CHARTER SCHOOL
FACILITIES INITIATIVE

CHARTER SCHOOL FACILITIES INITIATIVE
IS THE QUALITY OF CHARTER SCHOOL FACILITIES RELATED TO STUDENT PERFORMANCE?

NOVEMBER 2013

COLORADO LEAGUE of CHARTER SCHOOLS
focus on achievement

National Alliance for Public Charter Schools

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INTRODUCTION

During the 2012-2013 school year, 20 years following the enactment of the first charter legislation in the U.S., there are nearly 6,000 public charter schools across the country in 41 states plus the District of Columbia. Charter schools are now serving over two million public school students[1].

However, even in the face of charter schools' growing popularity, charters continue to be treated differently than traditional public schools in several ways, including funding and access to public facilities. One exceptional point of departure between public charter schools and traditional public schools is in the resources allocated to charter schools for the procurement and financing of the schools' facilities. Charter schools by-and-large are responsible for finding their own facilities solutions and paying for facilities out of the schools' per-pupil operating revenue (PPOR). To adapt, charter schools have found a wide array of facility arrangements. Some charter schools rent old grocery stores and renovate them to function as school buildings, while others build brand new, cutting-edge facilities.

This wide array of facility arrangements results in a dizzying display of haves and have-nots among the charter school sector nationwide, and has spurred the development of the Charter School Facilities Initiative (CSFI). The CSFI began as one state developed a survey of facilities to collect empirical data to show that a majority of charter schools in Colorado were paying a large portion of their operating budgets on subpar facilities. Results from the survey were published in the 2008 report, *Shortchanged Charters: How Funding Disparities Hurt Colorado's Charter Schools*, and were used to change facilities-related policies for charter schools in the state. Since then the Charter School Facilities Survey has been customized and administered in 13 states, providing enough data to explore relationships between characteristics of charter school facilities and school outcomes, which is explored in this report[2].

The quality of public school facilities across neighborhoods and districts in this country has become a large issue for charters, but no studies, to date, have explored whether characteristics that vary markedly between charter schools may have an impact on charter school performance outcomes. In fact, it is only recently that any research has attempted to demonstrate how the quality of school facilities impacts student outcomes.

Previous research on the relationship between the quality/characteristics of school facilities/ classrooms and educational outcomes have found that exposure to natural daylight, thermal

1 Data obtained from the National Alliance for Public Charter School's Dashboard, found at http://dashboard.publiccharters.org/dashboard/schools/year/2013.

2 Some comparable statistics differ from the previous CSFI report Charter School Facilities Initiative: Initial Findings from Ten States. It should be noted that the 10-state report includes all facilities data, while this report includes only the data from charter school facilities that also had corresponding school performance data, for a sample of 848 facilities (out of the original 956 facilities from the 10 states).

comfort, noise; and building age are all related to students' academic outcomes when studied in traditional public school buildings. The research outlined in this report takes advantage of a growing database of facilities data from the CSFI and looks for trends between the presence or absence of specific features in school facilities, such as those found to impact outcomes in prior research as well as features that charter facilities vary markedly on, and the performance of the corresponding schools.

Though the analyses presented in this report are purely descriptive in nature, and should not be construed as causal in any way, some initial trends did emerge. For example, higher performing charter schools, but not lower performing charters, tended to have dedicated spaces for libraries, science labs, art rooms, and/or music rooms. Yet, no discernible difference was found in the proportion of higher and lower performing charter schools that had dedicated computer labs or special education resource rooms. Some results were inconsistent with prior research, such as the relationship found between school performance and building age or noise; and other factors with considerable variations between charter school facility, like classroom size (measured in square footage per student), structural permanence (having at least some modular classrooms), and the original intended use of the facility (school or other), did not appear to be related to school performance outcomes in reading or mathematics.

As the Charter School Facilities Initiative continues to collect facilities-related data in additional states and reaches the point of being nationally representative of the charter sector as a whole, more sophisticated statistical assessment of the relationship between charter school facilities characteristics and performance outcomes will become possible. It is anticipated that the CSFI facilities database will reach that point by summer of 2015.

METHODOLOGY

SAMPLE

As of the drafting of this report, the CSFI has collected, or is in the process of collecting, facilities data from 13 states. However, this report examines the data from the initial 10 states, as school performance data was not yet available for the most recently collected states at the the time this report was published..

The CSFI worked with the local state charter support organizations (CSOs) to gather qualitative and quantitative data on the charter schools in their respective states. With the exception of the first state, Colorado, participating schools were measured by CSO staff and/or consultants, and charter school administrators completed an online survey. In Colorado, charter administrators provided all the data and a random selection of schools were re-measured by the CSO to check for reliability in measurement and reporting. (Additional detail on survey development and methodology can be found in Appendix A and B).

Overall participation rates were generally quite good, with seven of the 10 states reaching 75 percent or higher. For the purposes of the CSFI surveys, facilities (not charter schools) are the unit of analysis, and the number of charter schools in a state does not necessarily equal the number of charter school facilities. In this survey, schools that have separate state identification numbers, but share the same site and have the same chartering board, are considered to be one case (or facility). Additionally, for charter schools with multiple campuses, each campus is considered a separate facility and, therefore, a separate case. Further, when two or more charter schools share a building (co-location) each individual school is considered a separate case. In these instances, facility identification numbers are used to ensure that the spaces are accounted for appropriately. Table 1 shows the number of charters and facilities in each state presented in this report, as well as the overall rate of participation.

Table 1. Charter Facility Participation across the 10 States

State	Number of Charter Schools (when surveyed)	Number of Charter School Facilities (when surveyed)	Number (Percent) of Charter Facilities to Participate[a]
Colorado	141	141	116 (82%)
Georgia	43	43	36 (84%)
Idaho	43	53	51 (96%)
Indiana	59	59	35 (59%)
Massachusetts	70	69	63 (91%)
Michigan	201	298	200 (67%)
New Jersey	89	92	69 (75%)
New York	186	200	172 (86%)
Tennessee	41	36	31 (86%)
Texas	208	537	193 (36%)

a. Some figures may differ from state reports due to additions or refinements to the facilities data set.

It should be noted that the number of participants is not reflected equally across all analyses, for a variety of reasons. For example, 105 facilities with survey data lacked available performance data--largely due to schools with student populations that fell below publicly reportable thresholds. In addition, some facilities participated in only the measurement component of the survey while others only completed the online survey. Finally, because the facilities included were limited to only "higher" and "lower" performing schools, a fraction of the total schools were included in the analyses for this report (see Measurement section for information about how schools were selected). As a result, each analysis presented in this report may have a different number of facilities included. Each table or figure supplies the number of facilities that were included (labeled as "n") for the analysis being described.

MEASUREMENT

This section outlines the factors that were explored and how each was defined.

School Performance Data

School performance data for the subject areas of mathematics and reading were obtained from the U.S. Department of Education's EdFacts database. Data from all public schools (charter and non-charter) were used to rank schools' proficiency rates in each of the 10 states, separately. Though proficiency rates are not the most robust measure of quality for schools, it is the one measure for which all states have data. To define "higher" and "lower" performing charters for the study, all public schools were grouped by grade level configurations (i.e., K-5, K-8, K-12, 6-8, 6-12 and 9-12[3]) within their respective states. Each group was than ranked, using a percentile distribution from 1 to 100. Charters that fell into a percentile ranking of 1-10 were classified as "lower" performing charters. Charters that ranked between the 90th and 100th percentile were classified as "higher" performing charters. Table 2 shows the number of charter schools that participated in the CSFI study that were in the top and bottom decile, by state.

As ranking occurred by grade level, it was not necessary for analysis to be completed by grade level. All higher performing charter schools are considered as a group and all lower performing charters are considered as a group (though descriptive statistics are provided for the reader in Appendices C -G for many of the measures by grade level as well as a few other select charter characteristics).

3 These six grade levels were selected because the standards used in the facilities study are different and follow the same six levels. See Appendix B for details on the grade level standards used in this report.

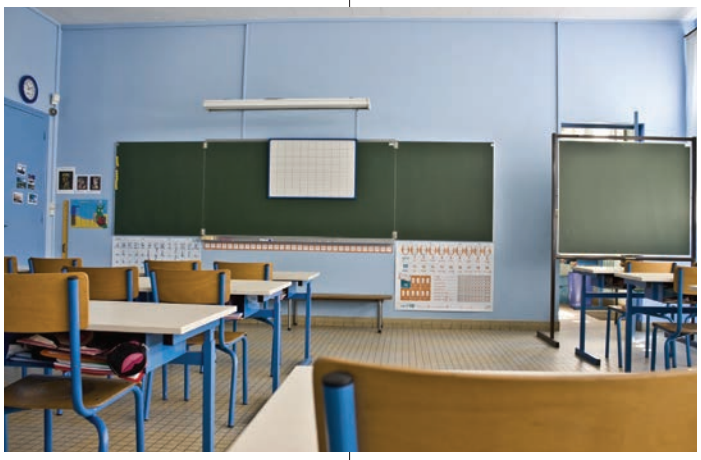
Table 2. Number of Charter Schools, with Facilities Data, that Appear in the Top and Bottom Decile within their Respective States

	Mathematics		Reading	
State	Top Decile	Bottom Decile	Top Decile	Bottom Decile
Colorado	23	11	28	8
Georgia	5	3	9	0
Idaho	7	3	5	2
Indiana	0	8	2	5
Massachusetts	8	1	6	0
Michigan	22	22	21	29
New Jersey	4	17	3	14
New York	16	17	4	24
Tennessee	3	10	0	3
Texas	31	41	28	35
Total	**119**	**133**	**106**	**120**

As seen in Table 2, the number of schools in each state to fall in either the top or bottom decile can be quite low, making state by state comparisons impractical. Therefore, all analyses presented in the report are done simply by comparing all higher performing schools to all lower performing schools. Analyses are done separately for mathematics and reading, as not all higher performing math schools are higher performing in reading, nor are lower performing schools often the same in both mathematics and reading. Average proficiency rates by state, school type, location, and charters serving above or below the mean percent FRL are available in Appendix C.

Classroom Size

Classroom size was measured by contractors or CSO staff members during the CSFI data collection phase in each state. For all participating charter schools, each instructional space was measured using a digital measuring device. All contractors/staff members were trained on how to use the device and on which spaces needed to be measured. Classroom size is measured in square footage per student for the general classroom spaces where core subjects are taught (as compared to specialized instructional spaces which will be described later). Contractors simply recorded the square footage of each classroom and recorded the measurement onto a data collection sheet which was later entered into the database.



In the analysis for this report, two metrics are used to assess whether classroom size is related to school performance. The first metric is the average classroom size (in square footage / pupil) for the entire facility. The second metric is the percent of classrooms in each facility that meet or exceed grade level size standards. There are different standards for different grades, based on industry guidelines for the amount of square footage per student needed for each age group. Kindergarten, grades 1-5, grades 6-8, and grades 9-12 each have a different standard in terms of square footage per student. (See Appendix B for a list of each grade level standard, by state). Average figures for both metrics by state, school type, location, and charters serving above or below the mean percent FRL are available in Appendix D.

Specialized Instructional Spaces (SIS)

Specialized instructional spaces (SIS) include libraries, computer labs (including mobile computer labs), science labs, art or music rooms, and special education resource rooms. Facilities were said to have dedicated SIS only when the space was predominately used for that purpose. Therefore, if a library sometimes served as a special education resource room the space was classified as a library, not a resource room. Likewise, if a school had a classroom that served half-day kindergarten in the morning and was the music room three afternoons a week, the room would be classified as a kindergarten classroom only. The only facility spaces that were allowed to be assigned multiple uses were gymnasium/auditorium/lunch room spaces. All other instructional spaces were recorded once according to the amount of time used for each function.

For this report, the percentage of higher and lower performing charter schools in facilities with either no SIS or all five SIS were compared. The average number of specialized spaces in charters by state, school type, location, and charters serving above or below the mean percent FRL are available in Appendix E.

Meal Service Capacity

Meal service capacity was measured by using facility administrator responses to three questions on the facilities survey:

- **"Does the school's facility have a full-preparatory kitchen that also meets district/state/ federal requirements?"**
- **"Does the facility have storage and equipment for keeping student meals warm?"**
- **"Does the facility have storage and equipment for keeping student meals cold?"**

Facilities with school administrators that responded "Yes" to having a kitchen (whether alone or in conjunction with equipment for keeping food warm/cold) or "Yes" to having both storage and equipment for keeping food warm and cold were considered to be a facility that has meal service capacity.

Facilities with administrators that responded "No" to all three items were classified as having no meal service capacity. Schools that reported having either (but not both) a warmer or a cooler were not included in the analysis, as it was unclear whether or not they provided any meal services for their students. The percentage of charters schools with and without meal service capacity are outlined in Appendix F.

Physical Education or Recreational Opportunity

Physical education or recreational opportunity is measured by administrator responses to three survey items regarding whether the school's facility includes a gymnasium, playground, or athletic field. For each item administrators could answer *a) "Yes", b) "No", or c) "No, but there is a playground (gym, athletic field) nearby that the school uses for this purpose."* Administrators responding either A or C to any of the items were defined as having access to a gymnasium, playground, or athletic field. Only administrators that responded B, or "No", were considered not to have access to that particular type of amenity. In this report, facilities with at least one of these spaces were defined as having an opportunity for physical activity. Schools with none of these items were said to have no physical education/recreational opportunities. The percentage of charter schools with zero, one, two, or three spaces are provided by state, school type, location, and charters serving above or below the mean percent FRL are available in Appendix G.

Building Quality

Building quality was a composite measure comprised of several short sub-scales. School administrators were asked to respond to a number of items regarding the condition of the facilities' site, electrical outlets and availability, plumbing, lighting, temperature control, noise, and air quality. Each subscale had a varying number of items, but all were rated on a Likert scale of Strongly Disagree (worth -2 points) to Strongly Agree (worth +2 points); Disagree and Agree were worth -1 and +1 points, respectively. The highest possible total for the composite measure, which simply added the points from all sub-scales together, was 63 points.

Building Construction

Building construction was measured by the school administrators' responses to whether or not the facility was "originally constructed as a school."

Building Permanence

Building permanence was measured by the school administrators' responses to whether the school's facility consisted of "permanent structures only", "modular/temporary structures only", or "both permanent and modular structures."

Shared Facilities

Shared facilities are somewhat commonplace in the charter school landscape, with charter schools sharing facility space with churches, non-profit organizations or other public schools. Schools that shared space with any type of entity were defined as being in a shared facility and this report presents analysis exploring whether higher or lower performing charter schools tended to be in, or not be in, a shared facility situation. In addition, the type of entity that the charter school shared with (private entity or another school) was also explored.

RESULTS

Classroom Size

Analysis of the relationship between average classroom size and school performance reveals very little difference between higher performing and lower performing charter schools (Table 3). However, variation does emerge between higher performing and lower performing charter schools in the percent of classrooms in the school large enough to meet state size standards—at least in mathematics. When comparing the average and median square footage per student within all general classrooms in a school, there appears to be no difference between higher and lower performing charter schools for either mathematics or reading. In both cases, the average and median square footage per students is around 29 square feet per student. However, simply looking at the average (or median) square footage obscures the question of how many classrooms in the school actually meet grade level standards for square footage per student.

Table 3. Average, Median Square Footage and the Percent of Classrooms in Each Charter School to Meet or Exceed Grade Level Standards, by Performance Category

	Average Square Footage Per Student, Per Classroom*	Median Square Footage Per Student, Per Classroom*	Average Percent of Classrooms in the School Meeting Size Standards	Median Percent of Classrooms in the School Meeting Size Standards
Math Performance				
Higher (n=103)	29.73 sq. ft.	28.59 sq. ft.	35%	15%
Lower (n=115)	31.81 sq. ft.	30.00 sq. ft.	50%	50%
Reading Performance				
Higher (n=91)	31.48 sq. ft.	30.04 sq. ft.	43%	32%
Lower (n=103)	30.24 sq. ft.	28.58 sq. ft	43%	33%

* The number of students in a classroom were based on school reports of the actual number of students being served in the room, not maximum capacity.

When looking at the percentage of general classrooms in each facility that meet or exceed grade level standards, a different picture emerges, specifically in regards to school performance in mathematics. The average and median percentage of classrooms meeting size standards is virtually identical for higher and lower performers in reading, with an average of 43 percent of classrooms meeting the standard. However, in mathematics, there is a markedly higher percentage of classrooms meeting their state's size standard within lower performing charter schools. In mathematics, an average of 50 percent of general classrooms meet size standards in lower performing charters, compared to an average of 35 percent of classrooms that meet grade level standards in the higher performing charters.

Specialized Instructional Spaces

When exploring the relationship between the presence of one or more dedicated, specialized instructional spaces (like libraries, computer labs, secondary science labs, art and music rooms, and special education resource rooms) there appears to be a positive relationship between having at least one dedicated library, secondary science lab, art room, and/or music room and higher performance at the school level. Table 4 shows that lower performing charter schools, for both math and reading, were generally less likely than higher performing charters to have each of these specialized spaces—with the exception of computer labs and special education resource rooms. For lower performing charters, the presence of dedicated music rooms was the least likely, with only 25 percent of the lower performers in reading and 29 percent of lower performers in mathematics having a dedicated music room.

There was no material difference in the percentage of higher and lower performing charter schools to have dedicated computer labs or special education resource rooms, for either math or reading. Around 60 percent of both higher performing and lower performing charter schools had computer labs and around 55 percent of both had at least one dedicated special education resource room.

Table 4. Percent of Higher and Lower Performing Charters in Facilities with and without Dedicated Specialized Instructional Spaces

	Library		Computer Lab(s)		Science Lab(s)*		Art Room(s)		Music Room(s)		SPED Resource Room(s)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Math Performance												
Higher (n=119)	60%	40%	57%	43%	61%	39%	56%	44%	54%	46%	56%	45%
Lower (n=133)	29%	71%	63%	37%	48%	52%	38%	62%	29%	71%	57%	43%
Reading Performance												
Higher (n=106)	51%	49%	58%	42%	51%	49%	59%	41%	57%	43%	53%	47%
Lower (n=120)	33%	67%	59%	41%	65%	35%	39%	61%	25%	75%	55%	45%

* Science lab analysis was for only schools that served secondary grades (i.e., middle schools, high schools, and 6th-12th grade schools only)

When comparing the percentage of higher and lower performing charter schools with facilities that included none of the specialized instructional spaces (zero out of five) or all of them (five out of five), higher performing charters were far more likely to have all five spaces. At least 61 percent of higher performing charter schools in mathematics and reading had all five specialized spaces, whereas 58 and 62 percent of lower performing charters in reading and mathematics, respectively, had none of the five specialized spaces. (See Table 5).

Table 5. Percent of Charters in Top and Bottom Decile of With All or None of the Five Specialized Instructional Spaces

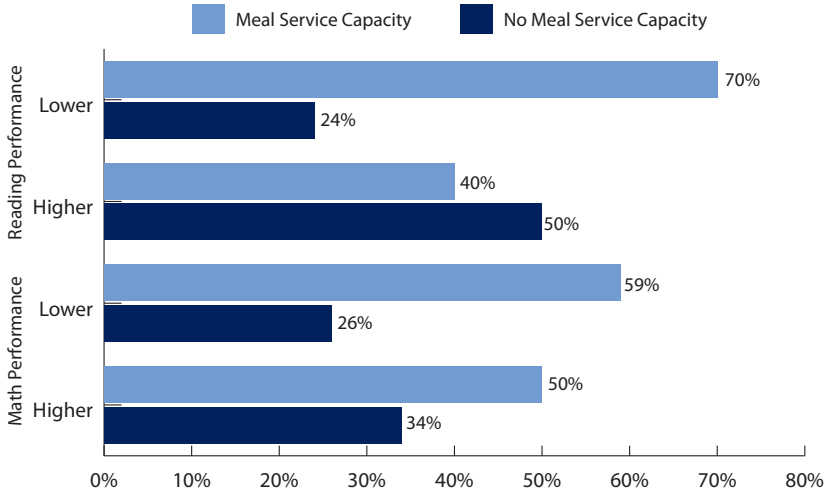
	Math Performance		Reading Performance	
Number of Specialized Instructional Spaces in the Charter Facility	**Higher**	**Lower**	**Higher**	**Lower**
Zero out of five (n=40)	38%	62%	43%	57%
Five out of Five (n=28)	65%	35%	61%	39%

Meal Service Capacity

Many charter schools lack full-service preparatory kitchens that also qualify them to receive reimbursement through the National School Lunch Program (NSLP). Based on the Charter School Facilities Survey, fewer than 50 percent of charter schools in nine out of the 10 participating states had a kitchen facility qualifying them to prepare meals on-site. However, most charter schools do have units to keep food warm and cold, enabling them to provide students with meals from a third-party vendor, and allowing for participation in the federal lunch program. This analysis explores whether higher performing charter schools are more likely to have meal service capacity than lower performing charters. "Meal service capacity" is defined as the on-site presence of either a full-service kitchen or equipment for both keeping food warm and cold, whereas "no meal service" is defined by the lack of either of these.

In both subject areas, a greater percentage of lower performing charter schools had meal service capacity than did the higher performing charter schools. This pattern was more pronounced when looking at school performance in reading. When looking at reading performance, 70 percent of lower performing charters had meal service capacity, as compared to 40 percent of higher performing charters. In mathematics, this difference was smaller, with 59 percent of lower performing charters having meal service capacity, as opposed to 50 percent of higher performing charters. In addition, a greater percentage of higher performing charter schools reported having no meal service capacity than lower performing charter schools. (See Figure 1).

Figure 1. Percent of Higher and Lower Performing Charter Schools in Facilities with and without Meal Service Capacity



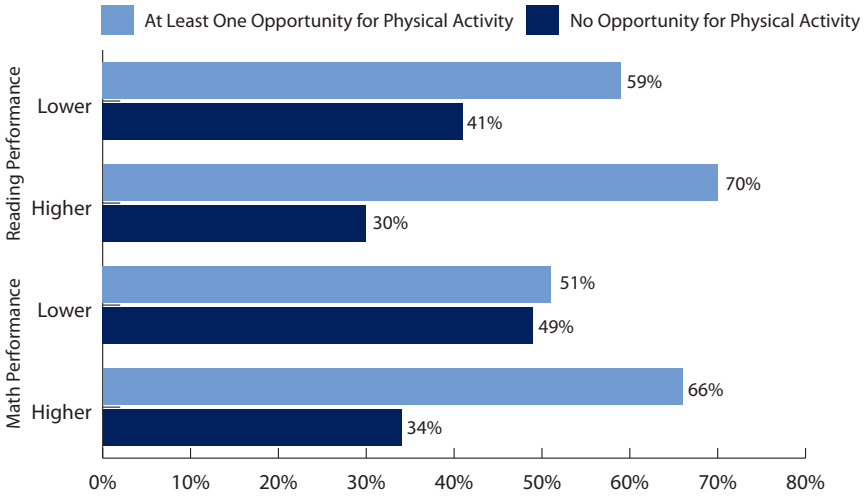
Note: No meal service capacity is defined by having neither a full-service kitchen nor equipment for keeping food warm and cold. A facility with either a full-service kitchen or equipment for keep food both warm and cold is defined as having meal service capacity. Facilities with no kitchen and either a warmer or a cooler, but not both, were not included in this analysis, so figures do not add up to 100 percent.

Opportunities of Physical Activity

Physical activity is considered to be an important aspect of child development, and research has found a link between daily physical activity and academic outcomes in school-aged children[4, 5, 6, 7, 8,]. In traditional public schools, the presence of a playground for young children and an athletic or playfield or gymnasium for older children is commonplace. However, many charter schools do not have these amenities on the school's facility or grounds. While some have access to nearby parks, athletic facilities, or public lands to use for the purpose of providing physical education and/or physical activity, there are still many charter schools that have nothing at all.

The following analysis explores the percentage of higher and lower performing charter schools that are in facilities with at least one option for physical activity and those with no option for their students.

Figure 2. Percent of Higher and Lower Performing Charters in Facilities with and without at Least One Opportunity for Physical Activity



4 Trudeau, F. & Shephard, R.J. (2008) Physical education, school physical activity, school sports, and academic performance. International Journal of Behavioral Nutrition and Physical Activity, 5:10. Obtain from http://www.ijbnpa.org/content/5/1/10

5 Dwyer T, Blizzard L, Dean K., (1996): Physical activity and performance in children. Nutrition Revolution, 54:S27-S35

6 Kirkendall D.R. (1986). Effect of physical activity on intellectual development and academic performance. In Academy Papers. Edited by Stull GA. Champaign, IL: Human Kinetics; 1986:49-63.

7 Shephard, R.J. (1997). Curricular physical activity and academic performance. Pediatric Exercise Science, 9:113-126.

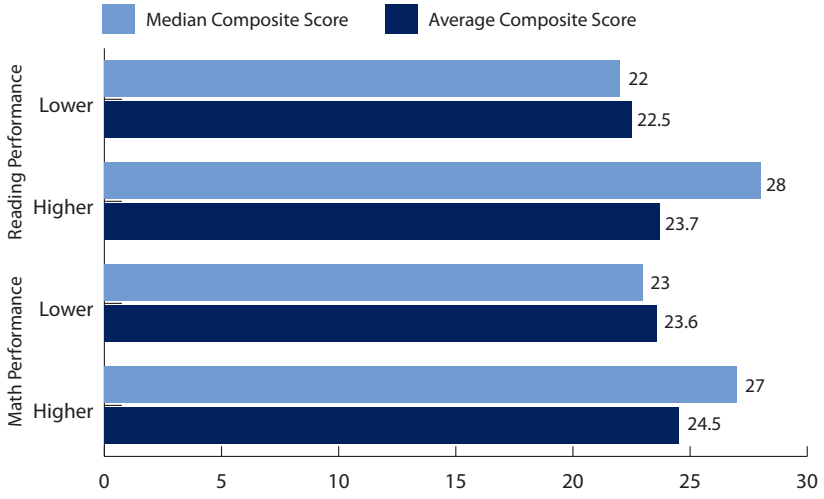
8 Taras, H. (2005). Physical activity and student performance at school. .Journal of School Health, 75:214-218.

There does not appear to be a clear cut relationship between having access to physical education options and student performance. For both mathematics and reading, higher performing charter schools were found more frequently to have at least one option for physical activity (Figure 2), with 66 percent of higher performers in mathematics, and 70 percent of higher performers in reading having at least one opportunity for physical education. However, lower performing charter schools' results were not as straight forward. At least half of the charter schools performing at the lower level, in both math and reading, had at least one opportunity. So while higher performing charters were more apt to have options for physical activity than lower performing charters, over half of lower performing charters had at least one option as well. This suggests that the presence or absence of physical activity options may not be a large factor in school performance outcomes.

Building Quality

In order to explore the relationship between overall facility conditions and academic performance, a composite score was developed from charter school leaders' perceptions in each of the following areas: site condition; air quality; windows and lighting; temperature; noise; electrical and plumbing; and fixtures. Questions making up this composite measure included items such as whether noise levels impact classroom instruction, the adequacy of lighting, the consistency and comfort associated with classroom temperatures, and the sufficient presence of electrical outlets. Based on an aggregated rating of perceived conditions in each of the seven areas, no significant differences were found in administrators' perceptions of overall school facility quality between higher and lower performing charters (Figure 3). Administrators of higher performing charter schools in both subject areas did give their facilities marginally higher ratings; however, none were rated very highly. The average charter school administrator, whether from a higher or lower performing charter school, gave their respective facility fewer than 40% of all possible points on the composite measure of building quality.

Figure 3. Average, Median Composite Scores on Charter Administrators Facility Adequacy Ratings (out of a possible 63 points)



Slight differences do emerge, however, when looking at each sub-scale score within the overall measure of facility quality (See Table 6). When looking at school performance in both mathematics and reading, administrators from higher performing schools gave higher ratings than administrators of lower performing schools for windows and lighting in the classrooms, temperature control, and adequacy of electrical infrastructure, plumbing and fixtures. On the other hand, administrators from lower performing schools gave their facilities higher average ratings on the condition of the school site (roofs, sidewalks, and surrounding land), the impact of internal noise on classroom instruction, and the quality of the air in the building. The largest difference was found in perceptions measured by the composite windows and lighting score.

Table 6. Composite Scores for Facility Quality by Higher and Lower Performing Charters in Mathematics

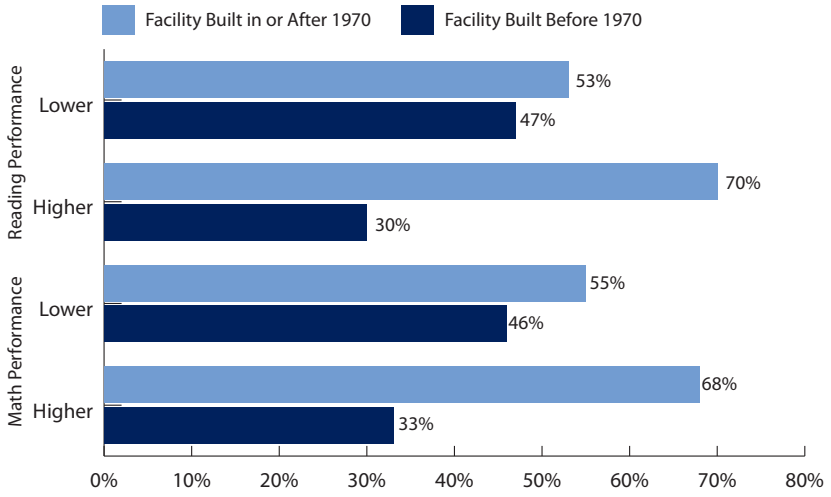
	School Site	Windows & Lighting	Noise	Air Quality	Temp.	Electric	Plumbing & Fixtures
Total Possible Points per Scale	**14**	**10**	**12**	**3**	**6**	**4**	**14**
Lower Performing Charters in Mathematics							
Mean Score	5.32	1.78	5.96	2.27	2.11	1.18	4.38
Sample Size	109	109	109	105	107	108	108
Standard Deviation	6.146	5.216	5.018	1.489	3.054	2.25	6.523
Higher Performing Charters in Mathematics							
Mean Score	4.79	3.27	5.79	1.9	2.34	1.85	4.54
Sample Size	97	97	97	96	94	97	97
Standard Deviation	6.421	4.182	5.418	1.762	2.298	2.017	5.683

*The chart for average composite facility quality scores as related to reading performance in each of the above areas is not included here, as results were extremely similar to those shown above for mathematics performance. The table for reading is in Appendix H.

Building Age

The original year that the charter school facilities were constructed ranged from pre-1900s to brand new and prior research has found an association between the age of the school building and student performance[9]. The following analyses look at the percentage of higher and lower performing charters that reside in facilities that were originally constructed before and after 1970. The year 1970 was selected as the cut point as it coincides with the time period when awareness of the harmful effects of asbestos and led paint became more widespread.

Figure 4. Percentage of Higher and Lower Performing Charter Schools Residing in Facilities Built Before and After 1970



Similar to the results for physical education options, no definitive relationship appears to exist between whether the schools' facilities were constructed before or after 1970 and school performance outcomes. While a higher percentage of higher performing charters reside in facilities constructed after 1970 (68 percent compared to 55 percent of lower performing charters in math and 70 percent compared to 53 percent of lower performing charter in reading), the fact that slightly over half of lower performing charters also reside in newer facilities suggests that newer facilities may not be an important factor in school performance.

9 Schneider, M., (2002, 2010). Do school facilities affect academic outcomes?" National Clearinghouse for Educational Facilities.

Facilities Constructed as a School

Based on analysis of the relationship between school performance and being housed in a facility that was originally built as a school, there is no appreciable difference between higher performing and lower performing charter schools (Table 7). Of higher performing charters in mathematics, 58 percent are in facilities originally constructed as schools and 42 percent are not. Exactly half of lower performing charters are housed in facilities originally built as schools. In regard to reading performance, 53 percent of higher performing and lower performing charters are housed in facilities constructed as schools.

Table 7. Percent of Higher and Lower Performing Charters in Facilities that Were and Were Not Originally Constructed as Schools

	Math Performance		Reading Performance	
Originally Constructed as a School?	Higher (n=103)	Lower (n=111)	Higher (95)	Lower (n=102)
Yes	58%	50%	53%	53%
No	42%	50%	47%	47%

Building Permanence

As a temporary solution or cost savings measure charter schools sometimes opt to purchase less expensive, modular units as a stop gap solution during periods of growth or as a cost savings measure during the school's earlier years. Across 10 states, approximately three percent of charter facilities were comprised entirely of modular units, and another 14 percent had at least one modular structure they used in addition to the schools permanent facility.

Table 8. Percentage of Higher and Lower Performing Charters in Permanent or Modular Facilities

	Math Performance		Reading Performance	
Originally Constructed as a School?	**Higher (n=102)**	**Lower (n=108)**	**Higher (95)**	**Lower (n=98)**
Modular Structures Only	3%	3%	3%	3%
Permanent Structures Only	76%	83%	77%	78%
Both Modular and Permanent Structures	21%	14%	20%	19%

To assess whether building permanence was related to school outcomes, the percentage of higher and lower performing schools residing in three facility types were explored: those in modular buildings alone, those in permanent structures, and those in facilities that are a mixture of permanent and modular structures. The results, displayed in Table 8, suggest that building permanence is not related to school performance outcomes. Across higher and lower performing charter schools, regardless of subject area, around three percent were housed in solely modular structures, between 76 and 83 percent were housed in fully permanent structures, and between 14 and 21 percent were in a mixed facility.

Shared Facilities

Another method of filling a temporary space need or saving costs on the schools' facility is to share a facility with another entity. Sometimes charters share facilities with churches, sometimes with a daycare, and sometimes with another public school. Except in New York City, sharing space is still a relatively uncommon occurrence for charters, with only 13 percent of the remaining sample in a shared facility situation. However, the practice is becoming more popular as districts look to partner more with charter schools and allow them to use underutilized facilities, pairing the charter with another school.

While sharing may save charters resources out of their per-pupil operating budgets, and afford them more amenities than they could afford if in a separate space, it is not known whether that benefit actually helps or harms a school with respect to performance outcomes. While the number of charters in either the top or bottom decile of performance that also share space is low (50 in math, 45 in reading), the results presented in Figure 5 suggest that charter schools in shared facilities have a tendency to be lower performing.

Figure 5. Percent of Charters Sharing Space with Other Entities that are Higher or Lower Performing

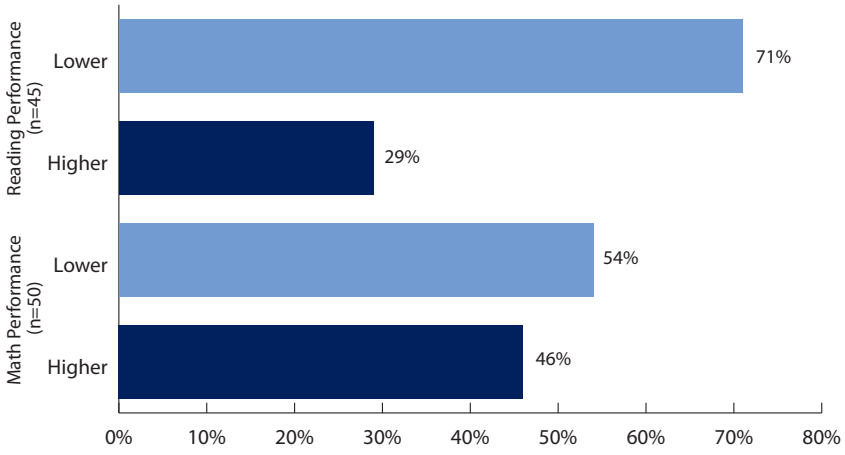
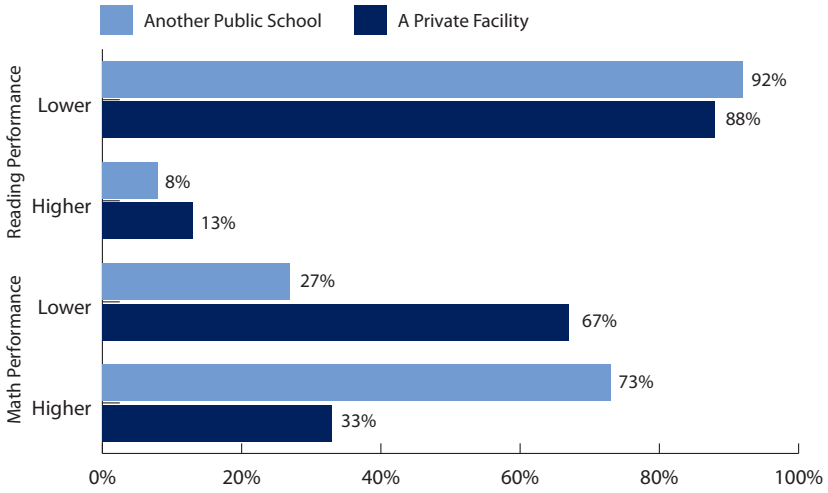


Figure 5 represents only the charters that were in a shared facility situation at the time of the survey. Performance data taken from the same academic year as the survey was administered suggests that there is a slight tendency for charter schools in shared facilities to be lower performing in mathematics. In reading, however, the tendency is particularly large for charters in shared spaces to be lower performing. Additionally, given the results presented in Figure 6, there does not appear to be a clear relationship between the type of organizations that charters share space with and student performance.

Figure 6. Percentage of Higher and Lower Charter Schools in Shared Facilities that Share with Either a Private Entity or another Public School (Charter or non-Charter)



The results from the analysis of mathematics performance among charter schools that share facility space suggest that it might be beneficial to share with another public school, but detrimental to share with a private entity. For reading performance, it appears that sharing a facility may be detrimental regardless of what type of entity the charter schools shares with.

CONCLUSIONS

The intent of this research was to explore the degree in which charter school outcomes are related to characteristics of school facilities.

Previous research on the impact of the quality or characteristics of school facilities or classrooms on educational outcomes have found that exposure to natural daylight, thermal comfort, noise and building age all impact students' academic outcomes when studied in traditional public school buildings. Charter schools vary from traditional public schools and from each other on the presence or absence of full-service kitchens, gymnasiums, libraries, and special education resource spaces. Some charters are in facilities that were originally constructed as schools, but many are not. Rather charters can be found in church basements, strip malls, business parks, and old warehouses. As such both the overall facilities and classrooms tend to be smaller than that which is considered the standard for traditional public schools.

This report used data collected from 10 states for the Charter School Facilities Initiative (CSFI) to begin to explore whether charter school facilities characteristics impact school performance outcomes. Because the sample of charter school states has not yet reached the point of national representation with respect to the number of charters in each state, region of the country, and types of authorizers allowed to oversee charters in the state, the analyses presented here were limited to trends seen in only the states' highest and lowest performers. These trends, along with prior research findings, will serve as factors that researchers can use to more deeply explore the impact of specific facilities characteristics on charter school outcomes, once the sample has reached full representation.

Some of the trends found from the first 10 states' charter facilities data support prior research. Though the difference was marginal, administrators of higher performing schools tended to rate their schools' facilities more positively on windows and lighting in the classrooms and consistent comfort of temperature throughout the school year. Other trends reported in this document were either inconsistent, such as with building age, or in the opposite direction of prior research, such as with the impact of noise on performance. Perhaps with a larger sample these analyses could be completed in a more granular fashion, allowing for more concise comparisons of building age or noise perception issues in the school building.

Other characteristics that vary more within the charter school facility landscape than in traditional public schools yielded some interesting trends. Classroom size, as measured by average square footage per student, did not appear to be any different for higher or lower performing charters. Yet, lower performing charter schools in mathematics did tend to have a higher percentage of classrooms that met grade level standards for classroom size.

Higher performing charter schools were more likely to have libraries, science labs, and dedicated art and music rooms, while lower performing charters were more likely to lack these specialized instructional spaces. There was no appreciable difference, however, between the percentages of higher and lower performing charter schools to include computer labs or dedicated special education resources rooms. Over fifty percent of higher and lower performing charter schools had computer labs and special education resource rooms.

Neither structural permanence nor original construction as a school appeared to be related to school performance, nor was the school administrators' overall perception about the quality of the facility. However, there did appear to be some relationship between sharing a facility with another entity and school performance—although the relationship was reversed between math and reading performance. In general, sharing space appears to depress charter schools' reading performance, regardless of whether the charter shares with another public school or a private entity. However, charters that share with another public school (charter or not) may see some benefit to their math performance. Further research on shared facilities, using more advanced statistical tests, would help shed light on the impact of sharing space with another entity on charter schools' performance outcomes.

Finally a trend between lower school performance and the presence of meal service capacity was found. This is, perhaps, a counterintuitive finding that may be mitigated by a number of factors, including: the percent of students that qualify for free or reduced priced meals and whether charters in urban areas are more likely to have kitchen facilities than those in rural areas. As the CSFI facilities database continues to build it will become more feasible to control for mitigating factors such as these in more robust statistical models.

The CSFI has recently completed data collection in Arkansas, Rhode Island, and South Carolina, but the 2013 state assessment data for those states will not be available to conduct these sorts of analyses for at least a year. In addition, California has recently begun to administer the online survey to their charter schools. With the completion of California's data collection and the addition of one or two more states, the facilities data set will reach national representation of the charter school landscape, at which time more sophisticated data analysis will become possible in determining the impact, if any, of charter school facilities on student performance outcomes.

APPENDIX A

Survey Development and Data Collection

A critical first step to gathering the best possible set of objective data and information about charter school facilities and facility needs was to develop a comprehensive questionnaire.

To accomplish this, the Colorado League of Charter Schools ("the League") commissioned Cuningham Group Architecture, Inc. The firm's principal architect, Paul Hutton, AIA, has designed a variety of schools and is known for his creative, cost-effective, and environmentally conscious facilities. Mr. Hutton has designed numerous new charter schools and charter school additions. Wayne Eckerling, Ph.D., a former assistant superintendent with Denver Public Schools with responsibilities for supervision of charter schools, educational planning, and research, was also selected to assist in the design of the survey and analysis of the data. In addition to his public school facilities expertise, Dr. Eckerling has experience with general obligation bond planning and implementation.

The draft questionnaire was reviewed by the League's facility task force, League staff, and others with expertise in school construction and educational policy. A draft questionnaire was then field tested with a small group of charter schools to ensure clarity and comprehensiveness of the items. Further revisions to the questionnaire were made based on the feedback from all participating Colorado schools and survey results. The revised base survey and state-specific questions were then administered in Georgia, Indiana and Texas. Extensive feedback was solicited from these states' charter support organizations and schools, resulting in further revisions to the League's base survey.

TOPICS ADDRESSED INCLUDE THE FOLLOWING:

- **Demographic information including grades served, year of inception, and number of students on the waiting list.**
- **Future facility plans.**
- **Shared use information.**
- **Facility information including year of construction and site size.**
- **Facility ownership, financing, and annual payments.**
- **Facility and classroom size and information technology resources.**
- **Facility amenities such as gymnasiums, lunch rooms, libraries, and playgrounds.**
- **Facility adequacy, condition, and maintainability.**
- **Facility funding.**

The questionnaire includes more than 145 items with some requiring multiple responses.

The Colorado League of Charter Schools' questionnaire was revised to address each participating states' specific facilities landscape through a collaborative effort that included key staff from each state charter support organization (CSO), the Colorado League of Charter Schools, and Dr. Eckerling.

In all states except Colorado, CSO staff and/or hired consultants measured all instructional spaces for each participating school and assisted schools with completing the questionnaires to ensure both timely and accurate responses. In Colorado, charter school personnel was responsible for all measurements and survey responses. A random set of schools were then measured again by League staff and consultants to gauge overall accuracy of measurements. In all states, submitted questionnaires were reviewed by the League's research team for consistency and completeness. Follow-up was done with the schools as necessary.

While the facility measurements and completed questionnaires are the primary source of data for this study, information from the states' departments of education on pupil membership, per-pupil funding, and free and reduced price lunch eligibility were provided to the League by each of the participating CSOs. The demographic and funding data provided was the states' official count and funding data that corresponded with the same year that the survey was conducted.

APPENDIX B

General Classroom Standards

General classroom standards, based on square footage per student, are shown in the table below. These standards were derived from standards used in other states and districts as well as best practice based on professional experience with charter and public school design. Adjustments were made for Montessori and Expeditionary Learning programs to reflect that larger classrooms are required to implement these educational programs.

General Classroom Standards (Square Footage Per Student) Used for each State

	ECE/Pre-K	Kindergarten	Grades 1-6	Grades 7-8	Grades 9-12
Colorado	58	41	35	30	32
Georgia	58	41	35	30	32
Idaho	n/a	41	34	29	30
Indiana	52	39	32	29	30
Massachusetts	n/a	60	37	34	34
Michigan	n/a	41	34	29	30
New Jersey	n/a	45	39	35	31
New York	n/a	45	35	30	30
Tennessee	n/a	41	33	30	30
Texas	45	41	33	29	29

APPENDIX C

Average Percent Proficient or Above Among Participating Charter Schools across 10 States; by State, School Type, Ownership Type, Location, and FRL

	Math		Reading	
	Charter Avg.	State Avg.	Charter Avg.	State Avg.
Colorado	82.7%	83.0%	91.6%	88.9%
Georgia	83.6%	82.2%	92.6%	89.5%
Idaho	84.1%	80.2%	90.1%	87.7%
Indiana	64.2%	79.6%	68.0%	77.4%
Massachusetts	63.2%	59.5%	73.4%	67.2%
Michigan	73.8%	78.2%	72.4%	78.5%
New Jersey	61.4%	76.0%	54.7%	68.7%
New York	64.6%	68.2%	47.5%	60.9%
Tennessee	28.4%	41.6%	31.8%	47.6%
Texas	74.5%	83.6%	85.0%	88.2%

School Type		
Elementary	72.3%	65.6%
Middle	68.6%	63.7%
High	51.6%	74.5%
K to 8	77.9%	76.7%
6 to 12	59.5%	73.2%
K to 12	75.3%	79.4%

Ownership Type		
School Owned	75.7%	80.8%
District Owned	67.7%	60.8%
Private Org. Owned	61.8%	60.0%
Other Gov. Owned	66.8%	69.0%
Mixed/Unidentified	71.4%	72.4%

Location		
Urban	68.0%	68.3%
Rural	76.6%	79.8%

Percent FRL		
Above the sample mean (60%)	66.1%	63.3%
Below the sample mean	77.1%	83.5%

APPENDIX D

Average Square Footage Per Classroom and Percent of School Classrooms Meeting Grade Level Standards Among Participating Charter Schools across 10 States; by State, School Type, Ownership Type, Location, and FRL

	Average Classroom Sq. Ft. / Pupil	Percent of Classrooms Meeting Standard
Colorado	35.0	48.8%
Georgia	28.0	14.1%
Idaho	31.0	27.5%
Indiana	34.5	55.3%
Massachusetts	30.5	35.0%
Michigan	32.1	51.3%
New Jersey	31.9	58.1%
New York	28.6	29.4%
Tennessee	28.1	34.5%
Texas	30.8	38.2%
School Type		
Elementary	31.3	34.9%
Middle	28.6	35.7%
High	31.4	49.0%
K to 8	32.4	47.1%
6 to 12	30.4	45.2%
K to 12	31.2	39.9%
Ownership Type		
School Owned	31.7	40.8%
District Owned	29.1	30.0%
Private Org. Owned	29.7	33.8%
Other Gov. Owned	29.0	37.0%
Mixed/Unidentified	31.8	45.2%
Location		
Urban	30.3	38.2%
Rural	33.8	50.2%
Percent FRL		
Above the sample mean (60%)	30.3	37.9%
Below the sample mean	32.3	44.1%

APPENDIX E

Average Number of Specialized Instructional Spaces in Participating Charter Schools across 10 States; by State, School Type, Ownership Type, Location, and FRL

	Average Classroom Sq. Ft. / Pupil
Colorado	1.9
Georgia	3.8
Idaho	3.7
Indiana	1.8
Massachusetts	3.8
Michigan	3
New Jersey	2.2
New York	2.1
Tennessee	2.7
Texas	2.6
School Type	
Elementary	2.5
Middle	2.7
High	2.2
K to 8	2.8
6 to 12	3
K to 12	3.2
Ownership Type	
School Owned	3
District Owned	2.3
Private Org. Owned	2.8
Other Gov. Owned	2.4
Mixed/Unidentified	2.4
Location	
Urban	2.6
Rural	2.8
Percent FRL	
Above the sample mean (60%)	2.6
Below the sample mean	2.6

APPENDIX F

Percent of Participating Charter Schools across 10 States with Meal Service Capacity; by State, School Type, Ownership Type, Location, and FRL

	Meal Service Capacity?	
	Yes	No
Colorado	17%	45%
Georgia	89%	9%
Idaho	45%	41%
Indiana	55%	30%
Massachusetts	55%	17%
Michigan	45%	52%
New Jersey	42%	53%
New York	69%	24%
Tennessee	56%	44%
Texas	63%	17%
School Type		
Elementary	63%	25%
Middle	63%	26%
High	48%	34%
K to 8	39%	48%
6 to 12	50%	26%
K to 12	51%	32%
Ownership Type		
School Owned	63%	21%
District Owned	76%	12%
Private Org. Owned	78%	11%
Other Gov. Owned	79%	5%
Mixed/Unidentified	34%	53%
Location		
Urban	57%	27%
Rural	41%	45%
Percent FRL		
Above the sample mean (60%)	62%	28%
Below the sample mean	40%	40%

APPENDIX G

Percent of Facilities with 0, 1, 2 and 3 Opportunities for Physical Activity among Participating Charter Schools across 10 States; by State, School Type, Ownership Type, Location, and FRL

	Percent with the Following # of Physical Activity Opportunities			
	0	1	2	3
Colorado	22%	24%	31%	23%
Georgia	23%	37%	31%	9%
Idaho	31%	24%	34%	10%
Indiana	42%	27%	15%	15%
Massachusetts	36%	36%	17%	11%
Michigan	49%	21%	16%	14%
New Jersey	64%	26%	6%	5%
New York	38%	28%	30%	4%
Tennessee	84%	12%	4%	0%
Texas	33%	25%	29%	14%
School Type				
Elementary	30%	30%	30%	10%
Middle	46%	28%	23%	4%
High	59%	21%	13%	8%
K to 8	38%	26%	21%	15%
6 to 12	53%	21%	17%	9%
K to 12	28%	17%	31%	24%
Ownership Type				
School Owned	18%	29%	27%	26%
District Owned	19%	21%	46%	14%
Private Org. Owned	31%	46%	18%	5%
Other Gov. Owned	32%	32%	21%	16%
Mixed/Unidentified	60%	18%	18%	4%
Location				
Urban	41%	25%	25%	9%
Rural	38%	27%	19%	16%
Percent FRL				
Above the sample mean (60%)	43%	24%	24%	9%
Below the sample mean	35%	27%	23%	15%

APPENDIX H

Composite Scores for Facility Quality by Higher and Lower Performing Charters in Reading

	School Site	Windows & Lighting	Noise	Air Quality	Temp.	Electric	Plumbing & Fixtures
Lower Performing Charters in Reading							
Mean	4.61	1.67	6.08	2.25	2.01	1.34	4.48
N	100	101	100	99	100	101	102
Std. Deviation	5.917	4.96	4.38	1.521	3	2.141	6.226
Higher Performing Charters in Reading							
Mean	4.6	3.21	5.9	1.52	2.29	1.65	4.45
N	89	89	89	88	87	89	89
Std. Deviation	6.329	4.176	5.436	1.875	2.09	2.116	5.492

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Charter School Facilities Initiative: Is the Quality of Charter School Facilities Related to Student Performance?
was prepared by the Colorado League of Charter Schools and the National Alliance for Public Charter Schools.