, and Other. Gender was also entered as a dummy variable named “male” where 0 was made equal to female, and 1 to male. Race/ethnicity and gender interaction terms were also created.

We included several other individual and campus characteristics as controls. Most of these controls were informed by the principal turnover literature, which is better established than studies exploring pathways to the principalship. While turnover studies investigate educators already in the principalship, they still inform transitions within the larger administration pipeline. The variables included in our study are: age (Brown & White, 2010; Crawford & Fuller, 2015; Lankford, O’Connell & Wyckoff, 2003), age squared (Crawford & Fuller, 2015), years of experience in education (Brown & White, 2010; Gates et al., 2003; Papa et al., 2002; Ringel et al., 2004), years of experience in education squared, the number of concurrent years employed with present school district, school size⁴ (Gates et al., 2003; Lankford, et al., 2003; Papa, et al., 2002), urbanicity of school⁵ (Brown & White, 2010; Gates et al., 2003; Gates et al., 2003; Ringel, et al., 2004), and a collection of time-lagged campus enrollment characteristics. All but one of the time-lagged campus level characteristics are student population descriptors, and include the percentage of economically disadvantaged (Brown & White, 2010; Fuller et al., 2007; Gates et al., 2003), Black, Latino, and Asian students on a campus (Brown & White, 2010; Gates et al., 2003; Papa, et al., 2002; Ringel, et al., 2004). The other time-lagged campus level independent variable is the campus accountability rating⁶, which is assigned to schools by

TEA each year. This variable, which is recorded on a four point ordinal scale, is meant to act as a broad measure of campus performance and reflects ratings of *academically unacceptable*, *acceptable*, *recognized*, and *commended*.

There are two years in our data set that TEA did not report accountability ratings for schools (2002-03 and 2011-12). To maximize the usability of our data set and include all 17 years, we imputed these two missing data points via multinomial logistic regression using Stata’s multiple imputation (MI) function (StataCorp, 2013). Following conventions to ensure compatibility between our imputation model and final analyses (StataCorp, 2013), we utilized all variables employed in our final analyses as part of our 100-iteration imputation process.

For each observation in our data set, the time-lagged variables correspond with the campus the individual was assigned to in the previous school year. These control variables are intended to account for factors that contribute to employers’ perceptions of candidate quality as well as variance in the amount and recurrence of administrative vacancies aspirants can move into. The quadratic terms of age squared and years of experience squared were used because our exploratory analysis revealed nonlinear relationships between those variables and the probability of being a head principal. All continuous independent variables in the data set were z-scored (standardized). Finally, it may seem that including variables for age, years with district, and years in the profession would introduce multicollinearity issues, as they are all measures of time that are tied to individuals. To ensure this was not the case, variance inflation factors (VIFs) were calculated for *all* independent variables to ensure their acceptable inclusion.

Analysis

Our first research question explicitly asks about the influence of time upon the likelihood of a particular event (the teacher-to-principal transition), therefore we deemed survival analysis as most appropriate. More specifically, we constructed a life table and employed discrete-time hazard modeling. Following the recommendations of the literature on survival analysis (Singer & Willett, 2003) we structured our dataset in person-period format, meaning that each unique individual has a separate row/observation for each time period they appear in the data set. For each period that an individual appears in the data set, they are at “risk” of experiencing the event of interest. In the case of the present study, individuals are at “risk” of becoming a head principal.

Our life table includes the period-specific survival and hazard functions, which are the rolling likelihood of remaining (“survival”) outside the principalship, and the “hazard” of experiencing the event of becoming a principal, respectively. Person-period survival and hazard modeling controls for the conditional dependence inherent within a longitudinal dataset, an issue encountered across many research domains in education (Baker, Punswick, & Belt, 2010; Bowers, 2010; Bowers & Lee, 2013; Bowers & Chen, 2015; DeAngelis, 2013). Although an individual’s risk of experiencing the hazard of the event under consideration is conditional on the previous year, hazard modeling by its very nature, avoids violating

assumptions of independence. In addition, hazard and survival models address the conditional, proportional probability and risk of an individual experiencing the event, dependent upon the total number of people still at risk of the event each year, controlling for the number of people who experienced the event, may have entered the dataset anew, or exited the dataset altogether (Singer & Willett, 2003).

Censoring occurs when there is an incomplete measure of an individual’s exposure to risk (Allison, 1984; Yamaguchi, 1991). In the case of the present study, all censoring is of the “right” variety, due either to study design (i.e., data collection ending at 2012-13) or because the individual exited the Texas public school system (e.g., retired, left the profession, moved out of state). Right censoring is an expected and normal part of survival time data that is accounted for by event history modeling techniques (Box-Steffensmeier & Jones, 2004; Yamaguchi, 1991). Figure 1 provides visualization of example scenarios contained in and excluded from our final data set. In the top panel, the example scenarios are shown in historical time, as measured by academic years. Case A would not be included in the dataset because we do not know if or when their first administrative certification occurred. This is an example of “left” censoring, because their initial exposure to risk (certification) occurred to the left of our entry window (1996-97 to 2005-06). Case E would be excluded because their initial certification occurred after the entry window. In the bottom panel, cases B, C, D, and F are shown in observation time. Notice that the beginning of observation time (period 0) does not correspond with a specific academic year. This allowance for scattered starts, as measured by historical time, is another desirable feature of event history analysis.

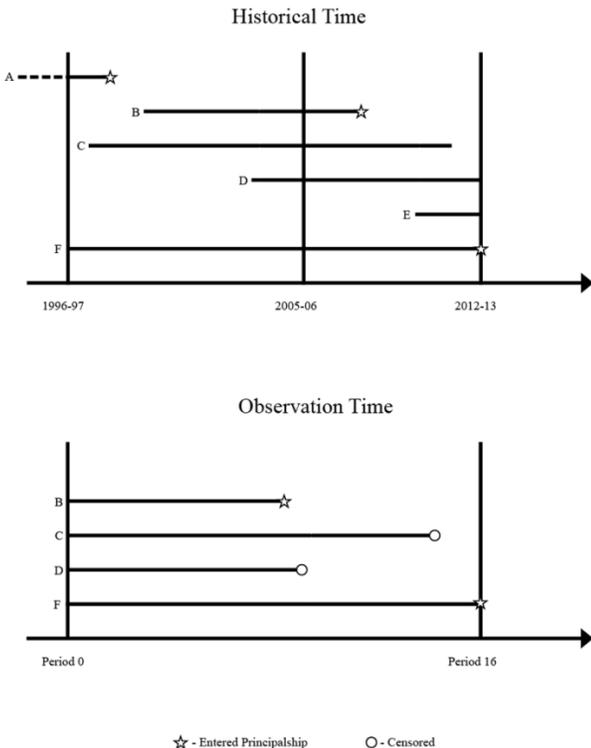


Figure 1: Visualizing Population, Data Structure, and Censoring

Following the recommendations of the literature on discrete-time hazard modeling (Singer & Willett, 2003), we estimated as the dependent variable in our models the probability of each person experiencing the event within any one period through a logistic regression. We included covariates that enable us to estimate the risk associated with each time period in the data set, thus controlling for all other variables. The equation for our model is as follows:

$$\text{logit } h(t_i) = [\alpha_1 D_1 + \alpha_2 D_2 + \dots + \alpha_{17} D_{17}] + \beta_1 \text{age} + \beta_2 \text{age squared} + \beta_{3-6} \text{race/ethnicity dummies} + \beta_7 \text{male} + \beta_{8-11} \text{race/ethnicity and male interactions} + \beta_{12} \text{years with district} + \beta_{13} \text{years as educator} + \beta_{14} \text{years as educator squared} + \beta_{15-17} \text{school size} + \beta_{18-20} \text{school urbanicity} + \beta_{20-23} \text{student body characteristics} + \beta_{24-26} \text{accountability rating}$$

The α 's are period-specific intercepts representing the log odds of event occurrence for the comparison group during the time period to which they are associated (Singer & Willett, 2003). The β 's are slope parameters that capture the effect of the covariates on the relative probability of entering the principalship.

Logistic regression fixes to a value of 0, the log odds of an individual with mean values of all covariates being assigned to the baseline outcome (Powers & Xie, 2008), which in this case is *not* being in the principalship. We include odds ratios in the output for each of our independent variables, as the coefficients traditionally returned by logistic regression are not reflective of a linear relationship, and therefore do not lend themselves to straightforward interpretation (Singer & Willett, 2003).

FINDINGS:

Descriptive Statistics

Recall that the present study asks whether and when teachers with principal certification enter the principalship, and further, seeks to determine how race/ethnicity and gender mediate the probability of making this transition. In pursuit of these questions, we begin with a review of the descriptive statistics. Our analysis then carries over to a review of our life table. We conclude our findings with an overview of the discrete time hazard results.

Table 1 displays the proportional representation of race/ethnicity, gender, and the intersection of race/ethnicity and gender among the study population across all observations in the data set⁷, as well as those observations occurring at two distinct, career junctions: initial principal certification, and first entry into the principalship. Every observation in the data set contributes to the figures in the *all observations* column. The *initial certification* column contains only those observations from period 0, which is the time that an individual first obtains principal certification and enters the data set. The *entered principalship* column refers only to those observations when individuals experienced the event of interest – first entry into the principalship.

Table 1: Descriptive Statistics for Study Population

	All observations				Initial certification				Entered principalship			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
<i>Individual characteristics</i>												
Female	0.669	0.471	0	1	0.656	0.475	0	1	0.582	0.493	0	1
Male	0.331	0.471	0	1	0.344	0.475	0	1	0.418	0.493	0	1
White	0.631	0.483	0	1	0.654	0.476	0	1	0.696	0.460	0	1
Latino	0.204	0.403	0	1	0.190	0.393	0	1	0.189	0.391	0	1
Black	0.146	0.354	0	1	0.136	0.342	0	1	0.097	0.296	0	1
Asian	0.006	0.077	0	1	0.007	0.081	0	1	0.005	0.070	0	1
Other	0.013	0.112	0	1	0.013	0.115	0	1	0.014	0.117	0	1
Female and White	0.411	0.492	0	1	0.419	0.493	0	1	0.396	0.489	0	1
Female and Latina	0.137	0.344	0	1	0.125	0.330	0	1	0.112	0.315	0	1
Female and Black	0.109	0.311	0	1	0.100	0.300	0	1	0.065	0.246	0	1
Female and Asian	0.004	0.063	0	1	0.004	0.067	0	1	0.003	0.055	0	1
Female and Other	0.008	0.089	0	1	0.008	0.089	0	1	0.007	0.083	0	1
Male and White	0.220	0.414	0	1	0.235	0.424	0	1	0.300	0.458	0	1
Male and Latino	0.067	0.251	0	1	0.066	0.248	0	1	0.077	0.266	0	1
Male and Black	0.038	0.191	0	1	0.036	0.186	0	1	0.032	0.177	0	1
Male and Asian	0.002	0.045	0	1	0.002	0.047	0	1	0.002	0.044	0	1
Male and Other	0.005	0.068	0	1	0.005	0.072	0	1	0.007	0.083	0	1
Age	42.621	8.977	22	76	37.983	8.484	22	70	41.447	7.586	26	69
Years in education	14.104	7.397	0	47	9.616	6.422	0	36	13.755	6.726	0	37
Years with district	8.653	6.947	0	44	5.952	5.238	0	34	7.204	6.921	0	37
<i>Campus Controls</i>												
Enrollment 0-600	0.320	0.467	0	1	0.350	0.477	0	1	0.627	0.484	0	1
Enrollment 601-1200	0.427	0.495	0	1	0.415	0.493	0	1	0.316	0.465	0	1
Enrollment 1201-1800	0.093	0.290	0	1	0.096	0.295	0	1	0.028	0.164	0	1
Enrollment 1801+	0.158	0.365	0	1	0.137	0.344	0	1	0.023	0.148	0	1
Urbanicity - rural	0.183	0.387	0	1	0.154	0.361	0	1	0.328	0.470	0	1
Urbanicity - town	0.091	0.288	0	1	0.084	0.277	0	1	0.153	0.360	0	1
Urbanicity - suburb	0.288	0.453	0	1	0.311	0.463	0	1	0.220	0.414	0	1
Urbanicity - city	0.438	0.496	0	1	0.451	0.498	0	1	0.299	0.458	0	1
% Students econom. disadv.	0.543	0.282	0	1	0.503	0.284	0	1	0.536	0.266	0	1
% Students Black	0.152	0.189	0	1	0.151	0.197	0	1	0.125	0.163	0	1
% Students Latino	0.451	0.314	0	1	0.406	0.318	0	1	0.427	0.310	0	1
% Students Asian	0.030	0.051	0	0.70	0.027	0.045	0	0.47	0.025	0.049	0	0.54
Accountability - unacceptable	0.029	0.167	0	1	0.016	0.125	0	1	0.030	0.171	0	1
Accountability - acceptable	0.511	0.500	0	1	0.538	0.499	0	1	0.480	0.500	0	1
Accountability - recognized	0.312	0.463	0	1	0.274	0.446	0	1	0.324	0.468	0	1
Accountability - commended	0.125	0.331	0	1	0.119	0.323	0	1	0.146	0.353	0	1
<i>N</i>	90,129				10,979				3,633			

The figures in Table 1 indicate that a larger proportion of White and male individuals enter the principalship than those gaining certification. A lower percentage of female and Black individuals enter the principalship than do obtain certification. We also found a substantially larger share of White males and Latino males among educators entering the principalship in comparison to teachers obtaining principal certification. Conversely, Latinas and Black females have lower representation among new principals than they do among those obtaining initial certification. These findings point to potential

inequities that can be further investigated through the statistical controls allowed by the discrete-time hazard model.

Table 1 also displays means for age, years of experience in education, and concurrent years of experience with a district. The population under study was, on average, just under 38 years of age (37.98), had been in education for just under 10 years (9.62), and had been with their district for just under six years (5.95) when they first obtained principal certification. Upon entering the principalship, the population averaged 41.45

years of age, had been in the Texas education system for nearly 14 years (13.76) and was employed with their present district for just over 7 years (7.20). These differences are intuitive, as we would expect those entering the principalship to be slightly older and more experienced, both overall and with their districts, than those obtaining certification. Of interest here is the relatively small difference in the mean number of concurrent years with present district between the certification and principalship observations – just over one year (1.25). This finding suggests that time served within a district may not be a large factor for entering the principalship. Bastian and Henry (2015) found that most North Carolina principals were “homegrown”, meaning their years after certification were typically spent with the same district that hired them as principals. We attribute this difference in findings to the ways that school systems are organized in each state. In North Carolina, most school districts are county wide. Counties in Texas can be comprised of many different school districts, meaning that aspiring principals can switch districts and enter the principalship without having to move. Also of interest is the difference in school enrollment and urbanicity between certification and principalship observations. While just 15% of certification observations occurred in rural schools, 33% of principalship observations were in rural schools. Further, 35% of certification observations were on campuses with a total

enrollment of 600 or less, compared to 63% of principalship observations. Finally, new principals tended to come from schools with slightly lower Black enrollment and slighter higher accountability ratings than certification observation schools.

Life Table

Following the recommendations for reporting the dependent longitudinal probability of experiencing the event within the dataset (Singer & Willet, 2003), Table 2 details a life table providing longitudinal descriptives of the population event history including the year-by-year set of individuals, censoring information, and the hazard and survival functions. The first column, *period*, is neither calendar nor academic year specific. As an example, consider period 0, which is when a classroom teacher first obtains initial administrator certification. For the individuals in this study, this could have occurred in any academic year in the previously described 10-year entry window that is portrayed in Figure 1. The *interval* column corresponds with the discrete nature of time in our model and serves as a reminder of what point in observation time that each period represents. For example, period 1 represents the point in time that demarcates interval one from interval two, and period two represents the demarcation of intervals two and three, etc.

Table 2: Life Table

Period	Interval	Not a principal at beginning of year	Became principal during the year	Censored	Hazard function	Survival function
0	[0,1)	10,979	-	279	-	1.000
1	[1,2)	10,700	311	261	0.029	0.971
2	[2,3)	10,128	339	237	0.034	0.938
3	[3,4)	9,552	380	222	0.040	0.901
4	[4,5)	8,950	525	213	0.059	0.848
5	[5,6)	8,212	457	206	0.056	0.801
6	[6,7)	7,549	449	231	0.060	0.753
7	[7,8)	6,869	355	1,099	0.052	0.715
8	[8,9)	5,415	287	1,078	0.053	0.677
9	[9,10)	4,050	189	786	0.047	0.645
10	[10,11)	3,075	127	551	0.041	0.618
11	[11,12)	2,397	81	516	0.034	0.598
12	[12,13)	1,800	60	389	0.033	0.578
13	[13,14)	1,351	35	373	0.026	0.563
14	[14,15)	943	20	420	0.021	0.551
15	[15,16)	503	15	264	0.030	0.534
16	[16,17)	224	3	221	0.013	0.527

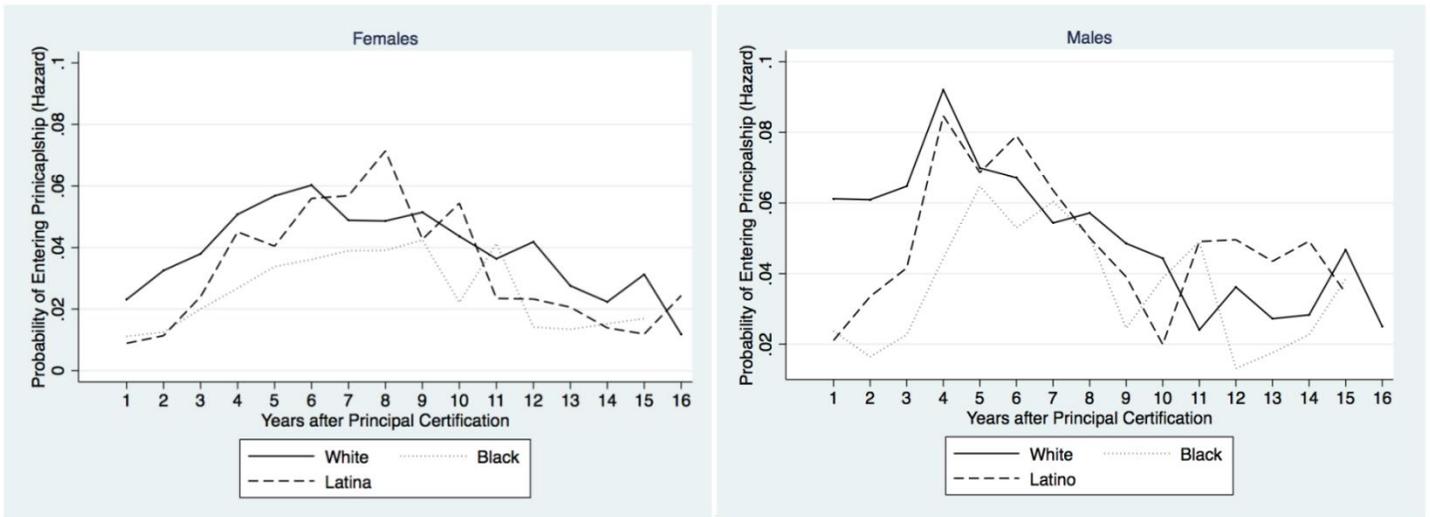


Figure 2: Plotted Hazard of Entering Principals by Intersection of Race/Ethnicity and Gender

The third column, *not a principal at beginning of year*, represents the number of administratively certified educators still employed on a campus but not in a principalship role at the beginning of each period. The fourth column, *became principal during the year*, represents the number of individuals in each period that experienced the event. The column labeled *censored* displays the number of individuals that, for varying reasons (e.g., retirement, profession change, move out of state, etc.) were not observed in the succeeding period. The large jump in censored cases between periods six and seven is an anticipated effect of our study design, as these cases are primarily those individuals who obtained certification late in the entry window (close to or during 2005-06) and had yet to enter the principalship at the end of data collection (the 2012-13 academic year; see case D in Figure 1 as an illustrative example). The hazard function represents the proportion of those still active in the data set that experienced the event in each period. Note that the hazard function remains quite low across all periods, with highs of 0.059 and 0.060 for periods four and six respectively. This means that during the periods of peak hazard, just 6% of the active study population became a principal, making the transition from teaching to the principalship a relatively rare event. Put more simply, teachers are most likely to become a principal six years after they obtain the requisite certification. After year seven, hazard steadily declines for the most part.

Turning attention back to table 2, recall that the survivor function is the proportion of educators that persist to the next period without becoming a principal. The period 16 figure of 0.527, informs us that just under 53% of teachers who obtain principal certification remain employed as non-principals after 16 years. Conversely, just over 47% of administratively certified teachers become principals within 16 years. The survivor function can be interpreted as such at any period. For example, five years after principal certification, 80% of certificate holders continue into their sixth year of not being a principal, while 20% will have already become principals. To summarize, the hazard of becoming a principal remains low, but peaks six years after certification. Additionally, and after 16

years, less than half of administratively certified teachers enter the principalship. In other words, we have determined no median lifetime (the point at which half the eligible population has experienced the event of interest) for teachers at risk of becoming principals. The conveyance of a median lifetime is a staple in survival analysis reporting; therefore its absence in our study, despite our utilization of such a wide observation window, was very surprising, as we expected more teachers to have entered the principalship within 16 years of certification. We revisit this finding in our discussion.

Now that the conditions of the population hazard and survival functions have been established, we turn to a discussion of the hazard experienced by groups at the various intersections of race/ethnicity and gender. Rather than create a separate life table for each group, we instead offer a graphical representation of these differences in hazard. Figure 2 charts the hazard of entering the principalship for the six primary intersections of gender and race/ethnicity used in our study. The left panel contains the hazard for White females, Black females, and Latinas. The hazard for females peaks between six and nine years after certification. Throughout the first six years after certification, White females have the highest probability of becoming principals. This probability is then momentarily eclipsed by that for Latinas in the seventh, eighth, and tenth years after certification. For the most part, White females maintain the highest probability of entering the principalship in the remaining periods of observation. On the male side of figure 2, we see that peak hazard occurs sooner for males than it does for females – between four and five years after certification. Not only does peak hazard occur more quickly after certification, but also, the hazard itself is greater. Put another way, males are more likely than their same-race, female counterparts to enter the principalship. They are also likely to do so sooner. The hazard for White males to become principals is higher than that of Latino males and Black males through the first four years after certification. This relative advantage diminishes over time until relative hazard becomes approximately equal for males of all races, seven to eight years after certification. Following these periods, there is no clear

advantage in hazard, as there is great fluctuation between each group's relative hazard. We will revisit these new contributions to the knowledge base in the discussion.

Discrete-time Hazard Model

Although in figures 4 we differentiated hazard by various intersections of race/ethnicity and gender, those figures do not take into account any additional individual or school characteristics. The discrete-time hazard model allows us to do just that. Table 3 displays the coefficients, standard errors, odds ratios, and significance measures for each term in the model. Although we are in possession of population data, significance measures help us to understand how much substantive impact that change in a particular covariate may have upon the hazard of becoming a principal, controlling for all other variables in the model. That is to say, every term matters, however change in variables shown to be "statistically non-significant" are associated with little substantive change in the probability of becoming a principal.

Goodness of fit

The deviance figure, which is -2 times the log likelihood of a model, provides the foundation for a comparison between a proposed model and a saturated model with perfect fit (a model with a unique parameter for every observation). Reduction in deviance between models suggests better fit. This difference in deviance follows a chi-square distribution (Allison, 1982; Singer & Willett, 2003) and can be tested for significance with degrees of freedom defined by the number of additional covariates. As displayed in table 5, the reduction in deviance between a model containing only period indicators and our full, reported model, was highly significant. The Aikake and Bayesian information criteria (AIC and BIC, respectively) champion parsimony by penalizing the deviance of models with added terms (Singer & Willett, 1993; 2003). Despite the very large addition of covariates brought by the full, reported model, the AIC and BIC measures dropped substantially.

Results

We begin with a brief glance at the period intercepts. Notice in table 3 that the coefficient associated with period six is the highest of all. This coincides with findings from our life table suggesting the hazard of becoming a principal peaks six years after certification.

Transitioning to the individual characteristics, we can see the age coefficient is positive, while the coefficient for age squared is negative. This reinforces our finding during the data exploration stage, which suggested a convex relationship between age and the probability of being a principal: additional years in age are helpful only to a certain point, where they then begin to actually diminish the odds of becoming a principal. This finding concurs with that of Ringel et al.'s (2004) study of Illinois and Crawford and Fuller's (2015) study of Texas. As expected, this same form of relationship was discovered with overall years in education.

Now, we turn to the race/ethnicity and gender variables. We found the conditional, main effects of Black and Latino to be significant and negative. The latter stands in contrast to Ringel,

et al.'s (2004) and Fuller et al.'s (2007) studies of Illinois and Texas, respectively, that found a positive association of the Hispanic/Latino main effect. In reviewing the odds ratios associated with our race/ethnicity and gender variables, we see that the relative odds of administratively-certified Black teachers and Latino teachers becoming principals are just 60% and 64%, respectively, of White teachers, controlling for all other variables. Inverting these odds ratios ($\frac{1}{0.600}$ for Black, $\frac{1}{0.643}$ for Latino) informs us that the odds of administratively-certified White teachers entering the principalship is 1.67 and 1.55 times greater than that of Black educators and Latino educators, respectively (and controlling for all other variables). The conditional, main effect of male is significant and positive – a finding that concurs with virtually all studies in the literature review. The odds ratio for male suggests that administratively certified male teachers are 1.20 times more likely than females to become principals, holding all other variables constant. Interestingly, the interactions of Black and Latino with *male*, are significant and positive. This suggests that although being Black or Latino is associated with a lower likelihood of becoming a principal relative to Whites, being Black or Latino *and male*, is associated with a higher likelihood of becoming a principal, relative to White females, controlling for all other variables. Therefore, the influence of male on the interaction terms is quite substantial. Our findings around these interaction terms represent an addition to the knowledge base that is discussed further in the next section of the paper.

Moving to measures of experience, the odds of becoming a principal do not increase with an additional year in the same district, controlling for all other variables. While this effect is likely offset for many by the boost gained from increased age and years of overall experience in education, it seems to suggest that districts are not averse to bringing in outsiders to become principals – a finding that connects back to our earlier observation of the small difference in mean years of experience between observations when individuals first obtained certification and observations of those entering the principalship.

Turning to campus controls, we found that spending the previous year in a school (recall that campus controls are time lagged) with a greater percentage of economically disadvantaged students is associated with a decreased likelihood of entering the principalship. The opposite is true for spending the previous year in a school with greater proportions of Black, Latino, and Asian students. We also found that spending the previous year in a school with larger enrollment or a school with greater metro-centric urbanicity is associated with a reduction in the relative odds of becoming a principal. This finding concurs with the descriptive analysis that found a larger prevalence of rural schools and those with enrollments of 600 or fewer among event observations as compared to entry observations. Finally, there is a decrease in relative odds of becoming a principal that is associated with accountability ratings of *acceptable* and *better*.

Table 3: Discrete-Time Hazard Model Output

	Coefficient	SE	Odds ratio	p ≤ x
<i>Period intercepts</i>				
Period 1	-0.146	0.075	0.864	***
Period 2	0.076	0.073	1.079	
Period 3	0.314	0.071	1.369	***
Period 4	0.801	0.067	2.227	***
Period 5	0.799	0.070	2.223	***
Period 6	0.917	0.071	2.502	***
Period 7	0.759	0.077	2.136	***
Period 8	0.816	0.082	2.260	***
Period 9	0.691	0.094	1.997	***
Period 10	0.562	0.110	1.754	***
Period 11	0.471	0.129	1.601	***
Period 12	0.430	0.148	1.538	***
Period 13	0.113	0.184	1.119	
Period 14	-0.143	0.256	0.867	
Period 15	0.296	0.293	1.344	
Period 16	-0.432	0.596	0.649	
<i>Individual Characteristics</i>				
Age	2.028	0.246	7.602	***
Age squared	-2.460	0.251	0.085	***
Asian	0.043	0.316	1.044	
Black	-0.517	0.080	0.596	***
Latino	-0.447	0.065	0.639	***
Other	-0.207	0.217	0.813	
Male	0.167	0.043	1.182	***
Male * Asian	-0.286	0.516	0.751	
Male * Black	0.417	0.130	1.517	***
Male * Latino	0.366	0.094	1.441	***
Male * Other	0.440	0.313	1.553	
Years with district	-0.170	0.029	0.844	***
Years in education	-0.410	0.105	0.664	***
Years in education squared	0.680	0.110	1.975	***
<i>Campus Controls</i>				
% Students econom. disadv.	-0.324	0.035	0.723	***
% Students Black	0.066	0.030	1.069	*
% Students Latino	0.396	0.036	1.485	***
% Students Asian	0.140	0.017	1.150	***
Enrollment (ref. 1-600)				
Enrollment 601-1200	-1.224	0.040	0.294	***
Enrollment 1201-1800	-2.426	0.106	0.088	***
Enrollment 1801+	-3.154	0.117	0.043	***
Urbanicity (ref. rural)				
Town	-0.590	0.055	0.554	***
Suburb	-0.794	0.049	0.452	***
City	-1.001	0.048	0.368	***
Accountability (ref. Unacceptable)				
Accountability - Acceptable	-2.120	0.051	0.120	***
Accountability - Recognized	-2.321	0.056	0.098	***
Accountability - Exemplary	-2.422	0.070	0.089	***
<i>Goodness of fit</i>				
Deviance (-2 log likelihood)	26,873.118			***
AIC	26,959.118			
BIC	27,362.673			

Note: * p ≤ .05; *** p ≤ .001

In sum, our event history analysis uncovered serious differences in the hazard of becoming a principal experienced by individuals at the various intersections of race/ethnicity and gender. Males and Whites tended to have higher peak hazard than other groups, and this peak hazard tended to occur sooner after certification. Our descriptive analysis uncovered inequitable representation of race/ethnicity and gender amongst principals. Our use of inferential techniques allowed us to determine if these inequities might be explained by systematic differences along lines of race/ethnicity and gender in personal and contextual characteristics such as age, experience, campus characteristics, etc. The DTH model, which controlled for such characteristics and more, established that an educator's race/ethnicity and gender -alone and in combination- have a substantial impact on one's prospect of becoming a principal. That said, Whiteness alone does not always lead to the highest probabilities of becoming a principal, as our race/ethnicity and gender interaction terms reveal that White females are less likely than Black males and Latino males to become a head principal, controlling for all other variables in the model.

DISCUSSION:

Through the life table and hazard plots, we documented the low probability of teachers becoming principals, yet we established no median lifetime. While we had anecdotal knowledge that many Texas teachers with administrator certification were not becoming principals, no empirical evidence of this phenomenon was available until a recent and important study on the influence of leadership preparation program features by Fuller, Hollingworth, & An (*in press*) affirming the low incidence of certificate holders entering the principalship. A not unreasonable hypothesis would place more certificate holders into the principalship, and sooner. Since this is not the case for many Texas teachers, we pondered several explanations.

First, it is possible that some Texas teachers become principals outside of the public school system, and therefore would not be reflected in the TEA data. Such instances are likely very few, as principal certification is not a requirement for the administration of private schools in Texas. Second, it is likely that many principal certificate holders are employed in other administrative positions for which principal certification is not necessarily required (such as district-level positions, e.g. coordinators, supervisors, directors, etc.), yet it represents the closest fit in credential. Additionally, some holders of principal certification may be satisfied as assistant principals and have no aspirations to be the chief campus administrator. The answer could also be as simple as teachers wanting to expand possibilities for the future while not being set on an immediate position change. Further, certificate holders may not be as interested in the principalship as they are with the bump in esteem and salary that comes with having the master's degree required to obtain the certificate, as many Texas public school districts utilize salary schedules that assign increased pay depending upon highest degree attained. Finally, the very low probabilities of whether and when Texas teachers become principals after certification could be entirely normal, or perhaps even exemplary when compared to other states. Without established points of comparison, we cannot say.

While females outnumber males nearly 4:1 amongst public school educators in Texas (Texas Education Agency, 2014), they remain underrepresented in the principalship when considering their overall representation amongst educators. As our analysis amplifies, the pathway to the principalship disfavors females, even when controlling for a host of other factors. Females of color are especially disfavored in their likelihood of transitioning from certificate holder to principal. Implicitly, our findings suggest that White men would have the most opportunity when they decide to pursue the principalship. In light of research regarding the experiences of Black principals (Gooden, 2005; Lomotey, 1993; Tillman, 2002, 2004) Latino principals (Hernandez & Murakami, 2016; Murakami, Hernandez, Mendez-Morse, & Byrne-Jimenez, 2015), and more specifically, the experiences of Latina (Méndez-Morse, Murakami, Byrne-Jiménez, & Hernandez, 2015) and Black female principals (Dillard 1995, 2010; Jean-Marie, 2013; Jean-Marie, Williams, & Sherman, 2009; Reed & Evans, 2008), the advantage afforded White men is all the more troubling. We mention these bodies of work for two important reasons. First, they call attention to the challenges faced by school leaders from these groups, and second, they highlight the unique perspectives and contributions toward school effectiveness brought by such leaders. Because our findings are suggestive of systemic, gendered, and racial biases, action must be taken to ensure that aspiring leaders at all intersections of race and gender are afforded equitable opportunity to bring their abilities to the principalship, thus influencing the public school leadership ranks to be all the more responsive to that of increasingly diverse student bodies.

To be clear, we do not advocate racial balancing as a solution to challenges we discuss above. That is to say, efforts to make more congruent the gender and race of those in the principalship with that of the larger, available talent pool; or of making leadership more representative of the increasing number of students of color in public schools, again, is not a turnkey solution. For instance, we know more is needed relative to a principal's cultural competence, as this is an incredibly meaningful aspect of leadership. Indeed, there are implications of this work worth discussing. For instance, we as scholars, practitioners, and policymakers, must acknowledge this disproportionality of gender and race amongst principals in comparison to those certified to lead. Is this disproportionality the result of gender and racial biases? Obviously, if either is true, then it is illegal. However, we need to know what causes and perpetuates these inequities, and that can only be done by first acknowledging them and their importance.

Implications

The fact that the hazard of becoming a principal peaks four to six years after certification is of interest. Why do educators secure positions approximately five years after certification (a finding that concurs with Bastian and Henry's (2015) study of North Carolina)? Is it possible that this peak corresponds with employers' perceptions of candidates' readiness as conveyed through the latter's experience in the assistant principalship? What happens for teachers, in these six or more years, on average, between when they become administratively certified and take the job of the principalship? As noted above in the

literature review, very little research has been done in this area, perhaps because the extent of the problem and of the amount of time has not been known previously, and previous to the present study, perhaps researchers and policymakers may have assumed the lag between certification and principalship to be only a year or two with the majority of certified teachers taking on the building leadership role. As noted by Stevenson (2006), there is a strong need for more research on the entire career trajectory of aspiring school leaders, especially on their transition from certification program, teaching with a building level administrative certification, and then to possible school leadership. There is an emerging knowledge base on novice principals (Crow, 2006; Spillane & Anderson, 2014), as well as on the assistant principalship (Armstrong, 2010, 2012; Barnett, Shoho, & Oleszewski, 2012), however much more work in this area is needed. As one of the few studies to have examined this time period between certification and principalship, Howley, Andrianaivo, and Perry (2005) sub-titled their article “why teachers don’t want to become principals”. Based on their survey of over 2,000 administratively certified teachers, they found a myriad number of reasons as to why a teacher would not take up the leadership role, including issues noted here of gender and racial biases, as well as those relating to school context. Howley et al. (2005) explain thusly:

The finding that teachers generally view the disincentives associated with the principalship as more salient than the incentives is particularly troubling, implying that, for large numbers of teachers, the principalship appears not to represent a professional aspiration... Moreover, if teachers do not see administration as the valued culmination of a career in education, but instead as an unpleasant task undertaken by individuals substantially different from themselves, they will tend, in the main, to discredit what school leaders contribute. (p.773)

For future research and policy on how to address this issue, we concur with recent literature that has called for an increased role of school districts in both “tapping” potential leadership talent (Myung, Loeb, & Hornig, 2011), and importantly given our findings here, providing structured and purposeful training and professional development for administratively certified teachers to bolster the principal pipeline. This is an important but often overlooked function of districts to provide the training for the teachers who have already indicated at least some desire for the principalship through obtaining certification. Much of the recent reports on district efforts in this area have focused on district initiatives through research funding of the Wallace Foundation (Anderson & Turnbull, 2016; Mitgang, 2013; Seashore Louis, Leithwood, Wahlstrom, & Anderson, 2010; Turnbull, Riley, Arcaira, Anderson, & MacFarlane, 2013; Turnbull, Riley, & MacFarlane, 2015). This work calls for a much stronger role of the school district central office in the ongoing and important work of professional development to prepare administratively certified teachers for the role of the principalship. We concur, as our results show that there are on average about six years of time for districts to provide training to teachers before they take up the role of the principalship. We encourage future research in this area which would examine

district practices for these teachers. A very promising area of emerging research and practice is the increasing number of university-district partnerships around principal training, in which university leadership preparation programs shift from seeing individual teachers and principals as their clients to districts as their clients (Klostermann, Pareja, Hart, White, & Huynh, 2015; Lochmiller, Chesnut, & Stewart, 2015), working to link their programs directly to district leadership pipelines, schools, and the specific needs of their local district organizations. We look forward to future work in this area.

This work is part of a larger conversation that provides a solid start to addressing the inequities that are made so apparent by our study. There are additional implications for states, preparation programs, and school organizations. First, state legislators must determine whether they want to continue to subsidize without more oversight, preparation programs that, taken together, place less than 50% of graduates obtaining certification. Should legislators require state education agencies to monitor program-specific placement rates in leadership positions? State education agencies might consider expanding their certification offerings to more appropriately match the destinations of principal certification holders that move into increasingly common, campus and district-level positions that did not exist in the past. However, as demonstrated here from across the state of Texas, states should not assume that the majority of the teachers certified to lead schools using the current system of certification will ever do so. Additionally, our results speak to the ongoing policy debate over the extent to which principal preparation programs should be held accountable for the performance of the teachers they certify to lead schools. Multiple studies have demonstrated the inherent difficulty of not only estimating the longitudinal influence of individual principals on student achievement (Bowers & White, 2014; Coelli & Green, 2012; Hallinger & Heck, 2011; Heck & Hallinger, 2014), but also the added difficulty of assessing principal preparation program quality on student achievement (Fuller & Hollingsworth, 2014, 2015; Fuller, Young, & Baker, 2011; Milstein & Krueger, 1997), yet reports continue to be issued calling for improved capabilities of preparation programs to train aspiring principals for the leadership of their future schools (Anderson & Turnbull, 2016; Levine, 2005). Our results cast this debate in a new light. We show at a state population level, that principal preparation programs in Texas do not train teachers who become principals the majority of the time, as less than half of all teachers in Texas who obtained an administrative certification became school leaders. Additionally, we show for the first time in the literature, that after certification, for teachers who do become principals, this does not take place on average until six years after certification, with very few taking up the building leadership role within the first few years. Thus, not only do they become principals in a minority of cases, but teachers who are administratively certified see half a decade go by before entering the principalship. We argue here that calls for measures of preparation program impact on eventual student performance must take into account these findings.

Preparation programs need to perhaps more carefully consider prospective students. Recruitment and selection should be

aimed toward generating practicing principals, especially if the program's mission is built around preparing the next generation of school leaders. Further, and even more relevant, is the need for programs to inform aspiring leaders about the current state of inequities in the selection process. This way, as aspiring leaders move into administration, they might have the requisite knowledge to disrupt power imbalances.

Our findings here indicate that pathways to the principalship are neither race nor gender-neutral. Hence, school organizations must be more cognizant of their personnel decisions. The same sorts of multicultural education and racial awareness training presented to students in many preparation programs ought be experienced by those responsible for the selection and assignment of school leaders. We further recommend the monitoring of recruitment, selection, and assignment processes over time. Examining the demographics of those currently in the principalship may be revealing, but we must not lose sight of that fact that there is a point when it is too late to examine and address why disproportionality is present. There should be an understanding of rates at different points of the leadership pipeline, such as the credentialing, application, interview, and offer stages. Examining multiple points in the pipeline can help bring more to light about those who successfully transition into the principalship, and those who do not.

There are also more implications for research. First, adding in more controls for personal background attributes could be helpful when studying administrator selection and assignment processes. While consistent, reliable records of undergraduate institution and principal preparation / master's program attended were not available for all individuals in our study, including such information in the future, could help to clarify their influence on the probability of becoming a principal, as extant findings differ across and within state contexts (see Bastian & Henry, 2015; Fuller et al., 2007; Fuller, Hollingworth, & An, 2016; Gates et al., 2004; Papa et al., 2002). Additional implications for research are captured by our discussion of the limitations to this study.

Limitations and Conclusion

The largest limitation to this study is the lack of information about the degree to which principal certification holders sought employment as a principal. That is to say, we do not know how often they applied, were interviewed, and given offers for principal positions. That said, if DeAngelis and Kwakyu Oconnor's (2012) findings from Illinois (that teachers with principal certification who were female or of color were, for the most part, *at least as likely* to apply for, interview, and accept principal positions in comparison to their White peers) held true for Texas, then our findings would be all the more indicative of bias. Additionally, there are limitations as to the generalizability of this study. As the literature review indicates, state context matters, and although this study has a great deal to say about the massive and diverse public education system of Texas, our findings may not hold true for locations with very unique or different demographic and cultural characteristics. Further, we did not account for school level (e.g. elementary or secondary) in our analyses. Understanding the influence of the school level in which teachers begin their careers, obtain

principal certification, and ultimately enter administration could have bearing on our findings, however a thorough and contributory exploration of these factors necessitates the space of separate studies.

Our findings represent the production and selection process as a large black box. We have high hopes for the potential of qualitative research to lift the lid on this box to better explicate and contextualize these processes so that a more equitable leadership pipeline may be established. Another limitation pertains to our paradigmatic perspective, which was informed by critical quantitative inquiry; we wish to thank Daniel B. Saunders for challenging our thinking in this area. Where critical research aims to give voice to those underrepresented and amplify their counternarrative, quantitative work bypasses much of this and instead represents these important human aspects as numerical measures. Such practice runs the risk of essentializing groups, neglecting individual agency, and reducing complex relationships and influences to predictable, consistent effects. We hope that this potential limitation is outweighed by the fact that our work reveals serious racial/ethnic and gender inequities in an otherwise ordinary-seeming process. To the extent that our analysis lends credence to the argument that principal selection in Texas might be influenced by systemic bias, and can be a vehicle for interrupting inequitable practices, we feel that our work indeed responds to Baez' (2007) call for critical, quantitative work to support transformative practice.

Notes

1. A term determined by Farley-Ripple, Solano, and McDuffie (2012) to be similarly explored in the literature through related terminologies such as *attrition*, *mobility*, and *stability*.
2. The "race/ethnicity" term is used in this study to indicate that categorizations of race and ethnicity are considered together to understand the careers paths of different groups of educators. We understand that race and ethnicity are separate constructs. We also recognize that people of a common race can be ethnically diverse, just members of a common ethnic group can be racially diverse.
3. While sex is likely a more accurate descriptor of the information being conveyed, gender is the term employed by the Texas Education Agency in our data to differentiate male and female educators.
4. Determined by enrollment and coded as four distinct dummy variables. 1=0 to 600 students, 2=601-1200 students, 3=1207-1800 students, 4=1801+ students
5. Determined by IES Common Core data standards and coded as dummy variables. 1=rural, 2=town, 3=suburban, 4=urban.

Suggested Citation:

Davis, B.W., Gooden, M.A., Bowers, A.J. (2017) Pathways to the Principalship: An Event History Analysis of the Careers of Teachers with Administrator Certification. *American Educational Research Journal*, 54(2), p.207-240.
<http://journals.sagepub.com/doi/abs/10.3102/0002831216687530>

REFERENCES:

- Allison, P. D. (1982). Discrete-time methods for the analysis of event histories. *Sociological Methodology*, 13(1), 61–98.
- Allison, P. D. (1984). *Event history analysis: Regression for longitudinal event data*. Beverly Hills, CA: Sage Publications.
- Anderson, L. M., & Turnbull, B. J. (2016). *Evaluating and supporting principals: Building a stronger principalship*. New York: The Wallace Foundation.
- Armstrong, D. E. (2010). Rites of passage: Coercion, compliance, and complicity in the socialization of new vice-principals. *Teachers College Record*, 112(3), 685–722.
- Armstrong, D. E. (2012). Connecting personal change and organizational passage in the transition from teacher to vice principal. *Journal of School Leadership*, 22(3), 398–424.
- Baez, B. (2007). Thinking critically about the “critical”: Quantitative research as social critique. *New Directions for Institutional Research*, (133), 17–23. <http://doi.org/10.1002/ir.201>
- Baker, B. D., Punswick, E., & Belt, C. (2010). School leadership stability, principal moves, and departures: Evidence from Missouri. *Educational Administration Quarterly*, 46(4), 523–557. <http://doi.org/10.1177/0013161X10383832>
- Barnett, B. G., Shoho, A. R., & Oleszewski, A. M. (2012). The job realities of beginning and experienced assistant principals. *Leadership and Policy in Schools*, 11(1), 92–128. doi: 10.1080/15700763.2011.611924
- Bastian, K. C., & Henry, G. T. (2015). The apprentice: Pathways to the principalship and student achievement. *Educational Administration Quarterly*, 51(4), 600–639. <http://doi.org/10.1177/0013161X14562213>
- Béteille, T., Kalogrides, D., & Loeb, S. (2012). Stepping stones: Principal career paths and school outcomes. *Social Science Research*, 41(4), 904–919. doi:10.1016/j.ssresearch.2012.03.003
- Bowers, A. J. (2010). Toward addressing the issues of site selection in district effectiveness research: A two-level hierarchical linear growth model. *Educational Administration Quarterly*, 46(3), 395–425. <https://doi.org/10.1177/0013161X10375271>
- Bowers, A. J. (2015). Site selection in school district research: A measure of effectiveness using hierarchical longitudinal growth models of performance. *School Leadership & Management*, 35(1), 39–61. <https://doi.org/10.1080/13632434.2014.962500>
- Bowers, A. J., & Lee, J. (2013). Carried or defeated? Examining the factors associated with passing school district bond elections in Texas, 1997–2009. *Educational Administration Quarterly*, 49(5), 732–767. <https://doi.org/10.1177/0013161X13486278>
- Bowers, A.J., Chen, J. (2015) Ask and Ye Shall Receive? Automated Text Mining of Michigan Capital Facility Finance Bond Election Proposals to Identify which Topics are Associated with Bond Passage and Voter Turnout. *Journal of Education Finance*, 41(2), p.164–196. <https://doi.org/10.7916/D8FJ2GDH>
- Bowers, A.J., & R. White, B. (2014). Do principal preparation and teacher qualifications influence different types of school growth trajectories in Illinois? A growth mixture model analysis. *Journal of Educational Administration*, 52(5), 705–736. <https://doi.org/10.1108/JEA-12-2012-0134>
- Box-Steffensmeier, J. M. (2004). *Event history modeling: A guide for social scientists*. Cambridge, NY: Cambridge University Press.
- Boyce, J., & Bowers, A. J. (2016). Principal turnover: Are there different types of principals who move from or leave their schools? A latent class analysis of the 2007–2008 Schools and Staffing Survey and the 2008–2009 Principal Follow-Up Survey. *Leadership and Policy in Schools*, 15(3), 237–272. <https://doi.org/10.1080/15700763.2015.1047033>
- Branch, G. F., Hanushek, E. A., & Rivkin, S. G. (2012). *Estimating the effect of leaders on public sector productivity: The case of school principals*. National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w17803>
- Brown, K. S., & White, B. R. (2010). *The state of leadership: Public school principals in Illinois*. Edwardsville, IL: Illinois Education Research Council.
- Carter, P. L., & Welner, K. G. (2013). *Closing the opportunity gap: What America must do to give every child an even chance*. Oxford University Press.
- Census Bureau (2014). Metropolitan and micropolitan statistical area totals dataset: Population and estimated components of change: April 1, 2010 to July 1, 2013. Retrieved from: https://www.census.gov/popest/data/metro/totals/2013/CB_SA-EST2013-alldata.html
- Crawford, E. R., & Fuller, E. J. (2015). A Dream attained or deferred? Examination of production and placement of Latino administrators. *Urban Education*. <http://doi.org/10.1177/0042085915602537>
- Crow, G. M. (2006). Complexity and the beginning principal in the United States: perspectives on socialization. *Journal of Educational Administration*, 44(4), 310–325. doi: 10.1108/09578230610674930
- DeAngelis, K. J. (2013). A look at returning teachers. *Education Policy Analysis Archives*, 21(0), 1–31. <http://doi.org/10.14507/epaa.v21n13.2013>
- DeAngelis, K. J., & Kawakyu O’Connor, N. K. (2012). Examining the pipeline into educational administration: An analysis of applications and job offers. *Educational Administration Quarterly*, 48(3), 468–505. <http://doi.org/10.1177/0013161X11436269>
- Dillard, C. B. (1995). Leading with her life: An African American feminist (re)interpretation of leadership for an urban high school principal. *Educational Administration Quarterly*, 31(4), 539–563. <http://doi.org/10.1177/0013161X9503100403>
- Dillard, C. B. (2010). The substance of things hoped for, the evidence of things not seen: Examining an endarkened feminist epistemology in educational research and leadership. *International Journal of Qualitative Studies in Education*, 13(6), 661–681. <http://doi.org/10.1080/09518390050211565>
- Fuller, E. J., & Hollingworth, L. (2014). A bridge too far? Challenges in evaluating principal effectiveness. *Educational Administration Quarterly*, 50(3), 466–499. doi: 10.1177/0013161x13506595

- Fuller, E. J., & Hollingworth, L. (2015). Exploring best practices in evaluating principal preparation programs. Paper presented at the Annual meeting of the American Educational Research Association (AERA), Chicago, IL.
- Fuller, E. J., Hollingworth, L., & An, B. P. (2016). The impact of personal and program characteristics on the placement of school leadership preparation program graduates in school leader positions. *Educational Administration Quarterly*, 52(4), 643-674. <http://doi.org/10.1177/0013161X16656039>
- Fuller, E. J., Young, M., & Baker, B. D. (2011). Do principal preparation programs influence student achievement through the building of teacher-team qualifications by the principal? An exploratory analysis. *Educational Administration Quarterly*, 47(1), 173-216. doi: 10.1177/0011000010378613
- Fuller, E., Young, M., & Orr, T. (2007, April). *Career pathways of principals in Texas*. Presented at the annual conference of the American Educational Research Association, Chicago, IL.
- Gates, S. M., Guarino, C., Santibáñez, L., Brown, A., Ghosh-Dastidar, B., & Chung, C. H. (2004). *Career paths of school administrators in North Carolina*. Santa Monica, CA: RAND.
- Gates, S. M., Ringel, J. S., Santibanez, L., Ross, K. E., & Chung, C. H. (2003). *Who is leading our schools?: An overview of school administrators and their careers*. Santa Monica, CA: RAND Corporation.
- Gates, S. M., Ringel, J. S., Santibáñez, L., Guarino, C., Ghosh-Dastidar, B., & Brown, A. (2006). Mobility and turnover among school principals. *Economics of Education Review*, 25(3), 289-302. doi:10.1016/j.econedurev.2005.01.008
- Gooden, M. A. (2005). The role of an African American principal in an urban information technology high school. *Educational Administration Quarterly*, 41(4), 630-650. <https://doi.org/10.1177/0013161X04274273>
- Hallinger, P., & Heck, R. H. (1998). Exploring the principal's contribution to school effectiveness: 1980-1995. *School Effectiveness and School Improvement*, 9(2), 157-191. <http://doi.org/10.1080/0924345980090203>
- Hernandez, F., & Murakami, E. (2016). Counterstories about Leadership: A Latina School Principal's Experience from a Less Documented View in an Urban School Context. *Education Sciences*, 6(1), 6. <http://doi.org/10.3390/educsci6010006>
- Howley, A., Andrianaivo, S., & Perry, J. (2005). The pain outweighs the gain: Why teachers don't want to become principals. *Teachers College Record*, 107(4), 757-782.
- Jean-Marie, G. (2013). The subtlety of age, gender, and race barriers: A case study of early career African American female principals. *Journal of School Leadership*, 23(3), 615-639.
- Jean-Marie, G., Williams, V. A., & Sherman, S. L. (2009). Black Women's Leadership Experiences: Examining the Intersectionality of Race and Gender. *Advances in Developing Human Resources*, 11(5), 562-581. <http://doi.org/10.1177/1523422309351836>
- Khalifa, M. A., Gooden, M. A., & Davis, J. E. (2016). Culturally responsive school leadership: A synthesis of the literature. *Review of Educational Research*, 34654316630383. <https://doi.org/10.3102/0034654316630383>
- Klostermann, B. K., Pareja, A. S., Hart, H., White, B. R., & Huynh, M. H. (2015). Restructuring principal preparation in Illinois: Perspectives on implementation successes, challenges, and future outlook. Edwardsville, IL: Illinois Education Research Council.
- Lankford, R. H., O'Connell, R. W., & Wyckoff, J. H. (2003). Our next generation: School leadership in New York state. RAND.
- Leithwood, K., Louis, K. S., Anderson, S., & Wahlstrom, K. (2004). *Review of research: How leadership influences student learning*. New York: Wallace Foundation.
- Levine, A. (2005). *Educating school leaders*. New York: Education Schools Project.
- Lochmiller, C. R., Chesnut, C. E., & Stewart, M. S. (2015). Preparing leaders in an era of school turnarounds: The promise of university/district partnerships as a lever for program improvement. In A. J. Bowers, A. R. Shoho & B. G. Barnett (Eds.), *Challenges and opportunities of educational leadership research and practice: The state of the field and its multiple futures* (Vol. 6, pp. 199-223). Charlotte, NC: Information Age Publishing.
- Loeb, S., Kalogrides, D., & Horng, E. L. (2010). Principal preferences and the uneven distribution of principals across schools. *Educational Evaluation and Policy Analysis*, 32(2), 205-229. <http://doi.org/10.3102/0162373710369833>
- Lomotey, K. (1993). African-American principals: Bureaucrat/administrators and ethno-humanists. *Urban Education*, 27395-412. doi:10.1177/0042085993027004005
- Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks: Sage Publications.
- Mascall, B., & Leithwood, K. (2010). Investing in leadership: The district's role in managing principal turnover. *Leadership and Policy in Schools*, 9(4), 367-383. <http://doi.org/10.1080/15700763.2010.493633>
- Méndez-Morse, S., Murakami, E. T., Byrne-Jiménez, M., & Hernandez, F. (2015). Mujeres in the principal's office: Latina school leaders. *Journal of Latinos and Education*, 14(3), 171-187. <http://doi.org/10.1080/15348431.2014.973566>
- Milner, H. R. (2012). Beyond a test score: Explaining opportunity gaps in educational practice. *Journal of Black Studies*, 43(6), 693-718. <http://doi.org/10.1177/0021934712442539>
- Milstein, M. M., & Krueger, J. A. (1997). Improving educational administration preparation programs: What we have learned over the past decade. *Peabody Journal of Education*, 72(2), 100-116. doi: 10.1207/s15327930pje7202_6
- Mitgang, L. (2013). *Districts matter: Cultivating the principals urban schools need*. New York, NY: The Wallace Foundation.
- Murakami, E. T., Hernandez, F., Mendez-Morse, S., & Byrne-Jimenez, M. (2015). Latina/o school principals: Identity, leadership and advocacy. *International Journal of Leadership in Education*, 0(0), 1-20. <http://doi.org/10.1080/13603124.2015.1025854>

- Myung, J., Loeb, S., & Horng, E. (2011). Tapping the principal pipeline: Identifying talent for future school leadership in the absence of formal succession management programs. *Educational Administration Quarterly*, 47(5), 695-727. doi: 10.1177/0013161x11406112
- National Center for Education Statistics. (2016a). *Percentage distribution of school principals by race/ethnicity, percentage minority, school type, and selected school characteristics: 2003–04*. Retrieved from: https://nces.ed.gov/surveys/sass/tables/sass_2004_27.asp
- National Center for Education Statistics. (2016b). *Number of public school principals and percentage distribution of school principals, by race/ethnicity and state: 2007–08*. Retrieved from: https://nces.ed.gov/surveys/sass/tables/sass0708_2009323_p1s_02.asp
- National Center for Education Statistics. (2016c). *Total number of public school principals and percentage distribution of school principals, by race/ethnicity and state: 2011–12*. Retrieved from: https://nces.ed.gov/surveys/sass/tables/sass1112_2013313_p1s_001.asp
- Papa, F. C., Lankford, H., & Wyckoff, J. (2002). *The attributes and career paths of principals: Implications for improving policy*. University at Albany, SUNY.
- Powers, D. A., & Xie, Y. (2008). *Statistical methods for categorical data analysis*. Bingley, UK: Emerald.
- Reed, L., & Evans, A. E. (2008). "What you see is [not always] what you get!" Dispelling race and gender leadership assumptions. *International Journal of Qualitative Studies in Education*, 21(5), 487–499. <http://doi.org/10.1080/09518390802297797>
- Ringel, J., Gates, S. M., Chung, C. H., Brown, A., & Ghosh-Dastidar, B. (2004). *Career paths of school administrators in Illinois: Insights from an analysis of state data*. Santa Monica, CA: RAND.
- Seashore Louis, K., Leithwood, K., Wahlstrom, K., & Anderson, S. E. (2010). *Learning from leadership: Investigating the links to improved student learning*. St. Paul, MN: The Center for Applied Research and Educational Improvement, University of Minnesota.
- Singer, J. D., & Willett, J. B. (1993). It's About Time: Using Discrete-Time Survival Analysis to Study Duration and the Timing of Events. *Journal of Educational and Behavioral Statistics*, 18(2), 155–195. <http://doi.org/10.3102/10769986018002155>
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence* (1st ed.). Oxford University Press, USA.
- Spillane, J. P., & Anderson, L. (2014). The architecture of anticipation and novices' emerging understandings of the principal position: Occupational sense making at the intersection of individual, organization, and institution. *Teachers College Record*, 116(7), 1-42.
- Stage, F. K. (2007). Answering critical questions using quantitative data. *New Directions for Institutional Research*, (133), 5–16. <http://doi.org/10.1002/ir.200>
- Stage, F. K., & Wells, R. S. (2014). Critical quantitative inquiry in context. *New Directions for Institutional Research*, (158), 1–7. <http://doi.org/10.1002/ir.20041>
- StataCorp. (2013). *Stata: Release 13*. College Station, TX: StataCorp, LP.
- Stevenson, H. (2006). Moving towards, into and through principalship: Developing a framework for researching the career trajectories of school leaders. *Journal of Educational Administration*, 44(4), 408–420. <http://doi.org/10.1108/09578230610676604>
- Texas Education Agency (2014). Texas academic performance report: 2012-13 state performance. Retrieved from: <http://ritter.tea.state.tx.us/perfreport/tapr/2013/state.pdf>
- Tillman, L. C. (2002). Culturally sensitive research approaches: An African-American perspective. *Educational Researcher*, 31(9), 3–12. <http://doi.org/10.3102/0013189X031009003>
- Turnbull, B. J., Riley, D. L., Arcaira, E. R., Anderson, L. M., & MacFarlane, J. R. (2013). Six districts begin the principal pipeline initiative. New York: The Wallace Foundation.
- Turnbull, B. J., Riley, D. L., & MacFarlane, J. R. (2015). *Building a stronger principalship, vol. 3: Districts taking charge of the principal pipeline*. Washington, DC: Policy Studies Associates, Wallace Foundation.
- Witziers, B., Bosker, R. J., & Krüger, M. L. (2003). Educational leadership and student achievement: The elusive search for an association. *Educational Administration Quarterly*, 39(3), 398–425.
- Yamaguchi, K. (1991). *Event history analysis*. Newbury Park, CA: Sage Publications.