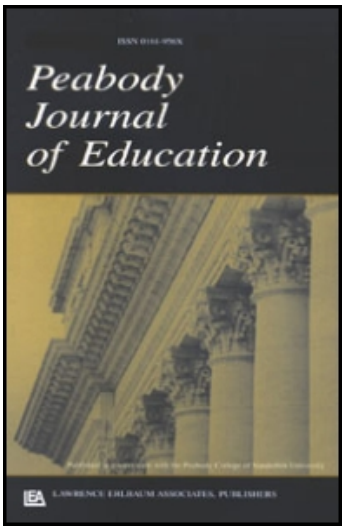

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Susanna Loeb [a]; Linda Darling-Hammond [a]; John Luczak [b]
[a] School of Education, Stanford University. [b] Program Officer for Education, Joyce Foundation.

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How Teaching Conditions Predict Teacher Turnover in California Schools

Susanna Loeb and Linda Darling-Hammond
School of Education
Stanford University

John Luczak
Program Officer for Education
Joyce Foundation

A number of studies have found that teachers are prone to leave schools serving high proportions of low-achieving, low-income, and minority students for more economically and educationally advantaged schools. In schools with very high turnover rates, this can pose a number of challenges, including lack of continuity in instruction, lack of adequate teaching expertise for making curriculum decisions and providing support and mentoring, and lost time and resources for replacement and training. If high rates of turnover are caused largely by student characteristics, then policy strategies to correct the problem are limited. However, due to data constraints, little research has sought to disentangle the effects of student demographic factors from occupational factors such as salaries and working conditions that may also influence turnover and are amenable to policy interventions. Using California teacher survey data linked to district data on salaries and staffing patterns, this study examines a range of school conditions as well as demographic factors and finds that high levels of school turnover are strongly affected by poor working conditions and low salaries, as well as by student characteris-

Requests for reprints should be sent to Susanna Loeb, 234 CERAS, 520 Galvez Mall, Stanford, CA 94305. E-mail: sloeb@stanford.edu

tics. Although schools' racial compositions and proportions of low-income students predict teacher turnover, salaries and working conditions—including large class sizes, facilities problems, multitrack schools, and lack of textbooks—are strong and significant factors in predicting high rates of turnover. Furthermore, when these conditions are taken into account, the influence of student characteristics on turnover is substantially reduced.

Much attention has recently focused on labor market variables that contribute to students' differential access to well-qualified teachers in schools serving more and less advantaged populations of students (Lankford, Loeb, & Wyckoff, 2002; National Commission on Teaching and America's Future [NCTAF], 1996, 2003). Along with issues associated with teacher recruitment are factors that influence decisions to leave the profession or to transfer among schools. Some analysts have argued that quit and transfer decisions are the largest component of teacher supply problems, as the lion's share of attrition stems from nonretirement choices (Ingersoll, 2001; NCTAF, 2003). The factors associated with these decisions, in the aggregate, are particularly important to understand in the case of schools with high rates of turnover, where the combined effects of individual quit decisions can be particularly problematic for school stability, curriculum coherence, instructional quality, and efficient use of resources (Shields et al., 2001).

Wages and benefits, nonpecuniary features such as working conditions and student body characteristics, and aspects of preparation and skill that influence teachers' success in the classroom are all likely to influence the decision to leave a school or to leave the occupation (Boyd, Lankford, Loeb, & Wyckoff, in press). A number of studies have looked at the influence of salaries on teacher decisions to leave teaching, and a few have looked at working conditions. Studies of school leavers have found that teachers leave schools with larger proportions of low-income and minority students at higher rates than other schools (Shen, 1997). Some research tracking patterns of transfers finds that teachers transfer out of high-minority schools into schools with fewer minority students (e.g., Carroll, Reichardt, & Guarino, 2000; Scafidi, Sjoquist, & Stinebrickner, 2002) and out of low-performing schools into better performing ones (Hanushek, Kain, & Rivkin, 2004).[1]

Given the confluence of negative schooling conditions in schools serving low-income and minority students, a critical issue for policymakers is

[1]However, two studies using earlier panel data (Heyns, 1988, and Stinebrickner, 1998, both using a national longitudinal data set, NLS–72) found that teachers did not leave schools serving low-income students at higher rates. In addition, Theobald (1990) found that Washington teachers in districts with high property values tended to leave the profession at higher rates. This, however, could include urban districts that serve low-income students.

whether these demographic variables can be disentangled from other factors that are amenable to policy influences. In this article we consider evidence concerning a number of these factors as they influence rates of school-level turnover, with an eye to what might be alterable through policy and practice. Whereas attrition in general may be a positive or negative occurrence for a school, depending on who leaves and for what reasons, high rates of turnover that undermine continuity in instruction and reflect difficulty securing or keeping competent teachers are problematic for school operations and for student achievement. Particularly, we focus on the organizational predictors of high attrition rates in schools where turnover is a major problem and vacancies are difficult to fill. We also use far more detailed data on school conditions than those found in previous studies of the effect of working conditions on decisions to quit or transfer.

Occupational Factors Influencing Turnover

Salaries

Substantial evidence suggests that wages play a role in retaining as well as attracting teachers. Baugh and Stone (1982), for example, found that teachers are at least as responsive to wages in their decision to enter teaching as are workers in other occupations. Studies employing national data sets and state administrative data have found that teachers are more likely to quit or transfer when they work in districts with lower wages, especially relative to alternative wage opportunities (Boe, Bobbitt, Cook, Whitener, & Weber, 1997; Brewer, 1996; Mont & Rees, 1996; Murnane, Singer, & Willett, 1989; Shen, 1997; Stinebrickner, 1998; Theobald, 1990; Theobald & Gritz, 1996).

Murnane and Olsen (1990), using data on North Carolina teachers who began teaching in 1975, found that a $1,000 increase in each salary step of a district's salary schedule would increase the teacher's mean duration in that district by 2 to 3 years. Teachers in high-demand fields like mathematics and science that have higher wage alternatives were especially vulnerable to salary differences in their decisions to remain in teaching. Hanushek, Kain, and Rivkin (1999) found, using Texas panel data on teachers and students, that increasing teacher salaries within a district by 10% reduces the probability of a teacher leaving the district by 2% for a teacher with 0 to 2 years of experience and by 1% for a teacher with 3 to 5 years of experience. Theobald (1990) and Gritz and Theobald (1996) found similar trends in retention linked to district and state wage levels for a sample of Washington State teachers, with the effects of salary differentials higher at the start of

the teaching career. Using a national longitudinal data set (NLS–72), Stinebrickner (1998) found that a teacher receiving a wage about 1 *SD* above the mean would have a 9% greater probability of staying in teaching more than 5 years than a teacher earning the mean wage.

Working Conditions

Although there is less research about the effects of working conditions on teachers' quit decisions, there is evidence from surveys of teachers that working conditions play a role in decisions to leave teaching. The 1995 Schools and Staffing Surveys (SASS) Teacher Followup Survey found that attrition rates were higher in high-poverty than low-poverty schools, and those who left high-poverty schools were more than twice as likely as those in low-poverty schools to report leaving because of dissatisfaction with teaching (Darling-Hammond, 1997). The major areas of dissatisfaction ranged from student motivation and discipline to lack of administrative supports. Salaries were also a factor, but a less prominent one.

These school-level differences are not surprising because there are large variations in teachers' salaries and working conditions across schools. In 1994, not only were the best paid teachers in low-poverty schools earning over 35% more than the best paid teachers in high-poverty schools (National Center for Education Statistics [NCES], 1997a, Figure 6.2), they also experienced much easier working conditions including smaller class sizes and pupil loads and much more control over decision making in their schools (NCES, 1997a, Table A 4.15). Teachers in high-poverty schools were much less likely to say that they had influence over decisions concerning curriculum, texts, materials, or teaching policies. They were also much less likely to be satisfied with their salaries or to feel they had the necessary materials available to them to do their job (Darling-Hammond, 1997).

Using the 1994 SASS data, Weiss (1999) found that, after controlling for teachers' personal and educational backgrounds, teaching fields, salary, and class sizes, teachers' perceptions of professional working conditions—such as administrative support, availability of necessary materials, participation in decision making, and collegial opportunities—were the most significant predictor of beginning teachers' morale, career choice commitment, and plans to stay in teaching. Shen's (1997) analysis of the SASS follow-up surveys confirmed that teachers who left teaching or transferred schools not only had lower salaries, they also felt they had significantly less influence over school policies and that their problems were less well understood by their administrators.

A few studies have modeled the effect of school resources on teacher retention. Stinebrickner (1998) found only a small effect of student–teacher

ratios on length of spells in teaching (in the expected direction but statistically insignificant); however, Theobald (1990) found that extremely large pupil:staff ratios are detrimental to staff retention. Theobald and Gritz (1996) found that male teachers are less likely to transfer to another school when they are in districts that spend more for teaching materials, suggesting that better resourced districts may have more holding power.

These few studies exploring individual teacher quit decisions shed some light on the relation between selected working conditions and teacher attrition but provide only spotty evidence about how a range of conditions may be related to school turnover rates. Moreover, although differences in teaching conditions and working conditions across school types have been documented, their implications for teacher attrition have not been systematically examined. Finally, previous studies documenting the influences of student characteristics such as race, class, and achievement on school turnover rates have not simultaneously examined a range of working conditions and salaries—conditions that may co-determinate with student characteristics—and that may also influence the holding power of schools.

The Problems of High-Turnover Schools

The conditions that create attrition in schools with high turnover may be distinctive. Teacher turnover—including both "movers," who leave one school or district for another; and "leavers," who exit the profession temporarily or permanently—is 50% higher in high-poverty than in low-poverty schools (Ingersoll, 2001, p. 516), and new teachers in urban districts exit or transfer at higher rates than their suburban counterparts (Hanushek et al., 1999). The end result is that some of these schools are staffed disproportionately with inexperienced and often untrained teachers.

In a set of studies regarding teacher quality in California, Stanford Research Institute researchers used a benchmark of 20% or more teachers without clear credentials to demarcate schools that have "high concentrations" of underqualified teachers, arguing that such high levels "can create problems throughout the entire school community" (Shields et al., 1999, p. 47; see also Shields et al., 2001). These problems include high turnover of untrained teachers, which creates continual hiring needs and instability; a lack of mentors, because few teachers are experienced or fully prepared; and an erosion of professional development for other teachers in the building, as the basic training needed for untrained novices must be repeated year after year, impeding progress on other pedagogical needs. In addition, the researchers found these conditions create disincentives for keep-

ing other credentialed teachers in the school. These teachers describe their embarrassment about the "lack of professionalism" and low levels of skills displayed by many uncredentialed teachers and the resulting instructional burden they experience to make up for the shortcomings of their colleagues (Shields et al., 1999, pp. 47–48).

Schools with high turnover often staff classrooms with a continuous string of short- and long-term substitute teachers (Shields et al., 1999, p. 48). This contributes to the instability students experience and to the low quality of instruction because substitutes frequently also have little preparation for teaching and there is little curricular coherence when personnel are constantly changing. Students in these heavily impacted schools experience a number of negative consequences in addition to the frequent lack of knowledge and skills on the part of individual teachers. First, students are more likely to encounter a string of such teachers, thus experiencing a cumulative effect that is more damaging to their learning than 1 year of poor teaching would create (e.g., for estimates of the cumulative effects of poor teaching, see Sanders & Rivers, 1996). Second, the "collective knowledge" of a school is weakened, and the overall expertise in the school may be inadequate to support educational decision making or collegial learning.

Finally, concentrations of new teachers create a drain on a school's finances as well as on human resources. For example, the high attrition rate of new and uncertified teachers—most of whom tend to leave within a few years (Darling-Hammond, 2003)—means that schools staffed primarily by such teachers must continually allocate funds for recruitment efforts and professional support for new teachers without reaping dividends from these investments. A recent study in Texas, using several different business cost models, found that the school system expenses of recruitment, hiring, and training associated with teacher attrition are $8,000 or more for each recruit who leaves in the first few years of teaching (Texas Center for Educational Research, 2000). Instead of using funds for needed school improvements, monies are spent in a manner that produces little long-term payoff (Carroll et al., 2000; Shields et al., 2001). Therefore, stemming the tide of attrition in these schools is critical for their ability to invest in student learning.

This Study

This study examines teacher, student, and organizational factors associated with high levels of turnover in California schools using three different measures as outcomes: (a) whether teachers report their school has a serious problem with teacher turnover, (b) whether teachers report that their

schools' vacancies are difficult to fill, and (c) the proportion of beginning teachers in the school. This last measure is typically associated with turnover, although it can also, in a relatively small number of instances, be influenced by large enrollment increases that require unusual levels of hiring.

The Data Set

We used data from a survey of 1,071 California teachers conducted in January 2002 by Louis Harris Associates. The teachers represent 1,018 schools located in approximately 370 different school districts in 53 of the 58 counties in the state. Telephone interviews of teachers focused on the working conditions in their respective schools, including the adequacy of textbooks and instructional materials, physical facilities, class size and schedule, professional development opportunities, and teacher turnover and hiring. The teacher sample consisted of a random, representative sample drawn from teacher lists provided by Market Data Retrieval, with oversampling of teachers residing in lower income census tracks so as to ensure an adequate number of teachers from low-income schools (Harris, 2002). The sample was then weighted to reflect the state representative proportions of teachers working in schools by level and student composition.[2] Because of the lag time in making vendor's lists available, the sample underrepresents new teachers. By the time the list is made available and the telephone surveys are conducted, last year's new teachers have become 2nd-year teachers, if they have remained in teaching. However, the sample closely represents the state's schools. For example, the proportions of minority students in the schools represented by the two random samples of all California teachers used by Louis Harris Associates to draw their sample for this study are 61% and 60%, respectively, as compared to the 61% recorded by the California Department of Education's California Basic Educational Data System (CBEDS) data about the state's schools.

In general, inexperienced teachers have higher attrition rates than experienced teachers (NCES, 1997b). However, because our dependent variables are measures of school-level teacher turnover, rather than individual attrition, the underrepresentation of less experienced teachers does not

[2]Harris (2002) used three samples drawn from data purchased from Market Data Retrieval (MDR): (a) Calhome: A random sample of names and home phone numbers of teachers in MDR's database for California public school teachers; (b) Caltech: A random sample of names and school phone numbers of teachers in MDR's database for California public school teachers. Samples were drawn from both lists to secure a comprehensive and representative overall sample; and (c) Calholo: A random sample of names and school numbers of teachers in MDR's database for California public school teachers residing in lower income census tracks. Earlier survey work showed that such teachers are much more likely to teach in schools serving a greater number of low-income students.

pose the problem for our analyses that it might if we were seeking to model individual attrition decisions. The sample adequately represents the schools in which more than 20% of teachers are uncredentialed (which are, by definition, schools with large numbers of inexperienced teachers) and low-income schools where inexperienced teachers are concentrated.

Louis Harris (2002) added school-level data on student demographics from three California Department of Education databases—the Academic Performance Index, Education Data Partnership, and the CBEDS.[3] We augmented the data that Louis Harris collected with additional teacher turnover and salary data from statewide data sources. First, we added the CBEDS data on school-level teacher experience levels and created a proxy for school-level turnover by calculating the percentage of 1st-year teachers in a school.[4] This process required the school-level merging of an individual teacher's school with the CBEDS database using a unique school code.

Second, we added teacher salary information from district salary scales for each school observation. Instead of average salaries, which are affected by teacher experience levels that vary across districts, we use salary schedule measures to represent teacher salaries at three different points during their career: (a) a beginning teacher salary, represented by the lowest salary offered in the district; (b) the entry salary level for most credentialed teachers in California, represented by BA+30 (bachelor's degree plus 30 credits), Step 1; and finally (c) an advanced salary level, represented by BA+60 (bachelor's degree plus 60 credits), Step 10. The first and third measures are gathered from a California Department of Education report, whereas the second measure is taken from a California Teachers Association salary report. Both of these reports present data from the J–90 salary schedule form that districts submit to the state.

We adjusted these salary measures for cost-of-living and wage differentials across the state, using the county as a unit of analysis to capture the differences across local labor markets. We used a county's average earnings per job in 1999 (California Department of Finance, 2002) to adjust each district's salary schedule. A limitation of this measure is that the adjust-

[3]The Academic Performance Index data can be found at http://api.cde.ca.gov/, Education Data Partnership at http://www.ed-data.k12.ca.us/, and the California Basic Educational Data System at http://www.cde.ca.gov/demographics/coord/

[4]Because California does not track teachers using a unique teacher identifier, it is impossible for the state to calculate yearly attrition rates the way many other states do. Therefore, the percentage of 1st-year teachers is used to estimate the number of new teachers that needed to be hired at a school the year before. More advantaged schools with low turnover tend to hire experienced teachers when they have relatively rare vacancies, whereas less advantaged schools with high turnover tend to have to hire beginners in larger numbers. Therefore, a large percentage of 1st-year teachers in a school is another proxy for high turnover.

ment does not take into account the mix of jobs in a local labor market: Some have more professional jobs and others have more low-skilled labor jobs. Nonetheless, it does reflect the alternative job and wage structures facing teachers who are relatively place bound, and it compensates to a substantial extent for the large cost of living differentials across the state.[5]

Table 1 highlights the salary differences across counties for our salary schedule measures. Statewide, salaries for comparably educated and experienced teachers varied by a ratio of almost 2:1 in 2000–01. The range of salaries adjusted for the level of other county wages shows nearly a 3:1 ratio for the highest and lowest paying districts across the state, relative to their local county labor markets. These salary range estimates are conservative because they include only the districts represented in our teacher sample, or 370 of the 842 districts that report salary schedule information to the state (California Department of Education, 2002). Much of this salary variation can occur within counties. In many counties, beginning teacher salaries vary by at least $5,000 (and as much as $15,000 in Alameda County), and advanced salaries vary by at least $7,000 (and as much as $27,000 in Los Angeles County). Other studies have found similar disparities in salaries within counties (Lankford et al., 2002; Pogodzinski, 2000).

Methods

After assembling the database, we created working conditions factors to represent teachers' views of the conditions in their current school and their optimism about future school conditions. We created binary variables from questions soliciting teachers' views of specific working conditions:

Whether there are enough copies of textbooks for every student to use in class.

- Whether there are enough copies of textbooks for students to take home.
- Whether students have access to computers in the classroom.
- Whether the teacher's largest class is less than 25 students.
- Whether the teacher's largest class is greater than 33 students.
- Whether the teacher reports that his or her classroom is too small for the number of students in the class.
- Whether the school uses space for instruction that was not designed as a classroom (e.g., gymnasium, auditorium, cafeteria).
- Whether the temperature in the classroom is uncomfortable.

[5]Other similar studies of California teachers have used median home prices as an adjustment (Pogodzinski, 2000), but those data were not available for many of the counties in the state.

Table 1
Range of California Salaries, 2000–01

	Range of Regular Salaries (County, District)		*Range of Adjusted Salaries Ratio to State Average (County, District)*	
Salary Schedule Level	*From*	*To*	*From*	*To*
Lowest	$23,194 (Lake County, Kelseyville Unified)	$45,709 (Alameda County, Pleasanton Unified)	0.502 (Santa Clara County, Alum Rock Union Elementary)	1.601 (Calaveras County, Vallecito Union Elementary)
BA+30, step 1	$27,639 (Tehama County, Reeds Creek Elementary	$49,591 (Alameda County, Pleasanton Unified)	0.597 (Santa Clara County, Gilroy Unified)	1.601 (Calaveras County, Vallecito Union Elementary)
BA+60, step 10	$37,278 (Fresno County, Alvina Elementary)	$69,478 (Santa Clara County, Mountain View-Los Altos Union)	0.880 (Santa Clara County, Gilroy Unified)	2.205 (Riverside County, Corona-Norco Unified)

Note. BA+30 = bachelor's degree plus 30 credits; BA+60 = bachelor's degree plus 60 credits.

- Whether the classroom has too much noise for students to concentrate.
- Whether the teacher has seen evidence of cockroaches, rats, or mice during the last year.
- Whether the school bathrooms are open and clean.

We also created four-level measures of teachers' reports about the quality of textbooks and of whether the textbooks give up-to-date information.

We created a dummy variable for whether the school schedule is "year-round multitrack." Typically, in such schools a group of teachers teach and a group of students attend for several months, stop attending for 1 month or more, and then resume attendance, whereas other groups of teachers and students use the building in the "off" times. The notion of such schedules is that, by servicing several different groups of students on different schedules, they are designed to use school buildings year round, thus increasing their capacity; and, by having shorter breaks, to avoid the long summer vacation that can negatively affect the achievement of some students. Although some approaches to modified calendars have been found to have academic benefits, schools that maintain a single-track approach to the modified calendar have had more positive outcomes than those that adopt a multitrack approach, which has more often been found to have a negative effect on achievement (e.g., see Cooper, Valentine, Charlton, & Melson, 2003).

In California, most multitrack schools were created for reasons of overcrowding, not educational preference. As several studies have reported, so-called Concept 6 multitrack schools in California's urban areas with limited facilities and increasing enrollments are so overcrowded that they must run several truncated sessions throughout the year and multiple sessions each day, resulting in a significant overall reduction in instructional time for the students, reduced access to many courses and specialized programs, increased tracking with less mobility between tracks, very large class sizes, and poorer academic performance (Herman, 1987; Oakes, 2002).

Finally, from the large number of survey questions evaluating school conditions, we conducted a factor analysis that produced two major factors: the first based on teachers' ratings of their school on eight dimensions of teaching conditions and the second based on teachers' optimism about the future for the school—that is, whether teachers believe conditions will improve—over the same eight dimensions. The component variables are based on teachers' ratings of the quality of professional development, working conditions for teachers, their own job satisfaction, quality and appropriateness of required tests for students, the way the school involves

parents, the textbooks and instructional materials given, the adequacy of physical facilities, and the availability of technology.

Table 2 describes the factors. The ratings factor has an alpha of 0.81, and the optimism factor has an alpha of 0.74. For both factors, teachers' rating of their working conditions has the strongest factor loading. In the ratings factor, this is followed by teachers' ratings of physical facilities, their ratings of professional development, and their own job satisfaction; all with

Table 2
School Conditions and Teacher Optimism Factors

Variable	*Observations*	*M*	*SD*	*Factor Loading*
School conditions				
The quality of professional development	998	1.981	0.849	0.607
Working conditions for teachers	998	2.017	0.862	0.752
Your own job satisfaction	998	1.661	0.716	0.604
The quality and appropriateness of tests you are required to administer	998	2.726	0.921	0.438
The way the school involves parents	998	1.906	0.876	0.579
The text books and instructional materials you are given	998	1.921	0.732	0.549
The adequacy of physical facilities in your school	998	2.282	0.909	0.619
Availability of technology (computers & other technology)	998	2.179	0.950	0.566
Teacher optimism				
The quality of professional development	1,019	0.784	0.412	0.626
Working conditions for teachers	1,025	0.658	0.475	0.675
Your own job satisfaction	1,013	0.859	0.348	0.569
The quality and appropriateness of tests you are required to administer	1,001	0.453	0.498	0.387
The way the school involves parents	1,035	0.883	0.321	0.393
The text books and instructional materials you are given	1,028	0.844	0.363	0.428
The adequacy of physical facilities in your school	1,024	0.697	0.460	0.484
Availability of technology (computers & other technology)	1,037	0.838	0.369	0.485

Note. These are the descriptive statistics for the members of the sample with no missing data for either of the dependent variables "turnover is a problem" or "vacancies are difficult to fill" outcome. For school conditions factor, the teacher ratings for the conditions in the school ranged from 1 (*excellent*) to 4 (*poor*); eigenvalue = 2.83, $\alpha = 0.811$. For teacher optimism factor, responses to the question "Looking ahead to 5 years from now, are you optimistic or pessimistic that this will be better 5 years from now?" were 0 (*pessimistic*) or 1 (*optimistic*); eigenvalue = 2.13, $\alpha = 0.735$.

loadings above .60. In the optimism factor, teachers' rating of their working conditions is closely followed by their ratings of the school's professional development offerings and their own job satisfaction. Therefore, these components—which include both tangible working conditions and teachers' learning opportunities—represent the major elements of the factors that reflect teachers' views about their workplaces.

We use logit regression to develop models for each of the first two outcome variables of interest—whether turnover is a problem and whether vacancies are difficult to fill, and ordinary least squares (OLS) regression for the third outcome variable—the proportion of beginning teachers in the school. For each of these equations, we estimate three models. In the first model, we enter teacher background characteristics: age, ethnicity, education level, and teaching experience (plus a squared term). In the second model, we add school demographic characteristics: the proportions of students by racial or ethnic status, the percentage qualifying for free or reduced-price lunch, the percentage of English language learners, and location (urban, rural, suburban). In the third model, we add organizational factors including enrollment, all the working condition measures described earlier, and salary levels adjusted for county wages for entering teachers (BA+30, which is the usual entry level for a credentialed teacher in California). We found that the three measures of teacher salary were highly correlated, and we selected the entry wage as the best proxy for overall salary. High-turnover schools tend to have a disproportionate number of younger teachers, and older teachers, who are at the very top of the salary scale and who tend to stay in the same school until retirement. The next section explains the results of our analyses.

Results

Descriptive Data

Table 3 gives the means and standard deviations for the variables used in the analysis. Due to the sample source, the teachers in our sample are somewhat more experienced and educated than the average teacher in California. On average, the sampled teachers have almost 16 years of teaching experience as compared to 13 years statewide (as reflected in the CBEDS data for the 2001–02 school year). Ten of these years of experience are in their current school; statewide teachers have been in the same district for 10.3 years. Approximately 38% have obtained a master's degree or higher as compared to 31% statewide. Nine percent of the sample is Latino,

Table 3

Descriptive Statistics for Analysis Variables—Weighted

Variable	*Observations*	*M*	*SD*	*Minimum*	*Maximum*
Outcomes					
Turnover is a very serious or somewhat serious problem in this school	1,052	.217		0	1
School had teaching positions which could not be filled for long periods of time	1,052	.222		0	1
Teacher age					
30 or younger	1,052	0.063		0	1
31–39	1,052	0.181		0	1
40–49	1,052	0.281		0	1
50 or older	1,052	0.460		0	1
Refused	1,052	0.015		0	1
Teaching experience					
Total	1,052	15.67	7.90	1	25
In current school	1,052	9.98	7.08	1	25
Teacher educational attainment					
BA	1,052	0.631		0	1
MA	1,052	0.355		0	1
PhD	1,052	0.014		0	1
Teacher race/ethnicity					
Latino	1,052	0.087		0	1
Asian	1,052	0.026		0	1
Black	1,052	0.017		0	1
School racial/ethnic composition					
Majority Latino	950	0.268		0	1
Majority Black	950	0.155		0	1
Majority Latino and Black	950	0.161		0	1
Other composition measures					
% English language learners	1,025	22.59	21.32	0	100
% Free and reduced lunch eligible	1,024	47.77	29.69	0	100
% students eligible for Calworks	1,025	15.62	14.99	0	95
Enrollment	1,026	744.75	570.58	2	4,335

Note. These are the descriptive statistics for the sample not missing either the Turnover is a Problem outcome or the Vacancy outcome. One teacher with 25 years of experience missing education was coded as having a master's degree. Two teachers missing race/ethnicity were coded as White.

3% Asian American, and 2% Black. Across the state, 13.5% of teachers are Latino, 5.1% are African American, and 4.4% are Asian.

Twenty-two percent of teachers surveyed believe that turnover is a very serious or somewhat serious problem in their schools, and 22% also reported that their school has had teaching positions that were difficult to fill. Although there is some overlap, these measures are not the same: 10% of those who noted that turnover was not a problem said that filling vacancies was. Forty-five percent of those who said turnover was a problem reported that filling vacancies was not. This difference may reflect, in part, the extent to which schools are selective about whom they hire. Schools that insist on filling positions with highly skilled teachers may have more difficulty filling vacancies than schools with high turnover that hire whomever they can find.

The teachers in our sample taught in schools with an average enrollment of 745 students, 23% of whom were English language learners and 48% of whom qualified for free or reduced-price lunch. Seventy-five percent of teachers in the sample were teaching in urban schools. Table 4 provides the mean for teacher-reported school characteristics by the racial or ethnic composition of the students. As expected, schools differ in the racial or ethnic composition of their students. In the weighted sample, 26% of teachers reported that they teach in schools in which the majority of students are Latino. Another 16% reported that their schools have a majority of Black students, and an additional 16% reported that over 50% of students are either Black or Latino with neither group a majority. Teachers in schools with a higher proportion of Black or Latino students are more likely to be in urban areas. They are also more likely to be in multitrack schools.

There appears to be no relation between student body composition and average class size; however, there is variation in the size of the largest classes taught, which is linked to student characteristics. Sixty-seven percent of teachers teach no classes with 25 or more students, whereas 25% teach classes with 25 to 33 students; 8% teach classes with more than 33 students. Very large classes are most frequently found in schools serving a majority of Black or Black and Latino students, although the differences are not statistically significant.

Adjusted teacher salaries are higher in schools with fewer Black or Latino students. In addition, classrooms in schools with more Black or Latino students have more facilities-related problems such as uncomfortable classroom temperatures; unclean bathrooms; and evidence of cockroaches, rats, or mice. There are no evident differences by student composition in whether there are enough copies of textbooks for students (89% of the total sample), whether there are enough texts for students to take home (64%),

Table 4

School Characteristics by Student Racial/Ethnic Composition of Schools

School Characteristics	*Overall*	*Majority Black*	*Majority Latino*	*Majority Black or Latino*	*Other*	*Missing*
n	1,052	179	339	186	246	102
Urban***	0.730	0.772	0.836	0.793	0.706	0.75
Suburban***	0.167	0.161	0.125	0.168	0.168	0.21
Rural***	0.103	0.067	0.040	0.039	0.126	0.05
Multitracked***	0.142	0.109	0.279	0.126	0.153	0.18
Largest class less than 25 students	0.576	0.608	0.593	0.623	0.558	0.68
Largest class 25–33 students	0.284	0.214	0.281	0.212	0.318	0.25
Largest class greater than 33 students	0.139	0.178	0.126	0.165	0.124	0.08
Adjusted salaries BA+30**	1.095	1.034	1.102	1.061	1.117	1.07
Adjusted salaries BA+60*	1.581	1.511	1.622	1.534	1.609	1.56
Teacher rating of school conditions—factor	0.038	0.257	-0.179	-0.216	0.048	0.13
Teacher optimism about conditions improving—factor**	0.028	0.073	-0.042	-0.129	0.053	0.00
Enough copies of textbooks for every student	0.883	0.912	0.905	0.783	0.899	0.93
Enough texts for students to take home	0.640	0.615	0.624	0.571	0.662	0.69
Text condition[a],**	1.56	1.362	1.585	1.688	1.574	1.51
Texts are up-to-date[a,†]	1.75	1.661	1.729	1.965	1.724	1.69
Access to computers in classroom	0.816	0.846	0.781	0.775	0.819	0.82
The classroom is too small	0.350	0.353	0.360	0.305	0.361	0.29
School uses nonclassroom space for instruction	0.315	0.330	0.314	0.303	0.314	0.41
Classroom temperature too cold or too hot[†]	0.325	0.317	0.350	0.416	0.305	0.45
Classroom too noisy***	0.215	0.165	0.261	0.263	0.214	0.25
Bathrooms are clean and open[†]	0.836	0.833	0.793	0.827	0.839	0.89
Evidence of cockroaches, rats, or mice***	0.270	0.249	0.361	0.283	0.271	0.28

Note. Means reported by groups. Chi-square test for differences across groups (unweighted tests). BA+30 = bachelor's degree plus 30 credits; BA+60 = bachelor's degree plus 60 credits.

[a]Range is 1 (*excellent*) to 4 (*poor*).

*$p < .05$. **$p < .01$. ***$p < .001$. [†]$p < .10$.

whether the classrooms are too small (36%), whether they have access to computers (78%), or whether nonclassroom space is used for classes (33% of the sample). There are no differences by student composition in the faculty rating of the school, although teachers in majority non-Black and non-Latino schools and those in majority Black schools tend to be more optimistic than those in majority Latino or majority Black and Latino schools.

Regression Analyses

In assessing the relation between turnover and school characteristics, we conducted regressions for each of the three dependent variables: whether turnover is a serious problem, whether vacancies are hard to fill, and the proportion of 1st-year teachers. In each case, we displayed three models. The first model included only teacher characteristics. The second model added demographic characteristics of the school: the racial or ethnic composition of the student body, percentage of students eligible for free or reduced-price lunch, percentage of English language learners, and whether the school is in an urban or rural area (in comparison to suburban). The third model added school factors that characterize teaching conditions, including teachers' reports of their working conditions and salaries for 1st-year teachers holding a bachelor's degree plus 30 credits (the standard entry rate for most new teachers in California).

For the first set of regressions, reported in Table 5, the outcome is whether teachers report that turnover is a problem for the school. The table gives the odds ratios and the *z* statistics for the estimates. Although teachers' ages and educations are not related to the probability of turnover being a problem, Black teachers are six times more likely to report a turnover problem in their school. This may be because Black teachers are more likely to be teaching in inner city schools.

In Model 2, although there is no difference in perceived turnover problems by urbanicity, we see substantially higher reported turnover problems in schools with higher proportions of Black, Latino or low-income students, as other studies have also found. The inclusion of racial composition increases the pseudo R^2 from 0.034 to 0.145.

Adding the variables included in Model 3, we find that a number of the measures of school characteristics predict turnover problems and substantially increase the predictive power of the model: The pseudo R^2 increases from 0.145 to 0.294. (In the linear probability model, the adjusted R^2 increases from 0.129 to 0.255.) Schools with lower salaries are more likely to have reported turnover problems, as are larger schools and those with multitrack schedules, lower ratings of school conditions by teachers, and

Table 5

Logit Results, Turnover Is a Serious Problem

	Model 1		Model 2		Model 3	
Variables	*Odds Ratio*	*z Stat*	*Odds Ratio*	*z Stat*	*Odds Ratio*	*z Stat*
Ages ≤ 30	1.494	0.85	1.748	1.37	1.751	0.92
Ages 31–40	1.312	0.89	1.542	1.54	1.274	0.68
Ages 41–50	1.161	0.58	1.239	0.92	1.087	0.30
Age missing	3.749*	2.01	4.128*	2.44	2.497	1.33
Latino	1.440	1.19	0.792	0.82	0.743	0.64
Black	6.163***	3.34	3.446*	2.16	2.485	1.56
Asian	1.765	1.13	1.080	0.16	1.009	0.02
Education—BA	0.992	0.04	1.017	0.10	1.161	0.67
Education—PhD	4.042	1.63	4.885**	2.65	1.623	0.72
Teaching experience	0.909	1.64	0.903†	1.85	0.890	1.48
Experience squared	1.003	1.50	1.003†	1.92	1.004	1.47
Majority Black			2.640***	3.65	2.626**	2.84
Majority Latino			2.073**	2.77	1.713	1.61
Majority Black or Latino			3.173***	4.55	2.891**	3.07
% Free/Reduced price lunch			1.017***	4.00	1.021***	3.51
% English learners			1.009	1.55	1.002	0.30
Urban			0.971	0.12	0.729	1.02
Rural			0.626	1.21	0.876	0.22
Enrollment					1.001*	1.97
Adjusted salaries BA+30					0.250†	1.80
Multitrack school					1.705*	1.99
School conditions factor					0.533***	4.30
Optimism factor					0.932	0.41
Evidence of rats					1.107	0.43
Enough texts					1.165	0.42
Enough texts for home					0.663	1.45
Texts in poor condition					1.212	0.89
Texts out-of-date					0.868	0.64
Computer access					0.728	1.19
Biggest class < 25 students					0.741	1.10
Biggest class > 33 students					2.469*	2.11
Classroom too small					0.842	0.76
Use nonclassroom space					1.268	1.05
Temperature problems					0.685	1.57
Classroom too noisy					1.313	1.10
Bathrooms clean and open					0.655	1.63
Linear adjusted R^2	0.0306		0.1291		0.2551	
Pseudo R^2	0.0339		0.1448		0.2937	

Note. $M = .238$, $N = 1{,}052$. BA+30 = bachelor's degree plus 30 credits.
*$p < .05$. **$p < .01$. ***$p < .001$. †$p < .10$.

large classes. The strongest predictor of turnover problems is teachers' rating of school conditions, which accounts for as much of the variance as the proportion of low-income students. When these school conditions variables are added, the effects of student demographics are somewhat muted; having a majority of Latino students is no longer a significant predictor of turnover problems.

We ran similar models using "difficulty filling vacancies" as the outcome. The results are given in Table 6. Here again, teacher characteristics have little influence on the outcome, whereas school student composition has a stronger effect. Teachers who report that their schools serve a majority of Black or Latino students also report more difficulty filling vacancies, as do those whose schools serve a greater percentage of English language learners. However, the predictive power of the model with student composition alone is even lower than in the turnover estimates. The pseudo R^2 increases from 0.038 in Model 1 to 0.071 in Model 2. Again, the inclusion of school characteristics in Model 3 dramatically improves the estimates (pseudo R^2 = 0.282). In this case, the estimated relation between the difficulty of filling vacancies and student body composition is reduced substantially with the inclusion of school characteristics. When school and teaching conditions are added to the model, none of the student characteristics are significant predictors of the ease or difficulty of filling vacancies. With this model, we find that larger schools, those with lower salaries, those that use multitrack schedules, those with lower ratings of school conditions, those with bigger classes, those that use nonclassroom space for classes, and those with noisy classrooms are more likely to have difficulty filling vacancies.

One concern with the first two analyses is that the teachers report both the school conditions and the outcomes. Some teachers may give all negative responses and others all positive responses. In this case, even if there were no differences in these measures across schools, we would see a correlation between outcomes and school characteristics in the data. To address this, we looked for a third outcome measure that is not teacher reported. Although it would be ideal to have turnover rates by school, we were not able to obtain this information because California does not collect such data. Instead, we used the percentage of new teachers in the school because schools with higher proportions of new teachers are hiring at high rates and typically have higher turnover rates. This variable can also be influenced by substantial year-to-year growth in school size, which may be a factor in a small number of cases that do not have high turnover.

Table 7 gives the results of similar estimations to those in Tables 5 and 6, using OLS regression to predict the percentage of 1st-year teachers in a school. For the small number of schools with multiple teachers in the sam-

Table 6

Logit Results, Vacancies Are Difficult to Fill

	Model 1		*Model 2*		*Model 3*	
Variables	*Odds Ratio*	*z Stat*	*Odds Ratio*	*z Stat*	*Odds Ratio*	*z Stat*
Ages ≤ 30	2.877*	2.16	2.995**	2.86	3.643*	2.20
Ages 31–40	1.180	0.45	1.267	0.88	1.063	0.16
Age 41–50	1.600†	1.74	1.708*	2.48	1.937*	2.11
Age missing	0.241	1.35	0.206	1.26	0.274	0.98
Latino	1.064*	0.19	0.815	0.74	0.715	0.79
Black	4.082	2.53	3.010*	2.12	2.291	1.41
Asian	1.598	0.87	1.159	0.32	0.962	0.08
Education—BA	0.678†	1.85	0.671*	2.43	0.667	1.62
Education—PhD	3.796	1.55	3.466*	2.19	1.366	0.43
Teaching experience	1.027	0.39	1.027	0.52	1.028	0.34
Experience squared	0.999	0.54	0.999	0.64	0.999	0.56
Majority Black			1.311	1.10	1.039	0.11
Majority Latino			1.405	1.38	0.823	0.58
Majority Black or Latino			2.190***	3.37	1.407	0.97
% Free/Reduced price lunch			1.001	0.36	1.004	0.57
% English learners			1.013*	2.19	1.007	0.92
Urban			1.123	0.51	0.880	0.33
Rural			1.482	1.21	2.556†	1.70
Enrollment					1.001**	2.96
Adjusted salaries BA+30					0.168*	2.19
Multitrack school					1.685†	1.75
School conditions factor					0.540***	3.62
Optimism factor					0.911	0.60
Evidence of rats					1.318	1.14
Enough texts					1.125	0.32
Enough texts for home					0.700	1.32
Texts in poor condition					1.402	1.64
Texts out-of-date					1.011	0.05
Computer access					1.479	1.39
Biggest class < 25 students					0.667	1.50
Biggest class > 33 students					2.223*	1.96
Classroom too small					1.334	1.17
Use nonclassroom space					1.708*	2.15
Temperature problems					1.278	1.04
Classroom too noisy					1.365	1.21
Bathrooms clean and open					0.601*	2.02
Linear adjusted R^2	0.0429		0.0548		0.2872	
Pseudo R^2	0.0383		0.0707		0.2818	

Note. $M = .208$, $N = 1{,}052$. BA+30 = bachelor's degree plus 30 credits.
*$p < .05$. **$p < .01$. ***$p < .001$. †$p < .10$.

Table 7

Regression Results, Percentage of First-Year Teachers

	Model 1		*Model 2*		*Model 3*	
Variables	*Coeff*	*t Stat*	*Coeff*	*t Stat*	*Coeff*	*t Stat*
Ages ≤ 30	0.0109	0.81	0.015	1.14	0.0117	0.92
Ages 31–40	0.0015	0.17	0.004	0.45	0.0074	0.86
Ages 41–50	–0.0034	0.46	–0.001	0.14	–0.0001	0.01
Age missing	0.0201	0.86	0.026	1.05	0.0387	1.27
Latino	0.0195	1.58	0.007	0.62	0.0053	0.46
Black	0.0977***	3.30	0.083*	2.43	0.0719**	2.86
Asian	0.0303†	1.67	0.012	0.67	0.0011	0.07
Education—BA	–0.0078	1.36	–0.007	1.34	–0.0048	0.89
Education—PhD	0.0583	1.62	0.054†	1.76	0.0371	1.23
Teaching experience	–0.0041*	2.11	–0.004*	2.30	–0.0049*	2.58
Experience squared	0.0001†	1.76	0.000*	2.06	0.0001*	2.32
Majority Black			0.011	1.34	0.0062	0.77
Majority Latino			–0.008	1.01	–0.0101	1.33
Majority Black or Latino			–0.003	0.39	–0.0125	1.64
% Free/Reduced price lunch			0.00024	1.64	0.0004**	2.74
% English learners			0.00059**	2.79	0.0004*	1.98
Urban			0.013*	2.26	0.0024	0.36
Rural			0.012	0.96	0.0123	0.97
Enrollment					0.0000	1.01
Adjusted salaries BA+30					–0.0653***	3.78
Multitrack school					–0.0200**	2.92
School conditions factor					–0.0089*	2.41
Optimism factor					–0.0019	0.46
Evidence of rats					0.0023	0.37
Enough texts					–0.0140	1.40
Enough texts for home					0.0029	0.50
Texts in poor condition					0.0051	1.13
Texts out-of-date					–0.0056	1.12
Computer access					0.0060	0.79
Biggest class < 25 students					0.0071	1.16
Biggest class >33 students					0.0136	1.37
Classroom too small					–0.0011	0.17
Use nonclassroom space					0.0108†	1.85
Temperature problems					0.0076	1.33
Classroom too noisy					–0.0116†	1.87
Bathrooms clean and open					0.0111	1.52
Adjusted R^2	0.0846		0.1541		0.2346	

Note. School level, $M = .074$, $SD = .071$, $N = 827$. BA+30 = bachelor's degree plus 30 credits.

ple, we used the average of the independent variables across teachers in the school. Therefore, the regressions are run at the school level. This assures that schools with multiple respondents are not overrepresented. Table 7 shows that Black teachers and those with less experience are more likely to be in schools with a high fraction of 1st-year teachers. Schools with a higher proportion of English language learners also, on average, have more new teachers. We find no difference in percentage of 1st-year teachers among other categories of schools with different racial, ethnic, or poverty compositions. The inclusion of student composition adds some predictive power to the estimates, increasing the adjusted R^2 from 0.085 in Model 1 to 0.154 in Model 2.

Once again, school conditions, added in Model 3, are the strongest predictors of the percentage of 1st-year teachers in the school. In particular, salaries have a strong influence on the proportion of beginning teachers. In addition, whether the school is multitracked, the teachers' rating of school conditions, the use of nonclassroom space for classes, and classrooms that are too noisy all predict a greater proportion of 1st-year teachers in a school. The inclusion of these measures increases the portion of the variation explained to 23.5%.

Discussion

Using a different approach from studies that examine individual teacher attrition decisions, this study examines the predictors of high rates of school-level turnover, which are the product of many individuals' decisions and are likely related to school conditions. We find that the racial, ethnic, poverty, and language composition of a school's student body influences a school's turnover, along with its difficulty filling vacancies and proportions of beginning teachers. However, we also find that working conditions add substantial predictive power to models of turnover and that, when these working conditions are added, the influence of student demographics on reported turnover and hiring problems is reduced.

Among the strongest predictors of these outcomes is a factor representing teacher ratings of their school conditions including on one hand tangible supports for teaching in the form of teachers' working conditions, physical facilities, and availability of textbooks and technology and on the other hand the kinds of conditions that impact on the substantive aspects of teaching including the quality of professional development, the involvement of parents, and the quality and appropriateness of tests teachers are required to ad-

minister (the most negatively rated variable by the overall sample of California teachers). Another strong predictor is whether the school runs a multitrack schedule, a variable that suggests less than optimal conditions for teaching as it reflects overcrowding, very condensed daily teaching schedules that may start very early or go very late in the day, and often year-round teaching schedules that require teachers to pack up and unpack their rooms periodically throughout the school year. Although multitrack schools are more likely to have reported turnover and hiring problems, we found that they have smaller proportions of 1st-year teachers.

In estimates of turnover and difficulty filling vacancies, the presence of very large classes (33 students or more) significantly influences indicators of turnover. This result is similar to Theobald's (1990) findings regarding class size as a correlate of teacher attrition in Washington State. Other predictors include inadequate classroom space (variously captured by classes held in nonclassroom space and classrooms that are too small, too noisy, or have temperature problems) and inadequate bathrooms.

Beginning salary levels for teachers holding a BA+30 credits, adjusted for county wages, are a significant predictor of all three outcome measures. In other estimates, we also found significant relations for salaries at the BA+60 level for teachers with 10 years of experience. However, the two salary variables are collinear, so we cannot separate their effects. We include only the base salary measure in the models. The point estimates suggest that an increase in relative salaries from one to two times the local wage decreases reported turnover and vacancy problems by at least 75% and reduces the percentage of new teachers by 6.5 percentage points.

As we noted earlier, our sample underrepresents beginning teachers but closely represents school types in California. To the extent that very inexperienced teachers perceive school conditions and turnover problems differently than more experienced teachers, our estimates may not be generalizable. However, these differences in perception are unlikely to be great. Other evidence suggests that, if anything, beginning teachers are more likely than veterans to experience poor working conditions, both because they are more likely to be hired into disadvantaged schools and because they are more likely to experience the least desirable conditions within their schools (e.g., see NCTAF, 1996, 2003).

Some of the indicators of poor teaching conditions that prove important in this study—factors such as very large class sizes and multitracking—may be specific to the most underresourced schools in California, which appear to be in even more difficult straits than schools in many other states. By the late 1990s, after the decline in spending that followed the passage of Proposition 13 in 1979, California employed a greater number of

underqualified teachers[6] than any other state in the country, and it ranked in the bottom decile among states on class sizes, staff:pupil ratios, libraries, and most other school resources (EdSource, 2001). In 2001, California's per pupil education spending, adjusted for cost of living, ranked 48th in the nation; reaching only 79% of the national average ($5,603 as compared to a national average of $7,079). Fully 98% of California's students were in districts that spent below the national average (Quality Counts, 2002, p. 87). Inequalities in funding have also grown. The California Postsecondary Education Commission (1998) noted

> The gap in expenditures for education between the high-spending and low-spending school districts in our state … has risen to $4,480 … . Perhaps the most disturbing part of this statewide picture is that many of the disparities noted above are consistently and pervasively related to the socioeconomic and racial–ethnic composition of the student bodies in school as well as the geographical location of schools. That is, schools in our low socioeconomic communities as well as our neighborhoods with a predominance of Black and Latino families often have dilapidated facilities, few or inadequate science laboratories, teachers in secondary schools providing instruction in classes for which they have no credential, curriculum that is unimaginative and boring, and teachers who change schools yearly and lack the professional development to complement their teaching with new instructional strategies and materials … . (p. 29)

It appears from our analysis that these kinds of conditions may contribute to high rates of turnover in the most heavily impacted schools, as well as to difficulties filling vacancies and a resulting staff mix that includes a high proportion of beginning teachers, all of which can affect the quality of education students receive.[7] This study presents evidence that reducing teacher attrition in schools where turnover is a problem may require improvements in both salaries and working conditions and that these improvements have the potential to overcome differences in schools' abilities to hire and retain teachers that have been associated with their students' characteristics.

[6]*Underqualified* is defined as teachers who lack a preliminary or clear credential in their teaching field, the standard credential recognized by California as reflecting attainment of its standards for teachers.

[7]For evidence on the negative relation between teacher inexperience and student achievement, see Betts, Rueben, and Danenberg (2000); Goe (2002); and Kain and Singleton (1996).

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