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A Survival Analysis of Student Mobility and Retention in Indiana Charter Schools

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Abstract

Research has demonstrated that high rates of student mobility are associated with a range of negative academic outcomes, both for students who leave their schools and those who remain behind. The current study focused on mobility among those enrolled in charter schools in the state of Indiana. A multilevel Cox Proportional Hazards survival analysis model was used to identify significant predictors of student mobility within and from a state charter school system, using factors at both the student and school levels. Results indicated that initial student achievement upon first entering a charter school, student ethnicity, participation in a Title I funded program, and average years of teacher experience at the school were all associated with the decision to leave the charter. Specifically, students with higher initial achievement scores, those eligible for Title 1 services, and non-Caucasian students were more likely to leave charter schools prematurely. In



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addition, schools with a more experienced faculty had lower early departure rates than did those with less experienced teachers.

Keywords: charter schools; student mobility; event history analysis.

Un análisis de la movilidad estudiantil y la retención en las escuelas charter de Indiana

Resumen

Investigaciones han demostrado que altas tasas de movilidad de los estudiantes se asocian con una serie de resultados académicos negativos, tanto para los estudiantes que abandonan sus escuelas como para los que se mantienen en ellas. Este trabajo analizó la movilidad entre estudiantes matriculados en las escuelas “charter” en el estado de Indiana. Tomando en cuenta factores tanto de los estudiantes como del nivel escolar, se utilizó el modelo de análisis Cox multinivel de riesgos Proporcionales de Supervivencia para identificar predictores significativos de la movilidad de los estudiantes dentro y desde el sistema de escuelas charter del estado. Los resultados muestran que el rendimiento de los estudiantes cuando entran en una escuela "charter", el origen étnico de los estudiantes, la participación en un programa financiado por el programa Título I, y el promedio de años de experiencia de los docentes en las escuelas estaban asociados con la decisión de abandonar una escuela "charter". Específicamente, los estudiantes no-caucásicos, que inicialmente tenían mayores puntajes académicos, y eran candidatos de obtener asistencia a través del programa Título I tenían más probabilidades de abandonar las escuelas “charter” prematuramente. Además, las escuelas con un profesorado con más experiencia tenían tasas menores de salida anticipada que aquéllas con docentes con menos experiencia.

Palabras clave: escuelas “charter”, movilidad de estudiantes; análisis histórico de eventos.

Student mobility is a critical issue for all schools. Mobility compromises effective student learning, and it raises important concerns with respect to educational accountability. It is difficult to hold a school accountable for learning outcomes, for example, when student mobility decreases exposure to the educational “treatment” provided by the institution. Although mobility and retention are issues for any school, they may be particularly acute for public schools of choice, such as charter schools, given the fact that charter schools are held to standards of accountability in ways that regular public schools are not. Indeed, we know relatively little about the factors that predict mobility in charter school membership. To this end the present study was designed to investigate mobility and retention in the charter schools for one state, Indiana.

Student turnover has been associated with poor academic performance for students in regular public schools. Mao, Whitsett, and Mellor (1997) found that students who changed schools within an academic year had lower mean scores on the state achievement test in Texas than did those students who remained in the same school all year. Osher, Morrison, and Bailey (2003) focused on the impact of student mobility on the academic performance and dropout rates of students in grades 9–12. They found that students who changed schools during these grades were more likely to have academic problems and eventually leave school altogether without obtaining a diploma. These studies support other findings that associate student mobility with a variety of academic and social problems (Eckenrode, Rowe, Laird & Brathwaite, 1995; Fowler-Finn, 2001;

Mehana, 1997; Reynolds, 2000; Rumberger & Larson, 1998). Moreover, high student mobility limits the effectiveness of school-based intervention programs and has a deleterious impact on the academic performance of those students who remain in the school (Hanushek, Kain, & Rivkin, 2003; Reynolds & Roberston, 2003).

The study of student mobility effects has not been a prominent focus in extant research on charter schools. In their recent survey of 58 comparative studies of charter schools, Hassell and Terrell (2009) lamented the lack of research on outcomes other than student achievement, such as mobility, persistence, and attendance rates. They noted that student mobility is not studied directly but is treated instead as a control variable in analyses that focus solely on achievement. In a recent study of California charter schools, for example, student mobility, along with 13 other factors were combined into a composite “School Characteristics Control” variable (Crane, Edwards, & Brazil, 2007).

A number of these studies appear to implicate student mobility directly in assessments of charter school effectiveness. For example, there is evidence that transition into a charter school is associated with achievement decrements (Booker, Gilpatric, Gronberg, & Jansen, 2004). Over time these transition effects could exert a cumulative, deleterious influence on the academic achievement of students who frequently change schools. Moreover, there is reason to think that mobility and transition effects might be differentially evident in charter than in regular public schools. In a report comparing student achievement in charter and public schools in North Carolina, Bifulco and Ladd (2004) found that a large reason for the relative poor showing of the charter schools was the much higher rate of student mobility. But they also reported that transferring to a charter school was more disruptive than transferring to a regular public school and that achievement decrements noted in the first year were not offset by gains in subsequent years. As they noted, leaving charter schools was relatively easier than leaving regular public schools, a trait may have been the main reason that student turnover rates in the state’s charters were twice that of the public schools.

High turnover rates in charter schools were also documented in a study sponsored by the National Bureau of Economic Research (Hanushek, Kain, Rivkin, & Branch, 2005). Here charter schools in Texas had much higher student turnover rates than did regular public schools. It has been demonstrated that moving between schools disrupts academic performance, with students frequently losing ground in their first year in a charter school (Gronberg & Jansen, 2001). Indeed, high rates of student mobility in the California charter school system were associated with lower academic achievement, as was true in regular public schools (Slovacek, Kunnan, & Kim, 2002). Finally, Hanushek, Kain, Rivkin, and Branch (2005) showed that the decision to exit a charter school is more sensitive to educational quality than is the decision to exit a regular public school, though this effect was seen primarily in higher income schools. The transaction cost of switching schools was particularly high for low income and minority students, who were less sensitive to school quality.

Given the clear negative impact of student turnover on academic performance and other markers of school success, as well as the relatively higher rates of such turnover found in many charter schools across the country, policy makers and others need to know what factors most influence the likelihood of a student leaving a charter school. Very little research has been done in this regard. As noted above, it has been shown that minority and poor students are more likely to attend schools with higher student turnover rates. However, it is not known to what extent these or other factors shape student mobility for charter school students. The present study examined these questions using data from extant charter schools in Indiana. This particular set of schools has been in existence since spring 2003. In particular this analysis examined the impact of student-level and school-level variables on student turnover in the entire Indiana charter school system (ICS), using survival analysis of students tracked longitudinally over the course of charter school enrollment.

Methods

Participants

The initial sample of students in the charter schools included 810 individuals in grades 2 through 6 who enrolled at some point during the years 2003 through 2006 in the Indiana charter school (ICS) system. To be included in the final sample, these students needed to have data available on the variables of interest in this study, including ethnicity, gender, reading, math and language achievement test scores, participation status for free/reduced lunch, special education services, and Title 1 programs. Individuals for whom one or more of these variables were not available were excluded from the final dataset, decreasing the sample from an original 810 to the final 647. Total enrollments differed quite markedly across institutions, from 13 students in the smallest school in the sample to 230 in the largest.

In addition, kindergarten and first grade students were not included in the study because achievement test data were not available for them. For some schools, these two earliest grades represented a large portion of the student body, meaning that the total sample size of the school will be relatively lower compared to other schools that do not have such a large proportion of early grade students. Of the 163 students who were potentially eligible for inclusion in the sample but who had to be excluded, most were missing information for one of the achievement tests, ethnicity, free/reduced lunch status and Title 1 eligibility status.¹

Table 1.

Sample statistics

Variable	Frequency	%
Sex		
Male	321	49.6
Female	326	50.4
Ethnicity		
White	68	10.5
Non-white	579	89.5
Free/reduced lunch		
Yes	538	83.2
No	109	16.8
Special education		
Yes	159	24.6
No	488	75.4
Title 1 funding		
Yes	100	15.5
No	547	84.5

¹ Individuals who were included in the sample were compared with those who were not, due to missing data, on demographic and achievement test variables (where available) using either a chi-square test (for categorical demographic variables) or a t-test (for continuous achievement test variables). No significant differences were found between the two groups on any of these variables. In addition, we estimated the Cox proportional hazards model described in the methods section weighting the schools by total enrollment and found that parameter estimates and tests of significance differed very little from the results presented in the manuscript. Therefore, we concluded that the missing data did not have a marked impact on the final conclusions reported in the manuscript.

Table 1 includes descriptive information for the sample of students included in this study. Males and females were approximately equally represented in the sample. With respect to ethnicity, the majority of students were non-white, with the vast number of these being African-American. In addition, 83% of the students received free or reduced lunch, and roughly 25% were recipients of some type of special education service. While a large proportion of the sample was eligible for free or reduced lunch, approximately 15% of students participated in Title I funded programs. A discussion with school leaders as well as individuals in the state department of education revealed that often, in their early years of existence charter schools do not have the data necessary to apply for Title I funding, usually because they lack sufficient information about student poverty and enrollment. This lack of data means that these schools cannot apply for any Title I funds, though they may be eligible for them, thus leading to the apparent paradoxical results presented in Table 1.

Indiana Charter Schools

The first Indiana charter schools opened in fall 2002. All of the elementary schools in this first cohort were authorized either by the mayor of Indianapolis or by Ball State University. Additional charter schools opened in the following academic year (2003–2004), with a total of 37 elementary and secondary institutions currently in existence in the state. Only the 11 original ICS elementary schools were included in the current study because they had sufficient time to establish themselves in terms of staff and curriculum, reducing the likelihood of spurious results from the instability of young charter schools. With respect to data collection, the charter elementary schools use a common metric for gauging academic achievement, which will be discussed in more detail below. These data are collected systematically at regular time points during the school year, allowing for reasonable comparisons among schools in terms of student achievement scores.

The smallest school in the sample contributed 7 students to the dataset, while the largest had 133 individuals. Descriptive statistics for the school level variables appear in Table 2. The mean student teacher ratio was 22.8, while the mean level of teacher experience was 5.5 years. Among the schools participating in the study, the average percentage of students passing the state academic competency test was 43%. It is important to note that this value is associated with all students, not just those appearing in the current study.

Table 2.
Student and school level variables

<i>Variable</i>	<i>Mean</i>	<i>Standard Deviation</i>
NWEA Language	186.8	19.5
NWEA Math	186.6	18.7
NWEA Reading	181.1	21.2
Student-teacher ratio	22.8	7.2
Teacher experience (years)	5.5	2.8
Average daily attendance (%)	95.5	1.2
State test pass rate (%)	43.4	12.5

Data Analysis

For this study, the student level variables included in the data analysis were gender and race (Caucasian/non-Caucasian), free/reduced lunch status (yes/no), special education status (yes/no), eligibility for Title I funded programs (yes/no), and scores on the Measures of Academic Progress (MAP) published by the Northwest Evaluation Association (NWEA). The MAP assesses language, reading and mathematics achievement, and it is the assessment administered by all Indiana charter school students at least twice a year. MAP is a computer adaptive test (CAT) that selects the items given to individual students based on their ability level. Performance is expressed using a standardized metric based upon Item Response Theory, a Rasch unit (RIT) score, which ranges approximately from 150 to 300. In this study we analyzed the RIT scores from the fall assessment of each student's first year in a charter school. At the school level the variables measured were student-teacher ratio, average years of teacher experience, average daily school attendance rate, and percentage of students passing the state mandated test (Indiana Statewide Test of Educational Progress Plus, or ISTEP+)

The outcome variable of interest was time enrolled in an ICS before leaving prematurely, leaving after having completed all available grades at the school, or being censored out (right-censoring). Leaving prematurely was defined as having occurred when the student left the school prior to having completed the highest grade available at that school. Censoring refers to the case where a student was enrolled in an ICS at the end of the data collection period but had not yet completed the highest possible grade offered at their school. Censored individuals can also be thought of as those who remained enrolled in the ICS and who had not yet reached matriculation to their next school by the end of the study period. Enrollment was assessed twice a year, and time was then coded as the number of these enrollment periods that students were in an ICS. Students who completed the highest possible grade at the school, and those who remained in an ICS at the end of the study period (spring 2006) were coded as non-leavers, while those who departed prematurely (i.e. prior to completing the highest possible grade) were coded as leavers.

Data analysis was conducted using a multilevel Cox proportional hazards model (Parmar & Machin, 1995). The Cox model is used for the modeling of censored time-until-event data as a dependent variable where one can assume that the covariates have a multiplying effect on hazard rates. The response variable for this study is the time until an individual prematurely leaves a charter school or until they are censored (i.e. the study period ends with the student remaining in a charter school). Traditionally, this model has been employed primarily in the medical sciences, where it has been used to examine predictors of time until death in the case of mortality studies and time until change in disease status when studying the effectiveness of medical treatments (Collett, 1996). However, over the last decade the Cox model has been utilized with greater frequency for the study of educational data in a variety of contexts. A review of the ERIC database using the keyword "cox proportional hazards model" produced 16 references between 1997 and 2009. Of particular relevance to the current research was a study of predictors of graduation for Engineering undergraduates (Chimka, Reed-Rhoads, & Barker, 2007). These researchers included independent variables such as gender, college entrance examination scores, and other measures of academic achievement to predict length of time until students graduated from college. They found that females and students with higher SAT math scores graduated the most quickly. In another study, researchers made use of the Cox model to model the number of times medical students had to take the United States Medical Licensing Exam before they passed it, with the locale of students' medical school, primary language, and gender (de Champlain, Winward, Dillon, & de Champlain, 2004).

Results of the study demonstrated that individuals trained in the United States or Canada and those whose primary language was English were most likely to pass the exam.

Of particular relevance is Chimka et al. (2007), who found that performance on standardized tests were useful predictors of the time until a change in academic status such as graduation. In the current study the event of interest was leaving the ICS system prematurely. The Cox model allowed for the inclusion of both categorical and continuous independent variables, and the results are expressed in terms of the strength and nature of the relationship between the independent variables and the time until a student leaves an ICS (or is censored) in the form of a regression-like coefficient. Because the explanatory variables were collected at both the school and student level, as described above, a multilevel model was appropriate to ensure that the standard error calculations accurately accounted for clustering of students within their respective schools. This clustering is typically associated with correlated response variables (time until leaving school in this case) among respondents in a common cluster (Therneau & Grambsch, 2000). If this correlation is ignored, it can lead to biased estimates of standard errors and incorrect hypothesis tests for parameter estimates. The multilevel Cox model extends the original to account for the clustering of individuals thereby avoiding the bias in standard errors (Therneau & Grambsch, 2000). Furthermore, the multilevel model allows for the inclusion of variables at both the individual (e.g., student) and cluster (e.g., school) levels. The ability to include effects at multiple levels allows for the exploration of more complex substantive models, accounting for two or more layers of effects on the outcome variable of interest. Parameter estimation in this context is carried out using the profile likelihood method in which the hazard rate (to be discussed further below) for each cluster is estimated independently and then removed from subsequent estimation of the coefficients for the independent variables (Asparouhov, 2006). Thus, one advantage of the current study is the use of this specialized Cox model designed for a very common situation in educational research, namely the collection of data from students in clustered units such as schools or classrooms.

Results

Of the 647 students included in the study, 350 (54.1%) left the ICS system prior to completing all available grades in the school during the period under study. The highest rate of student attrition occurred during the first year of attendance in an ICS, with a total of 68 individuals (10.5%) leaving before completion of their first year in a charter school and an additional 117 (18.1%) students leaving at the end of the first year. Approximately 23% of charter students left the system during or at the end of their second year, while 2.3% left at some point in their third year in a charter school.

As described above, to identify pertinent factors for predicting student attrition in the ICS system, the hierarchical Cox proportional hazards model was used. In this case, a number of variables within subjects and between schools were included in the analysis, with the outcome variable being the time until a student left the charter system prematurely, or the data collection period ended. Results of this analysis appear in Table 3. The parameter estimate can be interpreted very much like a slope in regression, such that positive values indicate that as the value of the independent variable increases so does the likelihood of a student leaving a charter school early. Likewise, negative parameter values suggest that as the independent variable increases in value, the likelihood of a student leaving a charter school declines. In the case of categorical variables such as sex, ethnicity, free lunch status, special education and Title 1, which were coded as 1 or 0, positive parameters mean that the group taking the value of 1 has a higher likelihood of leaving a charter school prior to matriculation. A hazard ratio for these variables represents the relative likelihood of

an individual in the group coded as 1 leaving a charter school versus this likelihood for an individual in the group coded as 0. Thus, a hazard ratio of 1 would indicate that members of the two groups were equally likely to leave an ICS early, while values less than 1 suggest that members in group 1 were less likely to leave early than those in group 0 and values greater than 1 would be interpreted in just the opposite way. For continuous predictor variables, such as test scores, the hazard ratio represents the change in the likelihood of leaving the school early for each 1 point increase in the predictor variable (e.g. test score).

Results from the Cox proportional hazards model suggest that with respect to the student-level variables, ethnicity, eligibility for Title I funded activities, and scores on the math, language and reading achievement tests were all significantly related to the likelihood that a student would leave the ICS system early. Specifically, white students (coded as 1) were less than half as likely to leave an ICS early as their non-white counterparts. This result could also be interpreted to mean that non-white students were more than twice as likely to leave as were white students. In addition, those eligible for Title I funding were more than twice as likely to depart prematurely as were those who were not eligible for such programs. Finally, students who achieved higher test performance in reading, math and language during the first testing cycle in which they were enrolled in a charter school were more likely to leave an ICS prior to completing the highest available grade than were those with lower such scores.

Table 3.

Within- and between-subjects factors and charter school student attrition

Variable	Coefficient	Standard error	Hazard ratio
Within-subjects factors			
Sex	-0.069	0.109	0.93
Ethnicity	-0.709*	0.129	0.49*
Free lunch status	0.312	0.272	1.37
Special education	0.146	0.192	1.16
Title 1	0.712*	0.116	2.04*
Reading score	0.008*	0.002	1.01*
Math score	0.010*	0.004	1.01*
Language score	0.007*	0.003	1.01*
Between-subjects factors			
Student teacher ratio	-0.012	0.017	0.99
Teacher experience	-0.071*	0.021	0.93*
School attendance rate	-0.074	0.110	0.93
State test pass rate	0.014	0.008	1.01

* $p < .05$

In an effort to further explore the finding that minority students were more likely to leave the ICS prematurely, schools were divided into those that were majority Caucasian and majority non-Caucasian. The percentage of students passing the state proficiency examination was significantly higher for the three schools that were majority-white than for the majority-minority schools. In addition, the correlation between the percentage of white students in the school and the percentage of students passing the state exam was estimated to be .77. Taken together, these results indicate that schools with a greater presence of Caucasian students could be viewed as higher quality, as defined by having higher achievement rates on the state proficiency exam. In addition, based on a t-test, the majority-white schools had significantly lower student-teacher ratios than did those with a

majority-minority student body. The correlation between the percentage of the student body that was white and the student-teacher ratio was -0.31, indicating that schools with relatively more white students had lower student teacher ratios. The implications of these findings for minority retention are discussed below.

Interpretation of the hazard ratios for continuous variables, such as test scores, can be facilitated by subtracting 1.0 from the value and then multiplying the result by 100 to obtain the percent change in the hazard for a one unit increase in the independent variable (Allison, 1995). For example, the hazard ratio for reading was 1.008, which translates to an increased likelihood of leaving a charter school of 0.8% for every 1 point increase in the initial reading score. Thus, if student A scored 10 points higher than student B on their initial NWEA reading assessment, (s)he would have an 8% greater likelihood of leaving a charter school early. Similarly, the change in likelihood of leaving a charter early was 1% per NWEA mathematics score point increase and 0.7% per NWEA language score point increase.

Teacher experience was the only between-subjects or school-level variable found to be significantly related to students' departure from the charter system. Specifically, students in schools where the teachers had more experience on average were less likely to leave early than were those in schools with less experienced teachers. Converting the hazard ratio to percent change in the likelihood of leaving early, as was done for the NWEA assessment scores, revealed that for every one year increase in average teacher experience at a given school, the likelihood of a student at the school leaving early declined by 7%. None of the other school level factors were found to be significantly related to student attrition.

Discussion

Prior research has demonstrated that student mobility can have a negative impact on a host of academic outcomes, including achievement test scores and graduation rates, for those who switch schools. Furthermore, individuals who remain in schools with high levels of student turnover also suffer academic and other deficits despite the fact that they do not change schools. Given that there is some evidence that charter schools may experience higher student turnover rates than traditional public schools, the potential difficulties associated with such attrition become particularly acute for them. For this reason, administrators and teachers in charter schools need to be especially cognizant of factors that might predict mobility among their own students. Armed with such knowledge, charter school leaders can work to mitigate situations that might lead to greater student mobility and in turn improve the educational enterprise in their schools. The goal of this research was to provide some evidence as to the factors at the student and school levels that might reliably predict a student's attrition from charter schools.

The results of this study show that Indiana charter schools displayed high rates of attrition, with the largest proportion of those leaving doing so in the first year. Indeed, of those enrolled in the original 11 Indiana charter schools from 2002 to 2006, more than half elected to leave prior to completing the final grade level available at their school. In terms of the student-level factors, ethnicity, eligibility for Title I funded programs, and achievement test scores were significantly associated with the decision to leave the charter system early. Further investigation of the data revealed that minority students were more likely to leave early than were whites. This outcome is particularly interesting given that the charters in this system have a predominantly non-white student body. Thus, one concern for policy makers is that members of the largest population of students enrolled in the school were also at greater risk for leaving early.

Of additional concern in this regard is the finding that as achievement test scores increased, the likelihood of leaving a charter school did as well. This result held true across the three domains tested here (math, reading, and language). It has been demonstrated elsewhere that the ICS system tends to attract lower-achieving students in general when compared with nearby traditional public schools (Office of Charter School Research, 2006). Thus, charter school administrators may be faced with a situation in which the most academically able students from a population of relatively low achievers make the decision to leave their schools and the entire charter school system at higher rates than do others. Such a situation would have the net effect of leaving these charters even more academically disadvantaged and potentially more at-risk for sanctions associated with not making AYP under the No Child Left Behind (NCLB) guidelines. Indeed, given prior research on the impact of high mobility rates on schools (Hanushek, Kain, & Rivkin, 2003), these early departures may have the “double barreled” effect of removing high performers from the struggling schools and reducing school effectiveness for the comparatively lower performers who remain behind.

In terms of school level factors, only teacher experience appears to have been associated with student attrition. As noted above, schools with more experienced teachers suffered lower levels of attrition than did those with relatively newer teachers. The mean level of teacher experience for those remaining in a charter was 6.3 years as compared to 4.8 years for those leaving. Among the factors that were not associated with higher levels of student mobility were the student-teacher ratio, the rate at which students passed the state mandated achievement test, and the average daily attendance rate. With respect to attendance, the level of variation was extremely low as is evidenced by the standard deviation in Table 2. Such a truncated range of values is typically associated with low statistical power and may be part of the reason behind a lack of statistical significance in this case. On the other hand, no such range restriction was in evidence for either student teacher ratio or test passing rates. In the case of the former, such rates ranged from 8.5 to 39.5 with a mean of 22.8 (see Table 2). A descriptive comparison revealed that the mean ratio for those remaining in a charter school was 23.2, as compared to 22.4 for those electing to leave early. Clearly there was very little difference between the two groups. Likewise, the school level mean ISTEP passing rate for those remaining in the charter system was 45.4 as compared to 41.8 for those opting out. Again, these values were close and serve to highlight the relatively minor difference on this variable between those who remained in the charter system and those who did not.

The pattern of results reported in this study suggests that school-leaving decisions are complex, and associated with a variety of factors. For example, the fact that students with higher initial achievement test scores were more likely to leave a charter might suggest a greater sensitivity to educational quality as has been noted in previous research (e.g., Hanushek et al., 2005). Although Hanushek et al. (2005) reported that sensitivity to school quality was not particularly strong in minority and low-income families, the current results appear to demonstrate that minority status, as well as eligibility for Title I services, were significantly associated with school-leaving in the charter schools examined here.

Indeed, an examination of the mean achievement test scores by race and decision to remain or leave the charter revealed no difference in pattern for white and non-white students. In other words, for both ethnic groups, those who left the charter schools early had higher mean achievement than those who remained, and the difference between the means for leavers and “stayers” was nearly identical across both ethnicities. Hence, it appears that academically able minority and non-minority students may leave a charter for similar reasons. While no surveys were conducted in conjunction with results presented here, so that the exact reasons for leaving are not known, it is possible that parents of students and students who entered the charter schools with higher levels of academic performance may have had concomitantly higher expectations regarding the educational opportunities to be afforded them. If these expectations were not met, these

students may well have left rather than remaining in schools that they or their families perceived as not meeting their needs. Again, it is important to note that this is supposition at this point, and should be investigated more fully in future studies.

In addition, minority students left the ICS at a rate more than twice that of white students. Given the relative similarities in the achievement levels of those who left ICS for minority and white students, it would appear that sensitivity to quality in the two groups was similar. The result reported here that minority students exhibited greater mobility in the ICS mirrors results showing that African-American students constituted a disproportionate share of those leaving the Los Angeles and San Diego charter schools (Zimmer & Buddin, 2006). Hanushek, et al (2005) found that parents are more likely to remove their students from charter school when they feel that school quality is substandard. Indicators of quality that were used in the previous study included average school performance on state achievement tests. As discussed above, schools with larger concentrations of Caucasian students exhibited better performance on the NWEA achievement tests in the form of higher mean test scores and higher rates of growth over time. Consistent with Hanushek et al.'s assumption that performance on standardized tests is a primary indicator of school quality, schools in the ICS system with a larger percent of minority students tended to display lower quality performance. In addition, as noted in the results, schools with a larger proportion of their student body being Caucasian had lower student-teacher ratios, providing further evidence that majority-minority schools may be seen as not having some advantages displayed by their majority-white counterparts. In light of previous research demonstrating that parents are more likely to remove their children from lower quality charter schools, these results suggest that a primary reason for the higher mobility rates among minority students in ICS schools is that they are more likely to attend schools that might be deemed lower quality, and thus their parents may make the decision to find better alternatives.

With respect to the impact of Title I status and charter school retention, as mentioned previously, conversations with charter school leaders and state education officials suggest that the issue may be related to obtaining funds. Specifically, to obtain Title I funds, schools must be able to provide poverty and enrollment information to the state. However, schools in the ICS system often do not have such data available during their early years of their existence, and thus cannot actually obtain the Title I funds for which they might be eligible. This is the reason for the discrepancy between the eligibility rates for free/reduced lunch and Title I in Table 1. In addition, many of those students whose eligibility had been determined previously were not provided with Title I services because the schools did not receive the funding. It is not possible to determine whether this fact was the direct cause of students' prematurely leaving charter schools without formally interviewing parents. However, given the results presented above that demonstrate higher early departures among those eligible for Title I services, coupled with knowledge that most of these schools did not obtain such funding during the period under study, it seems that a reasonable hypothesis to this effect can be proposed. In particular, one explanation of the significantly lower retention rates for Title I eligible students is that parents became dissatisfied when they became aware that their students would not be receiving services for which their children were eligible. Further research needs to be conducted in this area to validate this hypothesis.

Our data showed a significant relationship between student attrition and teacher experience, where attrition tended to be lower in schools where teachers had relatively more experience in the classroom. A relative lack of teacher experience may signal poorer educational quality or lead to the perception of poorer quality among students and their parents. In addition, the relative lack of Title I programs (or experienced teachers in Title I programs) may trigger school-leaving by other students. Hence perception of educational quality and availability of Title I programs may point to special vulnerabilities that confront the state's charter schools. On the other hand, the student

teacher ratio and passing rate on the state exam do not appear to cause particular concern among students and parents in terms of whether they should remain or leave a charter.

Charter school administrators and policymakers concerned with the problem of student retention clearly need to be aware of certain factors associated with the decision to leave. Specifically, students (and their parents) coming into a charter school with higher levels of academic achievement need reassurance that the school will meet their needs. Furthermore, in charter systems similar to the one studied here, in which non-white students make up the majority of those enrolled, ethnicity seems to be an important issue. Minority students may need special attention to ensure that they elect to remain in their school until completing the final grade available to them. Further investigation of this issue might uncover the specific factors associated with the decision for non-white students to leave a charter school. And finally, hiring and retaining more experienced teachers would seem to be a worthy goal in terms of retaining students in a charter school. The lack of significant results for the student-teacher ratio reported in this study should not be an endorsement of ever larger classrooms. Rather, this outcome may be a function of the relatively greater importance of some of the other factors just described. Future research in this area should focus more clearly on the impact of student teacher ratio and the decision of students to remain (or leave) a charter school.

It is recognized that this study represents only an initial effort to understand factors associated with student retention in charter schools. Prior research has been able to establish a clear link between high rates of student mobility and poor academic and social outcomes for both students and schools. In addition, data collected in several states appear to suggest that charter schools as a whole may have higher rates of mobility than that experienced by other public schools. Taking these two facts together, it seems reasonable to suggest that charter schools may be at particular risk for the deleterious effects of mobility that have already been described in the literature. With these issues in mind, the current study was designed to identify factors associated with student mobility in charter schools, with an eye toward providing administrators and others assistance in mitigating the negative repercussions of low rates of retention. To this end, we have isolated several such factors that can be fairly easily identified by those working in charter schools. The next step in this line of work is to gain further insights into the reasons why these factors might be important predictors of student mobility, and to develop strategies for mitigating their impact, thereby creating more stable charters that might serve their students better.

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