Impact of School Characteristics on PARCC Results

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Abstract

The purpose of this article is to take an in-depth look at how certain non-academic factors affect standardized test results in the middle school setting. As standardized testing and student growth impact school and teacher evaluation, it is important to consider the influence of factors both inside and outside of the classroom. This study analyzed the impact on student performance on the Partnership for Assessment of Readiness for College and Careers (PARCC) exam of the following variables: property taxes received by schools; instructional spending per pupil; percentage of low-income students; percentage of student mobility; percentage of English Language Learners (ELL); teacher salary, retention rates, and education; and class size. This analysis was based on data gathered from the Illinois State Report Card published by the Illinois State Board of Education on 374 of the 376 grade 6–8 middle schools located in Illinois. The three strongest predictors of the success rate for middle school age students on the PARCC exam were the student mobility rate, the amount of property tax received by the school, and the percentage of low-income students. Instructional spending per pupil, percentage of English Language Learners, teacher retention rate, salary and education, and class size had a less significant impact on students meeting or exceeding standards on the PARCC exam. This suggests that the socioeconomic demographics of the surrounding community are a contributing factor to student success.

Keywords: Illinois, PARCC, poverty, mobility, ELL, school funding, low SES, teacher retention, class size, academic success

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Standardized testing has become increasingly common in public schools. In many instances, the results of these tests are used not only to measure student learning but also to gauge teacher and school performance. State and federal regulation may link performance to funding, increasing the pressure of these high-stakes tests, especially on teachers and districts. Results of the Partnership for Assessment of Readiness for College and Careers (PARCC), the test recently given in Illinois for grades 3–8, are reported on the Illinois Report Card and are often viewed as a measure of a school's or teacher's effectiveness. Many teachers feel the pressure to "teach to the test," but educators have seen that there are factors beyond schools' or teachers' control. Despite enactment of the Every Student Succeeds Act (ESSA), which shifts away from reliance on standardized testing as a means for measuring school performance, student growth remains a part of teacher evaluation and districts use these tests as a measure of student learning. In Illinois, the Performance Evaluation Reform Act requires that measures of student growth be used in the evaluation of teachers and principals; some districts are using standardized testing, such as the PARCC, to measure this growth. As the assessment of performance and education has become more data driven, we—as mathematicians and mathematics educators—need to more deeply understand the forces that influence results on standardized tests.

1. Introduction

Previous research has shown that poverty has an overall negative effect on student success.

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Indicators of poverty in this study include high percentages of families with low socioeconomic status, high percentages of student mobility, low instructional spending, and low property tax income. A previous study was conducted through the Colorado Department of Education to see the impact of poverty, school size, and charter designation on students' standardized test scores (Chamberlin, 2007). The results of this study were that the "correlation with poverty was very large and negative" (Chamberlin, 2007, p. 23), meaning that high indicators of poverty were correlated with low test performance. Similarly, a study of success in math, language arts, and reading among elementary students found that "school level mobility had negative implications for student achievement," and, even after controlling for poverty status and school size, "school mobility had a negative impact on achievement" (Thompson, Meyers & Oshima, 2011, p. 16).

In addition, a study published by the Harvard Graduate School of Education found that teacher satisfaction with working conditions and school climate was a stronger predictor of long term retention than the socioeconomic status of the students. In effect, teachers were leaving the schools, not the students (Johnson, Kraft & Papay, 2012). In Illinois, many of the teacher satisfaction studies have focused on Chicago Public Schools (CPS). Teacher retention rates within the Chicago Public Schools system tend to be around the national average, but some schools within CPS replace half of their teaching staff within five years. The University of Chicago Consortium on School Research found that within CPS, teacher retention has more to do with the support network of the school and the community than with the characteristics of the students (Allensworth, Ponisciak & Mazzeo, 2009).

A study by Guisbond, Neill & Schaeffer mentioned that the standardized testing goals listed in No Child Left Behind (NCLB) "failed to consider the consequences of poverty and has been an excuse for not addressing them" (2012, p. 9). During the implementation of NCLB in Illinois specifically, "there was no significant gain in academic achievement in reading or math as measured by the PSAE" (Harman, Boden, Karpenski & Muchowicz, 2016, p. 16). The Prairie State Achievement Exam (PSAE) is an exam given to high school juniors. The lack of change in student success even at the high school level suggested that "focusing schooling on state mandated standards for core skill areas of reading and math, measured by standardized tests, is a failed experiment" (Harman et al., 2016, p. 16), so changing the standards and the test may not be the answer to improving education. However, we continue to give standardized tests and tie teacher and school evaluations to the results of these tests.

In 2010, Illinois adopted the Common Core State Standards (CCSS) which precipitated a needed change in their standardized test. Since the new standards "incorporate more real-world situations so students can learn important skills to utilize in the workplace and higher education" (Illinois State Board of Education, 2013b), Illinois reached out to the Partnership for Assessment of Readiness for College and Careers (PARCC) for a new standardized test. The new PARCC exam "serve[s] as an 'educational GPS system,' measur[ing] students' current performance, and point[s] the way to what students need to learn by graduation so they are ready for college and/or a career" (PARCC, 2015).

In contrast to the Illinois Standards Achievement Test (ISAT), the former Illinois standardized assessment, PARCC aims to develop "high-quality 21st century, technology-based assessments. They will go beyond the traditional paper-pencil, fill-in-the-bubble tests, using new innovative technology-enhanced items and more extensive constructed response items" (Illinois State Board of Education, 2013a, p. 1). In the English Language Arts (ELA) exam, students are asked to read and analyze fiction and nonfiction texts, possibly with an accompanying video or sound clip, and combine their understanding of the text and multimedia to address written response questions (PARCC, 2017a). For the mathematics portion of the test, students are asked to solve multi-step mathematical problems in real-world contexts and explain their reasoning,

instead of just applying a memorized skill (PARCC, 2017b). Problems in the mathematics portion of the test are grouped into three types. Type I questions assess concepts, skills, and procedures. Questions of this type make up 61% of the possible points and are computer graded. Mathematical reasoning is the focus of Type II questions. These make up 21% of the available points and consist of both machine- and hand-graded responses, which include written arguments and justifications of reasoning. Type III questions address mathematical modeling and application in a real-world context; these consist of both machine- and hand-graded responses and make up 18% of the points (PARCC, 2018).

On the PARCC assessment, students earn numerical scores that place them within five categories. Categories 1, 2, and 3 suggest that students may need additional support to move on to the next grade level. Categories 4 and 5 imply that students are ready for the next grade level and have met or exceeded standards (PARCC, 2015).

Although the PARCC exam is a newer assessment of student achievement, the variables of high student mobility, low property tax funding, and high percentage of low-income families have had a negative impact on student success on other measures of student achievement. The Educational Testing Service (ETS) published the report *Mind the Gap: 20 Years of Progress and Retrenchment in School Funding and Achievement Gaps* which looked at how changes in funding at the state level impacted student success on the National Assessment of Educational Progress (NAEP) (Baker, Farrie & Sciarra, 2016). The article concluded that higher statewide spending increased staffing and created competitive teacher salaries and, in turn, increased "outcomes of children from low-income families and with smaller achievement gaps between children from low-income and children from non-low-income families" (p. 27). During the 20-year period studied (1993 to 2012), Illinois had a pattern of declining revenue and spending fairness in terms of helping to provide comparable funding for schools serving populations of varying income levels (p. 17). Therefore, the state has historically not done enough to adequately provide schools with resources to attempt to counteract the educational impacts of poverty.

2. Method

This study focused on 374 public middle schools in Illinois. Data were gathered from the Illinois Report Card, the state reporting website on all public schools (Illinois State Board of Education, 2016b). Data were collected for schools identifying as a middle school containing only grades 6 through 8. Since schools report aggregate data for the Report Card, buildings with grades outside of this range were not included, as the data were not comparable. Furthermore, PARCC identifies grade bands for grades 3–5, 6–8, and high school (PARCC, 2018). Two of the 376 schools identifying as middle schools were excluded from the analysis because the data were incomplete.

2.1. Definition of terms

The dependent variable was the percent of students that met or exceeded standards on the PARCC exam as stated by the Illinois State Board of Education. The independent variables were as follows: instructional spending per student, property tax, teacher retention rate, average teacher salary, teacher education, percentage of low-income students, percentage of student mobility, percentage of English Language Learners, and class size. The independent variables are defined per Illinois State Board of Education (2016a) below.

- Instructional spending "is instructional expenditures divided by the nine-month average daily attendance. 'Instruction' includes activities dealing with the teaching of pupils or the interaction between teachers and pupils. Teaching may be provided for pupils in a school classroom or in another location, such as a home or hospital and may include other learning activities. It may also be provided through some

other approved form of communication, such as television, radio, telephone, or correspondence. Included here are the activities of aides or assistants of any type (clerks, graders, teaching machines, etc.), who assist in the instruction process. (Capital Outlay expenditures, which are reported separately, are excluded.)"

- The property tax level means "the receipt of taxes that apply to the prior year's levies, as well as those available from the current levy. Also included are payments in lieu of taxes as monies from the Corporate Personal Property Replacement Tax."
- Teacher retention rate is calculated as "the total number [of] full-time teachers returning to the same school in the past three years divided by the total number of full-time teachers from the past three years" in the district.
- Average teacher salary "is the sum of the salaries for all classroom teachers divided by the number of full-time equivalent classroom teachers."
- Teacher education is measured by the percentage of teachers with a master's degree or above and "is the sum of all full-time equivalent classroom teachers with master's degrees and above in the district, divided by the total number of full-time equivalent classroom teachers, multiplied by 100."
- Percentage of low-income students is defined as students that "receive or live in households that receive Supplemental Nutrition Assistance Program (SNAP) or Temporary Assistance to Needy Families (TANF); are classified as homeless, migrant, runaway, Head Start, or foster children; or live in a household where the household income meets the U.S. Department of Agriculture income guidelines to receive free or reduced-price meals. The percentage of low-income students is the count of low-income students, divided by the total fall enrollment, multiplied by 100."
- Percentage of student mobility is defined as "any enrollment change between the first school day in October and the last day of the school year. It is the sum of the students who transferred out and the students who transferred in, divided by the average daily enrollment, multiplied by 100. Students are counted each time they transfer out or in during the reporting year. Thus, individual students may be counted more than once."
- Limited English proficient students "are students who have been found to be eligible for bilingual education. The percentage of limited English proficient students is the count of limited English proficient students, divided by the total fall enrollment, multiplied by 100;" for the analysis listed below this percentage is referred to as percentage of English Language Learners (ELL).
- Average class size is defined as "the sum of specified class enrollments from kindergarten through Grade 8 for schools having grades below Grade 9 and in all subject areas in high school, divided by the number of classes. For high schools, and optionally for Grades 6 and 8, an average for the second and fifth class periods is used."

2.2. Analysis

After data collection, each independent variable was plotted against the percentage of students that met or exceeded standards on the PARCC exam (scores of 4 or 5) to visually test for a linear relationship. The Pearson correlation coefficient was used to quantify the linear relationship between the percentages of students that met or exceeded standards on the PARCC test and the listed independent variables (Table 1). The Pearson correlation coefficient is a measure of the strength of linearity between two variables and is a value between -1 and 1. A Pearson value of 1 means that the data lie along

a line with a positive slope (that is, the quantities are in direct variation), whereas a value of -1 indicates that the data lie on a line with a negative slope (indirect variation). A Pearson value of 0 means that the data do not have a linear relation. The magnitude gives a sense of how much the data reflect a linear trend. Generally, a value with a magnitude greater than 0.7 is considered to be a strong correlation and a value with a magnitude between 0.5 and 0.7 is a moderate correlation. For example, Figure 1 does not show a linear trend and has Pearson correlation coefficient of 0.289; Figure 4 reflects a linear trend in the data and has a Pearson coefficient of -0.791. It is important to remember that the Pearson coefficient is a measure of correlation, not causation. When we say that the percentage of low-income students is negatively correlated to PARCC success, we are indicating that schools with a high percentage of students from low-income families generally have low PARCC success rates, whereas schools with a low proportion of low-income students have higher success rates. We are not claiming that poverty *causes* low performance.

3. Results

Figure 1 shows the plot of percentage of students meeting or exceeding PARCC standards against the average amount spent per student on instruction, labeled as instructional spending. The data did not show a strong correlation. While many schools spent between \$4,000 and \$8,000, the range of proficiency on the PARCC test was wide. However, several schools spent in excess of \$10,000 per student, but still had less than 50% proficiency. These high-spending schools did not display common characteristics; the data for other measures we considered spanned the range of observed values. There were twenty-one schools that reported instructional spending over \$10,000: seventeen were in the Chicago suburbs, three were CPS schools, and one was rural (Scales Mound, a school in the northwest corner of the state).

The plot of the percentage of students meeting or exceeding PARCC standards against the amount of tax monies dispersed to the district

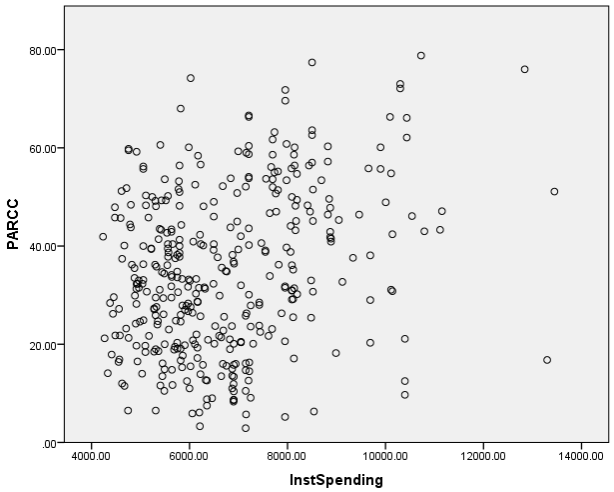

Figure 1: Percentage of students meeting or exceeding PARCC standards versus instructional spending per student.

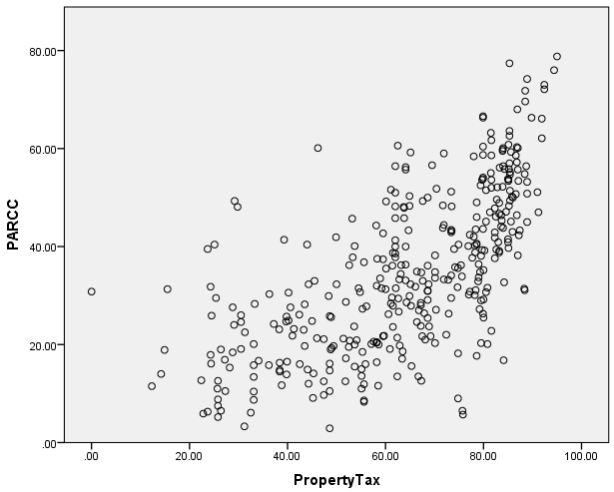

Figure 2: Percentage of students meeting or exceeding PARCC standards versus property tax received.

based upon the previous year's levies, labeled as property tax, is given in Figure 2. Note this does not include other sources of funding, such as state and federal aid (Illinois State Board of Education, 2016a). Schools that received larger amounts of money saw higher percentages of students meeting or exceeding PARCC standards. The data have a positive linear correlation.

Figure 3 is the plot of percentage of students meeting or exceeding PARCC standards against the student mobility percentage, labeled as mobility. No school with a mobility greater than 20% had more than half the students meeting or

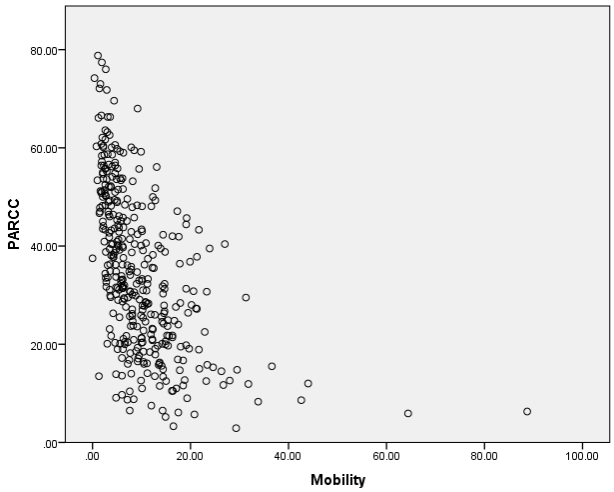

Figure 3: Percentage of students meeting or exceeding PARCC standards versus percentage of student mobility.

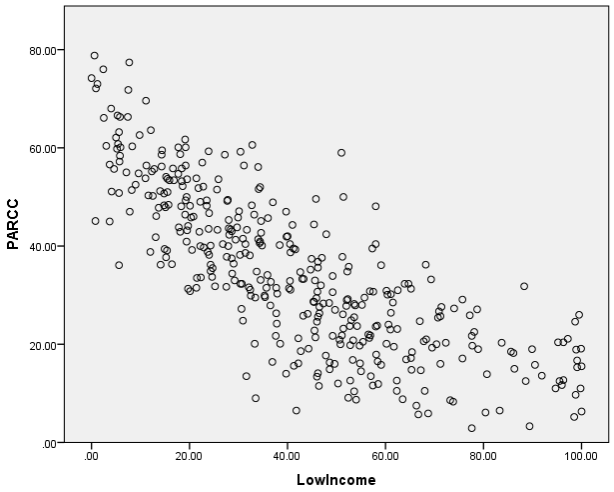

Figure 4: Percentage of students meeting or exceeding PARCC standards versus percentage of low-income students.

exceeding PARCC standards. As mobility within a school increased, the percentage of students that meet or exceed PARCC standards decreased. The data have a negative linear correlation.

The plot of percentage of students meeting or exceeding PARCC standards against the percentage of low-income students qualifying for free or reduced price meals, labeled as low-income, is displayed in Figure 4. Schools with a higher percentage of low-income students had a lower percentage of students meet or exceed PARCC standards. The data have a strong negative linear correlation.

Figure 5 shows the plot of percentage of students meeting or exceeding PARCC standards against percentage of limited English proficient students, labeled as ELL (English Language Learners). While many schools in Illinois have between 0% and 10% ELL students, the range of proficiency on the PARCC test was wide. However, no school with more than 10% of their population being ELL had more than half of their students meeting or exceeding PARCC standards. The data overall did not show a strong linear correlation.

Figure 6 gives the plot of percentage of students meeting or exceeding PARCC standards against the average class size. Many schools had an average class size between 25 students and 30 students, and the range of proficiency on the PARCC test varies widely. As a whole, the data did not show a strong linear correlation.

The data of percentage of students meeting or exceeding PARCC standards against teacher retention rate, labeled as teacher retention, is plotted in Figure 7. While many schools reported a teacher retention rate between 80% and 100%, the range of proficiency on the PARCC test was wide. The schools with lower than 60% retention were schools with a small staffing population of less than ten certified staff members. The data did not show a strong correlation.

Figure 8 shows the plot of percentage of students meeting or exceeding PARCC standards against the average teacher salary per school, labeled as teacher salary. The data appeared scattered with no strong pattern. Analysis indicated that the data did not show a strong correlation.

The plot of the percentage of students meeting or exceeding PARCC standards against the percentage of teachers with master's degree or beyond is presented in Figure 9. As with the plot of teachers' salary, the data appeared scattered with no strong pattern. Analysis indicated that the data did not show a strong correlation.

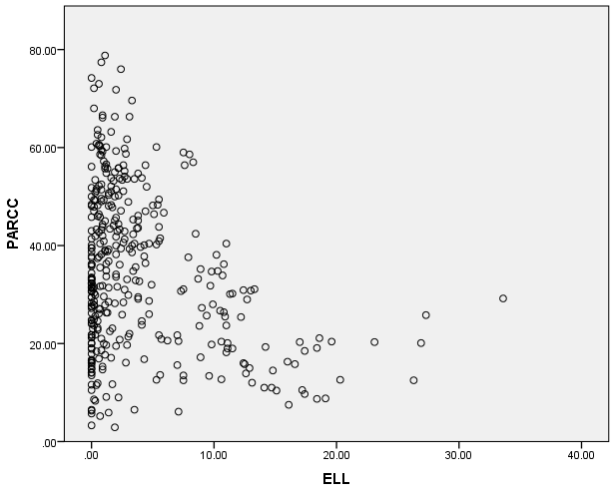

Figure 5: Percentage of students meeting or exceeding PARCC standards versus percentage of English language learners.

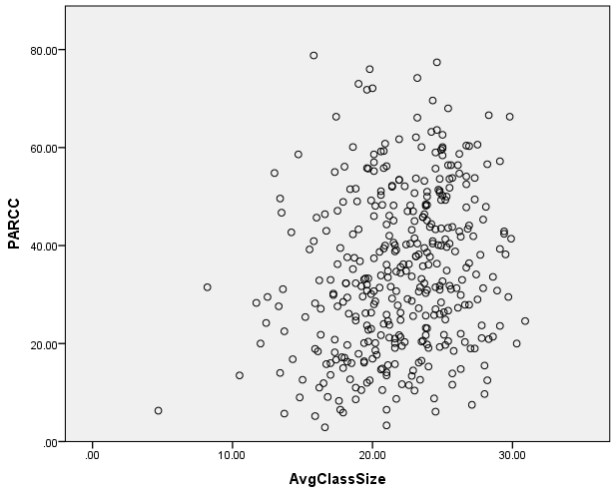

Figure 6: Percentage of students meeting or exceeding PARCC standards versus average class size.

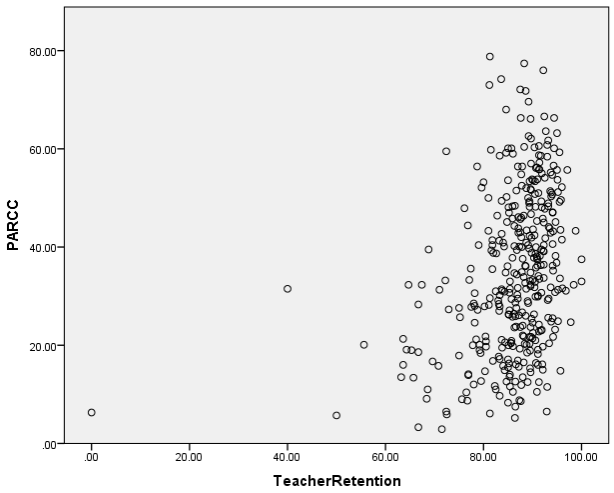

Figure 7: Percentage of students meeting or exceeding PARCC standards versus teacher retention rate.

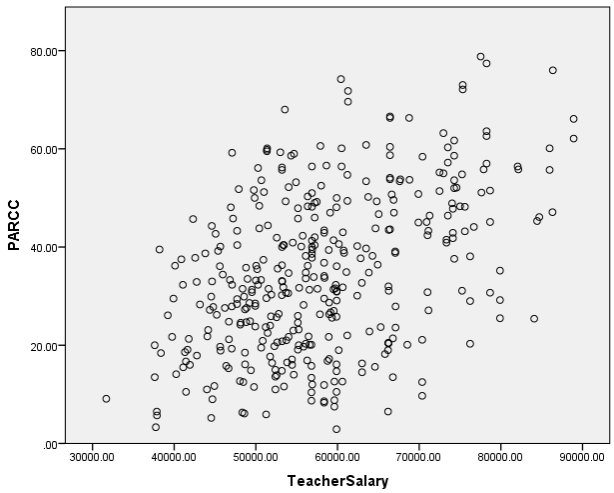

Figure 8: Percentage of students meeting or exceeding PARCC standards versus average teacher salary.

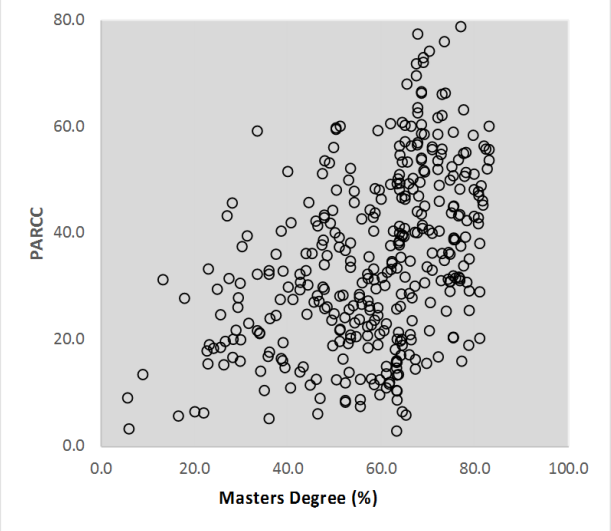

Figure 9: Percentage of students meeting or exceeding PARCC standards versus teacher education.

4. Discussion

Property tax funding, percentage of student mobility, and percentage of low-income students were the independent variables with the most visually clear linear relationship to PARCC success (Figures 2, 3, and 4, respectively). Instructional spending, percentage of English language learners, average class size, and teacher retention rates (Figures 1, 5, 6, and 7, respectively) all display vertical bands, as a majority of the schools fall into a limited range of values for each characteristic. Average teacher salary and the percentage of teachers with a master's degree or above (Figures 8 and 9, respectively) were widely scattered and displayed no discernible pattern.

All the Pearson correlations (see Table 1) were significant at the 0.01 level for a 2-tailed test. (If the significance is below 0.05, as it is for our analysis, then we may conclude that the data reflect a linear correlation whose strength is indicated by the magnitude of the Pearson coefficient.) The strongest correlations were created by property taxes ($r = 0.659$), mobility ($r = -0.526$), and percentage of low-income students ($r = -0.791$). The strong positive correlation between the amount of property taxes provided to a school and the percentage of students meeting or exceeding PARCC standards implied that schools that were better funded by their communities saw higher student success. Conversely, the moderate and strong negative correlations between success on the PARCC test and student mobility and low-income students implied that schools with high rates of student mobility and percentage of low-income students had low percentages of students meeting or exceeding the standards of PARCC. All three characteristics are indicators of poverty, suggesting a correlation between economic status and success on the PARCC test.

5. Limitations

This analysis only focused on a few of the identifying markers reported to the State of Illinois by schools, so it is possible there were other influences on student success that were not selected or were not reported on the Illinois State Report Card. There is also a limitation in the reported data. The definitions listed in the Illinois State Report Card are broad and may not accurately reflect the actual situations. The data were self-reported, so it is possible that districts interpret the definitions differently. For example, teacher retention is monitored over three years, and no detailed data were provided on those teachers who did not return. As mentioned by *The Schools Teachers Leave*, the one-year retention rate statistic can hide the fact that "within five years, the typical CPS school loses over half of its teachers" although the teacher retention rates were about the national norm (Allensworth et al., 2009, p. 1). It is possible that other discrepancies of reported data and actual influencing factors may be present in the other definitions as well.

6. Conclusions

The results of this research show there was a negative correlation between higher areas of poverty and student success on the PARCC exam, which is consistent with other studies on poverty and standardized test results. This quantitative analysis of success on the PARCC assessment helped to provide insight into the factors that predict success on the

Table 1: Pearson Correlation of school characteristics on the percentage of students meeting or exceeding standards on PARCC. *Correlation significant at the 0.01 level (2-tailed). **One school did not report instructional spending.

	Pearson Correlation*	Sig. (2-tailed)	N**
Instructional Spending	0.289	0.000	373
Property Tax	0.659	0.000	374
Mobility	-0.526	0.000	374
Percentage Low-Income	-0.791	0.000	374
ELL	-0.304	0.000	374
Average Class Size	0.211	0.000	374
Average Teacher Salary	0.456	0.000	374
Teacher Retention	0.333	0.000	374
Master's Degree or Above	0.429	0.000	374

standardized assessment. The data show that student success on standardized assessments is impacted by elements outside of the classroom setting, yet these results continue to be used as a measure of performance. In light of this research, it is important we continue to better our understanding of the extent to which standardized tests accurately measure the performance of students, schools, or communities. Also, if teachers and schools are held responsible for test results, it is essential for teachers and researchers to explore what types of interventions are effective and when they should be implemented, and for policy makers to agree on how such interventions are to be funded.

In terms of mobility, as students move between schools, a gap in their learning can occur which is reflected in their test scores. Schools with high mobility rates may also have to slow down the pacing of their instruction to accommodate many students with different learning gaps making it difficult to attain a score of meeting or exceeding standards for all students (Kerbow, Azcoitia & Buell, 2003). The research on student mobility did not collect data on why students were moving schools or families are leaving the area, so the personal aspect of the movement cannot be adequately addressed. Student mobility is not a factor that can be controlled by the school environment. There need to be changes in the community environment in order to reduce student mobility, and it may be difficult to change the climate of a community with "failing" schools.

Districts with higher percentages of low-income students are faced with the challenge of providing educational opportunities with less money. In his investigation *Does Money Matter in Education?*, Baker addressed the conflicting opinions of the impact of school funding (Baker, 2016). He concluded that money is an influencing factor in education, and points out that "schools and districts with more money clearly have a greater ability to provide higher-quality, broader and deeper educational opportunities to the children they serve" (Baker, 2016, p. 19). These opportunities come from employing highly qualified teachers, offering competitive teacher salaries, maintaining smaller class sizes, and outside enrichment opportunities. Although several of these variables were studied in this research, it is possible that the communities that are able to provide these items are communities that are not impacted by poverty.

Perhaps increasing school funding will allow schools to counteract the implications of high student mobility, low property tax support, and higher percentages of low socioeconomic students by allowing districts to provide quality interventions for the educational gaps created by these variables. These interventions would be able to target gaps in understanding and improve student growth. The state can also provide funding for quality and consistent teacher professional development as an intervention.

Funds could also be allocated to improve access to technology and teacher implementation to prepare students for the computer-based PARCC exam. Providing interventions that address and acknowledge the impact of poverty in hope of closing the achievement gap may help students regardless of the measure of success. Our study provides a baseline for continued quantitative analysis of student success.

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