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**The Effects of Public School Choice on Those Left Behind:
Evidence from Durham, NC**

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Durham, NC is a large, countywide district that, like many urban districts across the country, combines geographic attendance zones with a variety of parental choice programs. Using administrative data that includes addresses for individual students, we examine whether the likelihood of opting out of one's geographically assigned school varies across different groups defined by race, parent education level, and student achievement. We also examine how the characteristics of a student's geographically assigned school and the characteristics of nearby school choice options influence the likelihood of opting out. Finally, we compare the peer composition in neighborhood schools to what the peer composition in those schools would be if all students attended their neighborhood schools. We find that school choice programs in Durham have allowed higher achieving schools to cream-skim educationally advantaged students from many neighborhood schools. Although, cream-skimming has only small effects on the peer composition of non-choosers on average, schools with concentrations of disadvantaged students and schools located near choice schools attractive to high achievers are particularly hard hit by cream-skimming.

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1. Introduction

Scholars and policy makers have long worried that policies designed to increase parental choice of schools for their children might increase the isolation of disadvantaged students. Two separate hypotheses underlie this concern. The first is that high achieving students with involved parents are more likely to take advantage of expanded choices than disadvantaged students with less active parents, resulting in choice schools “cream skimming” the most motivated and able students. The second related hypothesis is that these more advantaged students are especially likely to opt out of schools with concentrations of disadvantaged students and low levels of achievement. Thus, students whose parents are unable or unwilling to take advantage of expanded options and thus remain in such schools will experience especially detrimental changes in their peer environment.

A relatively large literature examines the characteristics of students who take advantage of choice. These studies suggest that across a wide variety of choice programs and contexts, advantaged students opt out of their assigned public school at significantly higher rates than disadvantaged students. There is much less evidence comparing students who opt out to the peers in the specific schools they would have attended under more restrictive policy regimes. As a result it is difficult to quantify the effects that choice programs might have on the peer environments of schools with concentrations of disadvantaged students.

In this study we use data from Durham, North Carolina to examine the effect of school choice policies on the peer environments of students who remain in their assigned public school. Durham is a midsize, countywide district with several different school choice programs. We use data on elementary and middle school students, including information on home addresses, to examine who uses the Durham choice programs to opt out of their assigned school and to

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compare the peer composition of specific schools to what the peer composition of those schools would be if all students attended their assigned public school.

The paper is organized as follows. Section 2 reviews the results of empirical studies related to our research question. Sections 3 and 4 describe the school choice policies in Durham and the data we use. Section 5 presents our analysis and findings, and Section 6 concludes.

2. Literature Review

Several studies examine the characteristics of students who opt out of public schools for private schools (Epple, Figlio, & Romano, 2004; Fairlee, 2006; Figlio & Stone, 2001; Long & Toma, 1988; Lankford, Lee, & Wyckoff, 1995). These studies universally find that student ability, family income, and parent education are each positively correlated with the decision to attend private school. Several of these studies also find that white students are much more likely enroll in private schools in metropolitan areas with large concentrations of black students and that students generally are less likely to choose private schools in areas where the average level of achievement in public schools is higher. These results suggest private schools do tend to cream skim, particularly in areas with concentrations of disadvantaged students.

Several additional studies examine the characteristics of students who use vouchers to attend private schools. Hsieh and Urquiola (2003) focus on the nationwide voucher program in Chile, and show that wealthier families with higher education are much more likely to use vouchers to attend private schools. The most prominent voucher programs in the U.S. differ from that in Chile, however, by limiting eligibility to lower income families, restricting the ability of participating schools to select students, and/or prohibiting schools from charging tuition in excess of the voucher amounts. Evaluations of the voucher program in Milwaukee, which includes all of these restrictive provisions, find that together they can eliminate cream

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skimming on income (Chakrabarti, 2006; Witte, 2000). Nonetheless, these studies also find that parents with higher levels of education and involvement in their child's education are more likely to take advantage of vouchers. Studies of voucher programs in Cleveland, New York City, Dayton and Washington, D.C. also find that parents who have higher levels of education are more likely to use vouchers (Campbell, West, & Peterson, 2005; Howell et al., 2002; Metcalf et al., 2003). Findings on how ethnicity affects the propensity to use vouchers are mixed. Howell (2004) finds that in New York City African American students were more likely to apply for vouchers, but less likely to use them or to remain in private schools when they do. Metcalf et al. (2003) find that white students were more likely to apply for vouchers in Cleveland.

For a number of reasons, the studies of private school students and voucher users provide only limited information on how school choice policies are likely to affect the peer environments of non-choosers. First, programs to expand parental choice options are designed to change the set of students who are able to take advantage of alternative school options. Thus, information on which students choose private schools in the absence of expanded choice programs may not provide a good indication of who will opt out of their assigned school under different school choice regimes. Second, determining the effects of school choice on the peer environments of non-choosers requires information on the schools that private school students or voucher users would most likely have attended in the absence of other options. Because this information is difficult to obtain, none of the studies of private school choice or voucher programs quantify the effects of choice options on the peer composition of specific schools. Third, the leading voucher programs in the U.S. restrict the number of voucher recipients to no more than 15 percent of the public school population (Campbell, West & Peterson, 2005). In many urban districts, much

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larger percentages of students use public school choice programs to opt out of their assigned schools.

Public school choice programs include magnet schools, charter schools, intra- and inter-district open choice, and controlled choice. Although publicly funded voucher programs have been adopted in only three cities and two states, some combination of public school choice programs are provided in most urban school districts in the nation. Studies of such programs provide some, but still limited, evidence of the effects of these programs on the peer composition of students whose parents are unable or unwilling to take advantage of expanded choice.

Though initially introduced as a way to desegregate schools rather than explicitly to expand choice, magnet school programs may now be the most prevalent form of school choice in the U.S. Studies in several different cities report that parents who choose to enroll their children in magnet schools have higher levels of education and in some cases higher levels of income than parents who send their children to their assigned schools (Archbald, 1996; Citizen's Commission, 1997; Martinez, Goodwin, & Kemerers, 1996). In a study similar to ours, Saporito (2003) analyzes the enrollment patterns of students across 21 Philadelphia high schools. He finds that non-poor students from high poverty areas and who are assigned to schools with below average test scores are the most likely group to opt for magnets. However, he also finds that the magnet school program had only a small effect on the level of income segregation across Philadelphia high schools. Using a nationwide sample, Archbald (2004) compares levels of income segregation in districts with magnet schools to similar districts without magnet schools and does not find any association between magnet school programs and income segregation. However, even in cases where a magnet school program has little effect on district wide measures of economic segregation, it may have substantial effects on the peer environment of

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particular schools. Thus, neither the Saporito (2003) nor Archbald (2004) studies provide a complete picture.

Charter schools have been subject to intense scrutiny in recent years, but little of this research has carefully examined the effect of charter school programs on the peer composition of nearby public schools. Moreover the available evidence generates mixed results. Cobb and Glass (1999) find that charter schools in Arizona typically enroll 15 to 20 percent more white students than the nearest traditional public school and that roughly half of the charter schools contribute to ethnic/racial segregation. Booker, Zimmer and Buddin (2005) follow samples of charter school students in Texas and in California who were observed in a regular public school a year earlier. They find no evidence that charter schools in Texas are cream skimming. In that state, charter school students come from regular public schools with below average achievement and were scoring substantially lower than their peers in those schools. Considering the strong preference it has given to authorizing charter schools for at-risk students, however, the Texas charter school program might be exceptional. Their findings for California are more mixed. Though charter school students have lower test scores overall than their peers in the schools they previously attended; white students who select into charter schools tend to be higher achieving than the peers in the schools they left behind.

Two recent studies provide valuable information on intradistrict open choice programs. Cullen, Jacob, & Levitt (2005) examine enrollment patterns across Chicago high schools where more than half the students opt out of their assigned neighborhood school. They report that 74 percent of students in the top quartile on eighth grade achievement tests opt out of their assigned school, and more than two-thirds of those who opt out attend schools with high achievement levels. In comparison, only 37 percent of students in the bottom quartile opt out of their assigned

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schools and the majority of those opt for public schools that have below average levels of achievement. They also find that controlling for eighth grade achievement levels, students whose parents have some college and who are more involved in their education are more likely to opt out, as are students who report higher grades, fewer changes of residence, and higher expectations for graduation on a survey administered in eighth grade. These results suggest extensive cream-skimming in Chicago, but the study does not quantify the effects on the peer environments of those who do not opt out of their assigned school. Hastings, Kane & Staiger (2006) study an open choice program in Charlotte and find that parents of high achieving students are much more likely to choose schools with high average achievement levels and to send their children to a school far from their home, than parents of low and moderate achieving students. Simulations based on such a distribution of preferences suggest that open choice leads to considerably more stratification by ability across schools than would a neighborhood assignment plan.

In sum, the evidence suggests that many forms of school choice result in some degree of cream-skimming. Most markedly, studies in many different contexts find that parents with higher levels of education are more likely to opt out of their assigned or neighborhood public school.¹ However, because most studies are unable to identify the schools choice students would have attended under alternative student assignment policies, the effects of cream skimming on the peer composition of non-choosers are much less clear.

3. Student Assignment Policies in Durham

The Durham Public School district is a countywide school system that serves approximately 32,000 students in 46 schools. Over one-half of the student population is African-

¹ In addition to the U.S. studies cited above studies of school choice policies in Scotland, England, France, the Netherlands, and New Zealand also find that students from advantaged backgrounds are more able to take advantage of expanded choice opportunities (Ambler, 1994; Fiske & Ladd, 2000; Willms & Echols, 1992).

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American, and a rapidly growing Hispanic population now constitutes more than 15 percent of student enrollments. Approximately 25 percent of the district's students are non-Hispanic white. Unlike many other large, urban districts in North Carolina, the Durham Public Schools have never been subject to a federal desegregation court order. Nonetheless, race conscious student assignment policies were used in the district for a number of years. Since 1999, however, all student assignment decisions in Durham Public Schools have been race blind.

The district relies primarily on contiguous, geographic attendance zones to determine school assignments. The majority of students in the district attend their assigned school. As is the case in many urban districts across the country, however, several policies that provide parents the opportunity to opt out of their assigned school and attend another public school are layered on top of the district's geographic assignment plan.

First, the district has long had a very liberal student transfer policy. The current policy states that district officials can grant a transfer request for any reason, and must grant any requested transfer provided it is submitted before the school year, space is available at the requested school, and the student has an acceptable record of attendance and behavior for the prior school year. Our analysis indicates that at least nine percent of the students transfer from their assigned school to another zoned school.² By a "zoned" school we mean a school other than a magnet, year-round, or charter school with an assigned attendance zone.

The district also operates nine magnet schools. The educational programs in each magnet are designed around a specific theme, and each magnet offers unique enrichment opportunities. Any student residing in Durham is eligible to attend any of the magnet schools. Enrollment in a magnet school is by application only and admission is determined entirely by a computerized

² For reasons described below we cannot yet calculate this figure exactly. The estimate of 9 percent is conservative and represents a lower bound.

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lottery. One exception is that students in walk-zones established around each magnet school are given preference in the admission process. Siblings of current students are also given preferences at elementary magnet schools but not middle or high school magnets. Prior to 1999, magnet school lotteries were designed to meet racial composition guidelines. However, since 1999 all magnet school admissions are race blind.

In addition to these magnet schools, five of the district's schools operate on a year-round calendar, which divides the year into 9-week quarters with a three week break between each quarter. Students in year-round schools attend the same number of days as students in traditional schools and have the same basic instructional program. As is true for the magnet schools, admission to the year-round schools is by application only with selections made by lottery. In contrast to magnets, attendance zones are established for each year-round school, and students within the attendance zones are given preference in admissions. These attendance zones are much larger than those for traditional schools since there are so few year-round schools. Students can apply to year-round schools outside their attendance zone, and can be admitted if space is available. Transportation is provided only for students who live in the attendance zone of the year round school.

In addition, to these choice schools operated by the district, Durham is home to several charter schools. For a number of years, Durham has had a higher concentration of charter schools than any other district in the state. Charters in North Carolina are granted by the state and charter schools are operated independently of the local school district. Any student can apply for enrollment in a charter, with admission determined by lottery. Although the district does not provide transportation to charter schools for students, state law requires each charter

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school to develop transportation plans so that transportation is not a barrier to any student who lives in the local school district where the school is located.

We focus our analysis on students in elementary and middle school grades during the 2002-03 school year. During 2002-03, there were 18 zoned elementary schools and 6 zoned middle schools operating on a traditional calendar. Each of the zoned elementary schools serve grade k-5 and each of the zoned middle schools serve grade 6-8. In addition, there were six magnet elementary schools and two magnet middle schools; three year-round elementary schools and two year-round middle schools; and two alternative schools that serve students in special circumstances.³ The elementary magnet schools offer various themes but none are primarily targeted for high achieving students. One of the middle school magnets offers an International Baccalaureate Middle Years Program which is a rigorous, college prep curriculum. The other magnet school serves grades six through twelve and offers extensive visual and performing arts programs as well as an interdisciplinary academic curriculum. In addition to these options, there were seven charter schools in Durham that serve students in grades 3 through 8 and two more charter schools in nearby Chapel Hill. The charter schools are all small and have a variety of grade configurations. All but one serves at least one or more elementary school grades, and all but one serves one or more middle school grades.

4. Data

The data for the analyses presented here are drawn from two administrative sources: the North Carolina Department of Public Instruction's End of Grade (EOG) test files and Durham Public School's student transportation files. The EOG files contain a record for every public school student in grades 3 through 8, including charter schools student and students without test

³ One of the year round magnet schools is housed in the same building as a zoned school operating on a traditional calendar.

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scores. In addition to information on test scores, the EOG files indicate what school the student attended, the student's race/ethnicity and the highest level of education obtained by the student's parents. The transportation files include an address for every student for which the district is responsible for providing transportation. These files were linked together and made available to us by the North Carolina Education Research Data Center. In addition, we obtained school attendance zone boundary files from the County of Durham that allow us to place individual student addresses into school attendance zones established by the Durham Public Schools.

Three issues in assembling these data are important for the analyses that follow. First, because the Durham Public School district does not provide transportation for charter school students, we do not have addresses for the majority of charter schools students residing in Durham during the years they attended charter schools. We do have current year addresses for students who transferred into a charter school during the school year. In addition, because we have transportation files for multiple years between 1997-98 and 2005-06, we have addresses for charter school students who are observed at some point in the Durham public schools. All but two of the charter schools in Durham end by grade eight, and the two that serve older students end in tenth grade and begin after third grade. Thus, most of the charter school students between grades six and eight during the 2002-03 school year had transferred to a regular Durham public high school by 2005-06, and many of those that did not are observed in a Durham elementary school in earlier grades not served by their charter school. Thus, we were able to obtain addresses for nearly 70 percent of charter school students in grades six through eight for the 2002-03 school year. Because they are less likely to have aged out of their charter school by 2005-06, we have address data for only 45 percent of charter school students in grades 3 through 5. The possibility that some charter school students might have moved between the year we

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observe their addresses and the year they enrolled in a charter school introduces some measurement error into our analysis, but the error is likely to be small.

Second, in order to protect student privacy, the data center was not able to provide us exact student addresses. Rather we have for each student a block group id and a “fuzzed” latitude and longitude accurate within one kilometer of the student’s exact address. This information allows us to determine the attendance zone for a student with certainty in about 40 percent of our cases. For the vast majority of the remaining students we can narrow down the set of possible attendance zones to two or three, and identify the precise attendance zones with a high degree of confidence. Nonetheless, due to the uncertainty, if a student is observed in a school and the student’s address might possibly fall in the attendance zone for that school, we assign the student to that school’s zone. Consequently, we might fail to identify as opting out of their assigned school some students who have transferred to a nearby zoned school. More generally, due to the imprecision of our address data, some students might be placed in the wrong attendance zone, introducing an additional source of measurement error in our measure of attendance zone characteristics. For future iterations of this analysis, we plan to work with the data center to assign attendance zones based on exact student addresses.⁴

Third, one of the year-round middle schools, serving 262 middle schools students, is housed in the same building as a traditional, zoned middle school. The student test score files do not distinguish students who attend the year-round school housed in this building from the students in the traditional program. To distinguish the year-round students from those in the

⁴ Our block group assignments are based on exact addresses, and identify a unique attendance zone 40 percent of the time. In the case of middle school students, in over 97 percent of the cases where the block group identified a unique attendance zone, the ‘fuzzed’ latitude and longitude identified the same attendance zone. Thus, any inaccuracy in attendance zone assignments due to imprecise latitude and longitudes is likely to be small for our middle school sample. Because attendance zones for elementary schools are smaller, inaccuracies in attendance zone assignments are larger for the grade 3-5 sample.

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traditional program, we assume that any student who is in that school, but is not in the attendance zone for the traditional, zoned school is in the year-round program, and that all other students in the building are in the traditional program. This process results in an assignment of approximately the correct total number of students to each school. Undoubtedly, however, some students are misclassified. For purposes of computing a student's average peer characteristics, we treat the two schools as one. Thus, the peer characteristics for students that we assigned to the year-round program are assumed to be the same as for those assigned to the traditional school program. We have not yet had a chance to examine whether our results are sensitive to how we treat this issue.

Table 1 presents summary information on the students in our study. The first and third columns provide information on all students in grades 3-5 and grades 6-8 in the EOG files. Not including students in alternative schools, who are excluded from all of the analysis that follow,⁵ approximately 58 percent of elementary school students and 63 percent of middle school students attend their assigned school.⁶ Of the 42 percent of elementary school students who opt out of their assigned school—12.4 percent choose a magnet school, 13.0 percent opt for a year-round school, 10.5 percent request a transfer to another zoned school, and 5.7 percent choose a charter school. Of the 37 percent of middle school students who opt out of their assigned school—14.2 percent choose one of the two magnet schools, 10.8 percent choose one of the two year-round schools, 6.5 percent are identified as having requested a transfer to another zoned school, and 5.3 percent attend a charter school. The lower portions of the table show that approximately 60 percent of our study population is black, 25 to 28 percent is white, and nearly 9 percent at the elementary school level and 7 percent at the middle school level is Hispanic. Just

⁵ Assignment of these students is based neither on geographic assignment zones nor on parental decisions.

⁶ Because we might fail to identify some transfers these figures likely overestimate the number of students who attend their assigned school.

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over 38 percent of elementary school students and 48 percent of middle school students have a parent with a two- or four-year college degree.

The second and last columns describe the sample of students for whom we have address data. Overall, we have addresses for 96.3 percent of the students in grades 3 through 8 in 2002-03, although this percentage is lower for charter schools, particularly at the elementary school level. All the analyses that follow are conducted using the set of students for whom we have address data, and exclude students attending alternative placement schools. This sample includes 7723 students in grades 3-5, and 7018 students in grades 6-8.

5. Analysis and Results

Our analysis proceeds in three stages. First, we compare the characteristics of students who have opted out of their assigned school with students who do not. Second, we present multivariate analyses that provide more detailed descriptions of the students who opt out, how they compare to students from the same attendance zone, and what types of schools students are most likely to leave. Third, we compare the actual peer environments of students who remain in their assigned school to what those peer environments would look like if all students attended their assigned school. Although such a comparison does not tell us the effect of school choice policies on the peer environment of non-choosers, as the term “effect” is typically understood, it does provide insight into the potential of expanded school choice programs to alter peer environments.

5.1 Who Opts Out?

Table 2 examines the percentage of various groups of student who opt out of their assigned school. The first column reports the total number of students in each group and the second column indicates the percentage in that group who opt out. The table also shows the

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percentages of each group that opt out for various types of schools. We distinguish high achievement schools from other choice schools and from other zoned schools that operate on a traditional calendar. High achievement schools are schools with average reading scores in the top third of all Durham schools serving the same grade levels. At the elementary school level, this group includes two of the three year-round schools, and seven of the 18 zoned schools that follow a traditional calendar. At the middle school level this group includes the two magnet schools, one of the year-round schools, and one of the zoned schools. No charter schools are included among the high achievement schools.

Table 2 shows that, in both the elementary and middle school grades, black students are more likely to opt out of their assigned school than white students. Although previous studies provide mixed evidence about whether black students are more likely than white students to take advantage of expanded choices, this result is not surprising. Because their residential choices are more constrained, black families are less able to move to the attendance zone of the school they most prefer. Note, however, that white students are more likely than black students to opt out for a high achievement school. Although the residential choices of Hispanic families are also frequently constrained, Hispanic students are considerably less likely than either white or black students to opt out of their assigned school, and are especially unlikely to opt out for a high achievement school. This pattern suggests that the choice process might be considerably different for Hispanics than for other groups.

Consistent with previous research, we find that students with college educated parents are more likely to opt out of their assigned school than other students. The difference between those with and without college educated parents is even more marked if we examine the choice to opt out for a high achievement school. Elementary grade students with college educated parents are

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two and a half times as likely to opt out for a high achievement school as students whose parents lack college.

In the elementary grades, low, middle, and high achieving students are equally likely to opt out. Higher achievers are, however, more likely to opt out to high achievement schools than lower achieving students. In the middle school grades, where the bulk of magnet and year-round schools are high achievement schools, higher achievers are more likely to opt out of their assigned school than low achievers.

5.2 Multivariate Analysis of Who Opts Out

To further examine the differences between students who opt out and those who do not, we estimated a series of probit models using an indicator of whether or not a student opted out of their assigned school as the dependent variable. The marginal effects from these estimations are presented in Tables 3 and 4. Model (1) in Table 3 includes student characteristics only as explanatory variables. These results largely confirm the results in Table 2. White and Hispanic students are less likely than black students to opt out and students with college educated parents are more likely to opt out than others, although the effect of having a college educated parent is statistically significant only for middle schoolers. High and low achieving students are equally likely to opt out at the elementary school level, but higher achievers are more likely to opt out at the middle school level.

Model (2) in Table 3 adds a variable describing the student composition of the attendance zone where the student resides. The percent minority, the percent with college educated parents, and the percent of low achievers in an attendance zone are highly correlated. With only 18 elementary and 6 middle school attendance zones it is not possible to separate the effects of these different aspects of peer composition on the decision to opt out. Instead we use a composite

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measure of the extent to which the students in an attendance zone are from disadvantaged groups. This disadvantage index is a simple average of the percent minority, the percent of students whose parents do not have a college degree, and the percent of students achieving inconsistent reading mastery. The results reported in Table 3 show that students from attendance zones with higher percentages of disadvantaged students are more likely to opt out of their assigned school. The difference in the likelihood of opting out between black and white students is smaller, although still statistically significant, once we control the peer composition of the student's attendance zone. The effect of having a college educated parents becomes statistically significant at both the elementary and middle school levels in this model.

Model (3) in Table 3 adds measures of the distance of the student's residence to different types of schools. We include measures of both the distance to the nearest high achievement school and the distance to the nearest other choice school.⁷ The results suggest that it is the distance to a high achievement school rather than the distance to other choice schools that influences the likelihood of opting out. The statistically significant point estimates indicate that being one mile closer to a high achievement school increases the likelihood of opting out by 5 percent among elementary school students and 3 percent among middle school students.⁸ After controlling for both the peer composition of the student's attendance zone and the distance of the student's residence from various options, the difference between black and white students in the likelihood of opting out is much smaller and no longer statistically significant. This result suggests that the primary reasons why black students are more likely than white students to opt out of their assigned school is because black students are more likely to be assigned to a

⁷ More specifically, we measure the distance to the nearest high achievement school other than the one to which the student is assigned.

⁸ Because our student address data is "fuzzed" these distances are measured with error, and thus the effect estimates are biased toward zero.

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disadvantaged schools and live closer to schooling options other than their assigned school. Hispanic students, however, remain much less likely to opt out than either black or white students even after controlling for these factors.

Next we estimated model (3) separately for black and white students, and separately for students with college educated parents and others. The results are presented in Table 4. Comparing the models estimated for elementary grade black and white students two differences stand out. First, the level of student disadvantage in one's assigned attendance zones has virtually no effect on a black student's likelihood of opting out. Black students are as likely to opt out of schools with few disadvantaged students as out of schools with concentrations of disadvantaged students. Whites, in sharp contrast, are much more likely to opt out of schools with concentrated disadvantage than other schools. Second, for white students, distance to the nearest high achievement school has a much stronger effect on the likelihood of opting out than distance to other choice schools. However, this is not the case for black students. Similar differences between black and white students emerge from the middle school models. However, middle school black students are more likely to opt out of schools with higher concentrations of disadvantaged students. The differences between students with college educated parents and students whose parents do not have a college degree as similar to the differences between black and white students. In particular, the student composition in the assigned attendance zone is especially important for college educated parents, and much less important for parents without college.

The results in Table 4 indicate that white students and students with college educated parents are much more likely than black students and students whose parents do not have college degrees to opt out of a disadvantaged school for a high achievement school. This result suggests

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that schools serving catchments areas with concentrations of disadvantaged students will have even fewer white and educationally advantaged students as a result of parental choice policies. The results also indicate that parents who do not have a college education are less likely to opt out of their assigned schools than other groups, and when they do opt out they are not anymore likely to opt out of disadvantaged schools or to opt for high achievement schools. Consequently, school choice policies are likely to have the most detrimental effects on the peer composition of this group of students.

5.3 A Counterfactual Comparison

In this section we attempt to describe the overall effect of choice programs on the peer environment of specific groups of students and specific schools. Specifically, we compare peer compositions given the actual distribution of Durham students across schools to the peer compositions that would have emerged if all students had attended the school to which they were assigned. This counterfactual, in which all students attend their assigned schools, is probably not what we would see in the absence of school choice programs. About one-quarter of the students in Durham choose a school other than one of the schools with geographic assignment zones. If magnet, year-round, and charter schools were not available, more zoned schools would be required, and as a result attendance zones would be drawn differently. In addition, student assignment policies influence residential choices and decisions to opt out of the public schools in favor of private schools. Thus, we might expect to see a different pattern of residential segregation and private school enrollment if Durham choice programs were removed. Nonetheless, the counterfactual comparisons presented in this section provide a good indication of the potential of choice to affect the peer composition of specific schools and groups of students.

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We begin by calculating a series of exposure indices given the observed distribution of students and comparing these to the same indices under the counterfactual. An exposure index measures the extent to which one group has contact with another, and can be defined for any pair of groups. The exposure rates here are defined as the percentage of students in Group B attending the same school as the typical member of Group A.⁹ These comparisons are presented in Tables 5, 6, and 7. The exposure rates presented in these tables are the rates for students who remain in their assigned school under the actual school choice policies in Durham.

Table 5 shows that both black and Hispanic students in both elementary and middle schools have less exposure to white students, on average, than they would if all students attended their assigned school. White students also have less exposure to black students than they would under the counterfactual. However, in all cases, differences in exposure rates are very small. Table 6 shows that students who remain in their assigned school have less exposure to students with college educated parents and more exposure to students whose parents are high school dropouts than they would under the counterfactual. The reduction in exposure to students with college educated parents is larger for students whose own parents lack a college education. Middle school students whose parents have a high school education but no college see the largest reduction—from 48.7 to 43.2 percent. These findings are similar to those from a similar analysis of enrollment patterns across Philadelphia high schools, which found that school choice increases aggregate measures of socioeconomic segregation, but that the changes were small (Saporito, 2003).

⁹ Mathematically, the exposure rate is a weighted average of the percent of group B in each school, where shares of Group A are used as the weights. Higher values indicate more exposure to the other group. Exposure of Group A to members of its own group can be interpreted as a measure of group isolation. In this case higher values represent greater isolation.

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Table 7 compares the actual peer achievement levels of students who remain in their assigned school to what those achievement levels would be if all students attended their assigned school. All groups of non-choosers encounter classmates with lower average reading achievement levels, a higher percentage of low performers, and a lower percentage of superior performers than they would under the counterfactual. Changes in peer achievement levels are larger for middle school students than for elementary school students. At the elementary school level, white students and students with college educated parents see smaller changes in peer achievement levels than black students, Hispanic students, and students whose parents did not go to college. At the middle school level, changes in peer achievement levels are more similar across groups. The largest increase in the percent of low performing peers is 3.0 for students who are themselves low performers, and the largest decrease in the percentage of superior performers is 3.9 for black students and low performing students.

Generally, even for disadvantaged student groups, the differences between average peer compositions actually observed and those that would be observed if all students attended their assigned school are small. However, it is important to note that Tables 5, 6, & 7 reflect average differences for each group. These averages conceal considerable variation across schools.

Figure 1 plots the distribution of changes in our index of disadvantage for each zoned school against the disadvantage index for the attendance zone assigned to that school. By change in the disadvantage index we mean the difference between the actual disadvantage index and that which would be observed if all students attended their assigned school. Here we group elementary and middle schools together. The plot reveals several things. Changes in peer composition vary across schools. Although most schools see the index of disadvantage increase, at least four schools see it decrease. Schools that end up with lower percentages of

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disadvantaged students as a result of school choice policies all serve attendance zones with relatively low levels of disadvantage. The three schools that serve attendance zones with the highest concentrations of disadvantaged students do not see especially large increases in their disadvantage index as a result of choice. Clearly ceiling effects are at work here. There are so few students from advantaged groups in these attendance zones that even if a large percentage of those students opt out, it results in only a small change in the overall peer composition of the schools. Even with these ceiling effects, a bivariate regression shows a statistically significant, positive relationship between the change in the disadvantage index and the disadvantage index of a school's attendance zone. In other words, students in areas with substantial concentrations of disadvantaged students whose parents are unable or unwilling to take advantage of expanded school choice opportunities tend to see the largest declines in exposure to advantaged peers as a result of school choice policies.

Four schools, two elementary and two middle schools, see especially large changes in peer composition as a result of school choice policies. Details on the student composition of the attendance zones served by these four schools as well as the changes in peer composition resulting from school choice are detailed in Table 8. The changes in peer composition for these schools are substantial. The two elementary schools see the percent white drop from 13 percent to less than 5 percent, and the percent college educated drop from over 20 percent to around 10 percent. All four schools see a substantial drop in peer achievement levels. In three of the four schools, the percent of low achieving students increases by a quarter or more, and all four schools see a substantial drop in the percentage of high achieving students. We see, then, that even when the effects on average measures of peer composition are small, school choice policies can result in substantial changes in the peer environment of specific schools.

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Three of these four schools (Elementary School #1, Elementary School #2, and Middle School #1) fit a similar profile. They each serve an attendance zone with below average percentages of white students, students with college educated parents, and high achieving students, but enough students from these groups that their exodus in response to choice opportunities results in substantial changes in the school's peer composition. Middle School #2 differs from the other three. It has above average percentages of advantaged and high achieving students, but has two high achievement magnet schools located within its attendance zone. As a result it loses large percentages of its high achieving students.¹⁰

The non-choosers whose peer environments are changed the most by the choices of other students are not those who live in the most racially and economically isolated areas. These students find themselves in schools with high concentrations of disadvantaged students whether or not parental choice policies are in place. Rather the students who see the largest changes as the result of school choice policies are those who live in attendance zones with substantial concentrations of disadvantaged students, but some share of advantaged students as well. Students living in attendance zones located near choice schools that are attractive to high achieving students are see substantial reductions in peer achievement levels.

6. Conclusion

In keeping with prior research, we find that advantaged students, and particularly students whose parents have a college education, are more likely to opt out of their assigned school. Advantaged students are most likely to opt out of schools with concentrations of disadvantaged students in order to attend schools with high levels of achievement. As a result, school choice programs in Durham have allowed higher achieving schools to cream-skim educationally

¹⁰ This effect is exacerbated by the fact that students who live in the immediate vicinity of a magnet school are given preference in the admission process.

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advantaged students from many neighborhood schools. When we compare the average peer environment of various groups of non-choosers to what would be observed if all students attended their assigned school, we find only small differences. However, schools with concentrations of disadvantaged students and schools located near choice schools attractive to high achievers are particularly hard hit by cream-skimming.

Several considerations limit the conclusions we can draw from these findings. First, one might question our ability to generalize findings from Durham. A persistent theme in the literature on school choice is that differences between who opts out and who remains behind depend heavily on context. Characteristics of neighborhood public schools and the local community, key features of school choice policies, the type of programs offered at alternative schools, the accessibility of information on school quality, and idiosyncratic historical and cultural factors can all influence the choices made by different groups of students (Figlio & Stone, 2001; Fuller, Elmore, & Orfield, 1996). Nonetheless, the student assignment policies in Durham, which overlay neighborhood assignment zones with several different school choice programs, are typical of the policies in many urban areas. Also, our findings concerning what type of students opt out of their assigned school, which schools lose the most students, and which types of schools educationally advantaged students tend to choose, are consistent with findings from settings as diverse as Chicago, Philadelphia, Charlotte, Cincinnati, San Antonio, Milwaukee, Cleveland, Scotland, and New Zealand.

More telling, questions can be raised about the counterfactual comparison we present. School choice programs can influence how district officials draw attendance zone boundaries, parent choices about whether to keep their child in public schools, and patterns of residential location. Consequently, the peer environments students would encounter if all students attended

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their assigned school cannot be interpreted as the peer environments they would face in the absence of school choice policies. It is possible that if Durham's school choice programs were eliminated, patterns of sorting similar to those documented here would reemerge as educationally advantaged families opt for private schools and move to areas assigned to desirable schools. Thus, it is best to interpret the results of our analyses as estimates of the potential rather than the actual effects of public school choice policies on the peer environments of non-choosers.

Finally, it is not clear what effects different peer environments have on the academic achievement and other important outcomes of individual students. Emerging evidence suggests that the most beneficial peer environment for a student depends on his or her background and ability level (Hoxby & Weingarth, 2005). Nonetheless, it is widely agreed that schools characterized by excessive racial isolation and concentrations of educationally disadvantaged students often have detrimental effects on student achievement. Any policies that result in more of those types of schools should cause concern among policy makers.

Students who are assigned to poor performing schools and whose parents are unable or unwilling to take advantage of expanded school choice opportunities are an especially vulnerable population. The results of our analyses suggest that any benefits of expanded school choice that accrue to those able to take advantage of it, might come at the expense of poorer learning environments for those left behind.

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Table 1: Summary Information on Durham Students, 2002-03

	Grades 3-5		Grades 6-8	
	All students	Students with Address Data	All students	Students with Address Data
<i>Enrollment</i>				
Total Number	8071	7723	7448	7217
In an Assigned School	4703	4626	4570	4500
In a Magnet School	998	992	1028	1022
In a Year-Round School	1048	1043	778	767
Transfer Request ^a	850	850	468	468
In a Charter School	467	212	380	261
In an Alternative School	5	0	224	199
<i>Race/Ethnicity</i>				
% Black	60.5	60.0	60.8	60.7
% White	25.3	25.5	27.8	28.1
% Hispanic	8.9	9.1	6.9	6.7
% Multiracial	2.8	2.8	2.6	2.6
% Asian	2.3	2.4	1.8	1.8
% Native American	0.3	0.3	0.2	0.2
<i>Parents' Education</i>				
% Less than High School	8.2	8.3	6.4	6.2
% High School	53.3	53.5	45.5	45.7
% Two-Year College	12.1	11.9	14.5	14.4
% Four-Year College	26.3	26.3	33.5	33.7
<i>Achievement Level</i>				
% Inconsistent Mastery	20.3	19.9	22.2	21.8
% Consistent Mastery	44.8	44.7	45.5	45.6
% Superior Performance	34.9	35.5	32.3	32.7

a. Students who attend a zoned school other than the one to which they are assigned. Only students with address data could be identified as transfer requests.

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Table 2: Percent of students in who opt out of their assigned school, by student characteristics, 2002-03

Grades 3-5					
	N	Total	To High Achievement School	To Other Choice School	To Other Zoned School
<i>Student's Ethnicity</i>					
Black	4637	46.0*	15.4*	24.0*	6.6*
White	1967	34.6*	25.2*	8.7*	0.7*
Hispanic	700	22.4*	7.0*	10.4*	5.0*
<i>Parents' Education</i>					
Less than college	4772	37.3*	11.1*	20.2*	6.0*
College Degree	2951	44.6*	26.6*	15.1*	2.9*
<i>Student Achievement</i>					
Inconsistent Mastery	1471	40.0	9.7*	22.4*	7.9*
Consistent Mastery	3311	40.0	14.9*	20.5*	4.6
Superior Performance	2266	40.0	24.1*	13.8*	2.1*
Grades 6-8					
	N	Total	To High Achievement School	To Other Choice School	To Other Zoned School
<i>Student's Ethnicity</i>					
Black	4194	40.0*	25.5*	7.0*	7.5*
White	2018	30.9*	22.7	5.7	2.5*
Hispanic	482	22.6*	12.4*	2.5*	7.7
<i>Parents' Education</i>					
Less than college	3579	31.9*	18.5*	5.6*	7.9*
College Degree	3439	40.0*	29.3*	6.7*	4.0*
<i>Student Achievement</i>					
Inconsistent Mastery	1408	32.1*	14.1*	10.0*	7.9*
Consistent Mastery	3095	35.1	23.1*	5.6	6.3
Superior Performance	2266	39.4*	32.1*	4.3*	3.0*

Based on all students in EOG file. N is total number of students including those who attend assigned school.
* indicates significantly different from other students (non-X) in two-tailed t-test at 0.05 level.

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Table 3: The relationship between student characteristics, attendance zone characteristics, and the decision to opt out

	Grades 3-5		
	(1)	(2)	(3)
Black	Omitted	Omitted	Omitted
White	-0.14** (0.05)	-0.10** (0.05)	-0.07 (0.05)
Hispanic	-0.21** (0.04)	-0.20** (0.04)	-0.20** (0.04)
Other	-0.15** (0.04)	-0.12** (0.04)	-0.12** (0.04)
College Educated Parent	0.09 (0.06)	0.11** (0.05)	0.11** (0.05)
Inconsistent Reading Mastery	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.02)
Consistent Reading Mastery	Omitted	Omitted	Omitted
Superior Reading Performance	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)
Zone Disadvantage Index ^a		0.61** (0.30)	0.67** (0.30)
Dist. to Nearest Other Choice School			-0.01 (0.02)
Dist. to Nearest High Achiev. School			-0.05** (0.02)
Number of Observations	7723	7723	7723
	Grades 6-8		
	(1)	(2)	(3)
Black	Omitted	Omitted	Omitted
White	-0.15** (0.04)	-0.12** (0.03)	-0.06 (0.04)
Hispanic	-0.12** (0.03)	-0.11** (0.03)	-0.12** (0.02)
Other	-0.08** (0.03)	-0.07** (0.03)	-0.05 (0.03)
College Educated Parent	0.07** (0.03)	0.08** (0.03)	0.09** (0.03)
Inconsistent Reading Mastery	-0.06* (0.03)	-0.07** (0.03)	-0.08** (0.02)
Consistent Reading Mastery	Omitted	Omitted	Omitted
Superior Reading Performance	0.09** (0.03)	0.10** (0.02)	0.10** (0.02)
Zone Disadvantage Index ^a		1.11** (0.56)	1.18** (0.33)
Dist. to Nearest Other Choice School			-0.02 (0.02)
Dist. to Nearest High Achiev. School			-0.03** (0.01)
Number of Observations	7018	7018	7018

Estimates are marginal effects computed at the sample means from results of probit models. An indicator of choice to opt out is the dependent variable. Robust standard errors adjusted for clustering by assigned attendance zone in parentheses. * statistically significant at 0.10 level, ** statistically significant at 0.05 level

a. Average of percent minority, percent of parents with no college, and percent students showing inconsistent mastery in reading in the attendance zone to which the student is assigned.

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Table 4: The relationship between student characteristics, attendance zone characteristics, and the decision to opt out, by student characteristics

	Grades 3-5			
	Blacks	Whites	College	No College
Black			Omitted	Omitted
White			-0.05 (0.06)	-0.06 (0.05)
Hispanic			-0.18** (0.06)	-0.20** (0.04)
Other			-0.14** (0.04)	-0.07 (0.06)
College Educated Parent	0.11** (0.04)	0.15** (0.08)		
Inconsistent Reading Mastery	-0.01 (0.02)	-0.01 (0.04)	0.00 (0.03)	-0.01 (0.01)
Consistent Reading Mastery	Omitted	Omitted	Omitted	Omitted
Superior Reading Performance	0.00 (0.02)	0.04 (0.03)	0.01 (0.03)	0.03 (0.02)
Zone Disadvantage Index ^a	0.24 (0.45)	1.58** (0.36)	1.70** (0.35)	0.02 (0.34)
Dist. to Nearest Other Choice School	-0.03 (0.02)	0.01 (0.02)	0.04* (0.02)	-0.06** (0.02)
Dist. to Nearest High Achiev. School	-0.04 (0.03)	-0.06** (0.03)	-0.07** (0.03)	-0.03 (0.02)
Number of Observations	4637	1967	2951	4772
	Grades 6-8			
	Blacks	Whites	College	No College
Black			Omitted	Omitted
White			-0.05 (0.04)	-0.07 (0.04)
Hispanic			-0.14* (0.09)	-0.11** (0.01)
Other			-0.06 (0.04)	-0.03 (0.04)
College Educated Parent	0.09** (0.02)	0.10 (0.06)		
Inconsistent Reading Mastery	-0.11** (0.03)	-0.07** (0.02)	-0.13** (0.02)	-0.06** (0.03)
Consistent Reading Mastery	Omitted	Omitted	Omitted	Omitted
Superior Reading Performance	0.11** (0.03)	0.11** (0.04)	0.10** (0.01)	0.11** (0.05)
Zone Disadvantage Index ^a	1.01** (0.40)	1.41** (0.43)	1.57** (0.43)	0.85** (0.40)
Dist. to Nearest Other Choice School	-0.03 (0.02)	-0.00 (0.02)	-0.01 (0.02)	-0.02 (0.02)
Dist. to Nearest High Achiev. School	-0.03** (0.01)	-0.04** (0.02)	-0.04** (0.01)	-0.03** (0.01)
Number of Observations	4194	2078	3439	3579

Estimates are marginal effects computed at the sample means from results of probit models. An indicator of choice to opt out is the dependent variable. Robust standard errors adjusted for clustering by assigned attendance zone in parentheses. * statistically significant at 0.10 level, ** statistically significant at 0.05 level

a. Average of percent black, percent of parents with no college, and percent students showing inconsistent mastery in reading in the attendance zone to which the student is assigned.

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Table 5: Exposure to Different Ethnic Groups, Actual Compared to Counterfactual

Students Own Ethnicity	Exposure to Whites		Exposure to Blacks		Exposure to Hispanics	
	Actual	Counter-factual	Actual	Counter-factual	Actual	Counter-factual
<i>Elementary School Grades</i>						
Black	20.5	21.9	63.3	64.0	11.0	8.9
White	41.3	40.6	44.3	45.6	7.7	7.2
Hispanic	19.1	20.5	58.2	59.9	17.3	13.9
<i>Middle School Grades</i>						
Black	27.8	28.3	59.5	60.5	8.1	6.7
White	33.5	33.5	54.0	55.5	7.9	6.6
Hispanic	28.1	29.1	57.3	58.2	9.8	8.1

Actual measures of exposure are for students who remain in their assigned school, and are compared to measures of exposure for these same students under the counterfactual that all students attend their assigned school.

Table 6: Exposure to Students with College Educated Parents for Students in Assigned Schools, Actual Compared to Counterfactual of All Students in Assigned School

Education of Student's Own Parent	Exposure to College Educated		Exposure to H.S. Dropouts	
	Actual	Counterfactual	Actual	Counterfactual
<i>Elementary School Grades</i>				
Less than High School	28.5	31.3	18.1	14.8
High School	31.4	35.2	8.8	7.7
Two-Year College Degree	42.6	42.1	7.6	6.8
Four-Year College Degree	49.9	50.1	6.3	6.3
<i>Middle School Grades</i>				
Less than High School	44.8	49.1	8.3	7.2
High School	43.2	48.7	6.5	5.8
Two-Year College Degree	44.5	49.2	6.7	6.0
Four-Year College Degree	46.7	50.9	6.6	6.0

Actual measures of exposure are for students who remain in their assigned school, and are compared to measures of exposure for these same students under the counterfactual that all students attend their assigned school.

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Table 7: Average Reading Achievement of Peers, Actual Compared to Counterfactual

	Average Achievement of Peers		Exposure to Low Performers		Exposure to Superior Performers	
	Actual	Counter-factual	Actual	Counter-factual	Actual	Counter-factual
Elementary School Grades						
<i>Student's Race Ethnicity</i>						
Black	-0.082	-0.041	20.6	19.9	30.9	32.4
White	0.18	0.195	14.3	14.0	41.9	42.5
Hispanic	-0.167	-0.113	22.8	21.8	27.5	29.6
<i>Parent's Education</i>						
No College	-0.082	-0.036	20.7	19.8	30.9	32.6
College	0.114	0.130	15.8	15.6	39.2	39.9
<i>Student's Achievement Level</i>						
Inconsistent Mastery	-0.146	-0.095	22.4	21.4	28.4	30.3
Consistent Mastery	-0.035	0.002	19.4	18.8	32.8	34.2
Superior Performance	0.115	0.134	15.8	15.5	39.3	40.0
Middle School Grades						
<i>Student's Race Ethnicity</i>						
Black	-0.089	0.009	23.0	20.2	27.8	31.7
White	-0.018	0.081	19.7	18.3	31.9	34.8
Hispanic	-0.086	0.010	23.5	20.9	28.2	32.0
<i>Parent's Education</i>						
No College	-0.079	0.015	22.6	20.1	28.2	31.9
College	-0.021	0.059	21.1	19.1	30.5	33.8
<i>Student's Achievement Level</i>						
Inconsistent Mastery	-0.120	-0.017	24.2	21.2	26.8	30.7
Consistent Mastery	-0.057	0.031	21.9	19.6	29.0	32.6
Superior Performance	0.006	0.080	20.2	18.5	31.4	34.7

Actual averages are for students who remain in their assigned school, and are compared to averages for these same students under the counterfactual that all students attend their assigned school.

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Table 8: Schools with largest change in student composition

	Elem. School #1	Elem. School #2	Median Elem. School	Middle School #1	Middle School #2	Median Middle School
% White in Zone	12.7	12.7	18.9	18.9	29.3	25.3
Rank on % White	5/18	4/18		1/6	4/6	
Change in % White	-8.4	-9.7	-0.1	-0.4	-0.7	0.3
% Coll. Ed. Parents in Zone	22.9	21.7	32.2	44.4	52.3	48.5
Rank on % Coll. Ed. Parents	5/18	3/18		2/6	4/6	
Change in % Coll. Ed. Parents	-14.2	-9.2	-3.5	-11.5	-4.8	-3.4
Avg. Reading Score in Zone	-0.113	-0.236	-0.062	0.034	0.134	0.084
Rank on Avg. Reading Score	9/18	5/18		3/6	4/6	
Change in Avg. Reading Score	-0.293	-0.163	-0.052	-0.176	-0.205	-0.092
% Inconsistent Mastery in Zone	21.2	23.9	18.9	19.0	20.4	19.7
Rank on % Incons. Mastery	10/18	12/18		3/6	4/6	
Change in % Incons. Mastery	6.0	3.0	1.1	4.8	5.1	3.8
% Superior Perf. In Zone	24.6	24.6	29.9	31.5	36.9	34.2
Rank of % Superior Perf.	5/18	6/18		3/6	4/6	
Change in % Superior Perf.	-7.2	-7.3	-1.7	-7.7	-8.2	-3.1

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