



School Comparison Report Subcommittee of the Superintendent's Executive Advisory Group

*An Inquiry Linking School Expenditures and School Performance
A Study into Whether and How Dollars Make a Difference*

Prepared for:
Subcommittee Members

Prepared on behalf of:
Co-Chairs Brent Husson and Dr. Mike Barton

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PREFACE

When Clark County voters were asked in two recent elections to increase their financial commitment to public schools, the requests were resoundingly rejected. In response, District officials partnered with community leaders to examine the connection between school funding and school performance. This study is the result of that partnership. It was undertaken in the belief that a change in use of talent, tools, and time can mean better results are provided in a more-efficient manner. The guiding intent is to ensure that scarce funds directly support the mission. That is to marshal people, time, and money to achieve the Board-adopted District vision: “All students progress in school and graduate, prepared to succeed and contribute in a diverse, global society.”

In the Clark County School District (CCSD), the Open Book Portal is a web-based set of interactive tools that has brought greater financial transparency to the District. In the face of a questioning public, Open Book represents an innovative step by CCSD. It is also an acknowledgment. When you accept public tax dollars, you have a responsibility to publicly report on their use in a clear and transparent fashion. That same brand of thinking applies to the current study. In a similar manner, this project was driven by the conviction that greater attention to whether and how and how much school spending is associated with school performance can bring greater accountability for fiscally-sound practices.

In May, 2014, the Superintendent of the Clark County School District convened a team of citizens to serve as an Executive Advisory Group. The Group’s purpose was to recommend procedures that can pave the way for a program-based budget review. A program-based budget review can help ensure a return on investment for all expenditures. As part of that effort, the Group established a Subcommittee. The Group asked the Subcommittee to come up with a way to gauge and portray how many and which schools efficiently achieve high results. This report is the result of that Subcommittee work.

At the outset of the Subcommittee work, the expressed purpose was to generate a rating for each school that linked school expenditures and school performance. Two questions drove this. Which schools achieve high value at low cost? Which achieve the greatest gains at the lowest annual cost? The euphemism used at the outset to describe this was return on investment or ROI.

While ROI or “bang for the buck” is an easy concept to grasp, this study showed that applying it to schools in the Clark County School District may be problematic. There are three reasons.

1. Because school districts are not laboratory settings and experimental designs and randomized controlled trials are not options, it is impossible for this study to make causal claims that connect spending and school performance.
2. Data that were available on discretionary expenditures did not vary sufficiently to permit school-by-school analysis.
3. Methods used in this study did not enable CCSD to gauge improvement over time in school effectiveness and efficiency.

These discoveries surfaced during the course of this study. As a result, they prompted a change in the focus of the study. Attention shifted from generating an ROI rating for each school to identifying which schools achieve higher results than expected, given their expenditures and school demography.¹

¹ The section in this paper on “Methodological Issues in Analyzing School Performance and Return on Investment” was provided by Jonathan N. Katz, Kay Sugahara Professor of Social Sciences and Statistics at the California Institute of Technology (Cal Tech). Contracted to undertake the data analysis, Dr. Katz provided the narrative for the methods section as well as the tables and figures that accompany it.

CONTEXT

Long known as the fastest growing large district in the U.S., the Clark County School District (CCSD) added 200,000 students between 1984 and 2004. As it grew, the District increased in complexity and challenge. Where two-thirds of students were White 30 years ago, today two-thirds are non-White. Half are economically disadvantaged, and one fourth of all students are English learners.

As student composition was changing in CCSD, the nation was undergoing a sea change. Across the country, districts wrestled with new federal accountability rules. Where Adequate Yearly Progress or AYP once dominated the discussion about what constitutes school effectiveness, the federal government now permits states to chart their own course. States seeking flexibility and relief from federal requirements submitted waiver applications to the federal government. As a result, in Nevada, Adequate Yearly Progress gave way to a school star-rating system. Ratings are assigned based on proficiency, growth, and gaps. At high school, graduation rate and proficiency matter most, but under the new arrangement more attention is focused on seeing that all students are college-prepared and career-ready.

These changes affect how we think about what it means for schools to be accountable. And change is still taking place. As the bar is raised on what is expected of students, staff, and schools, Nevada is poised to deploy new tests to replace annual state-administered Criterion-Referenced Tests (CRTs). These changes lead us to re-think what matters most.

The reality is that, with few exceptions, increased academic expectations have only recently been accompanied by increased funding for public education. In spite of modest increases last year, Nevada's K12 funding levels have still not entirely recovered from the Great Recession.² As a result, when viewed statewide, Nevada school districts still receive some of the lowest per-pupil funding in the nation. And until very recently, Nevada ranked nearly last when it comes to reading achievement among eighth graders on the Nation's Report Card (*National Assessment of Educational Progress* or *NAEP*). Yet today, upwardly-trending results provide an indication that fortunes are changing not just for CCSD but for the state. A double-digit improvement in District graduation rate from 2009 to 2013 is mirrored by statewide improvements on other indicators. Among eighth grade students according to *NAEP*, from 2009 to 2011 no state improved significantly faster than Nevada in Reading, and from 2011 to 2013, only two states improved faster than Nevada in Reading.

Despite these gains, the Clark County School District is looking for ways to provide greater value to students and families. By linking school expenditures and school results, the District hopes to demonstrate to taxpayers, lawmakers, and staff that greater effectiveness and efficiency are possible. By reassuring the public that their tax dollars are used in ways that directly impact students and classrooms, the District hopes to rekindle public faith in schools.

This study is devoted to that end.

² Statewide in Nevada, K-12 funding for the fiscal biennium ending June 30, 2015 was approved by Nevada Legislature at \$320 million higher than for the biennium ending June 30, 2013. This is less than the Nevada Legislature approved in 2009 for the biennium ending June 30, 2011 (see Nevada Legislative Appropriations Reports: 2009, page 130; 2011, page 114; and 2013, page 108; Nevada Legislative Counsel Bureau).

This study examines the relationship between school expenditures and school performance in Clark County School District:

- How do schools compare on NV School Performance Framework, relative to schools with similar students and spending?
- Which schools out-pace expectations; which deliver about as expected, and which do not?

While this study successfully produced a model that answers these questions, the investigation will be extended so other analytic methods can be explored and a fuller set of data can be assembled that permit the District to identify how many and which schools achieve the greatest performance gains at the lowest cost. Extending the study has the added benefit of enabling the District to strengthen the study by subjecting it to a review by national experts and local stakeholders.

The study was undertaken for several reasons:

- Nevada in general and Clark County School District in particular rank near the bottom nationally in per pupil spending.
- The academic performance of schools in the State and the District falls at or close to the bottom of national ranks.
- Tepid voter support for investment in schools means grim prospects for an economy seeking to attract new businesses.
- The lack of public confidence heightens the need to identify practices that can help rebuild public confidence in schools.
- To rebuild confidence, a way is needed to expand the number of schools that achieve high performance at low cost.

The logic driving the study is this. Identifying schools that achieve better than expected results can help us look more carefully at what is behind the results, with the aim of replicating those schools, individuals, or factors. This is challenging because school performance is related to student characteristics that may be beyond the control of schools. There are:

- Schools that serve many students who live in poverty and schools that serve few in poverty
- Schools that have many students who are eligible for special education services and schools that do not
- Schools where most students are unable to fully understand English and schools where all are fully English fluent

The goal is for every student to exit school college-prepared and career-ready, but the stretch is greater for some than others. Due to their readiness, some students are behind from the starting gate. Those who are behind from the beginning must travel farther to arrive at the same learning destination. Those who want to examine the relationship between school expenditures and school performance must wrestle with this variability in student demographic composition. The question is whether to account for it when comparing output to expenditures. If some consideration is made, how is that done?

One way to address this question is to set aside school composition and examine how academic performance varies based on expenditures. This is called an “unadjusted view.” This study takes that approach. But the study goes further.

A second approach is to adjust expenditures for each school, taking into consideration demography of the school. The rationale is this. In a case where two schools are identical in every respect except one has a greater share of disadvantaged students, it can be assumed that the school with a larger share of disadvantaged students will require more funds per student than a school of identical size and enrollment with fewer disadvantaged students. Some studies suggest that the expenditures for schools with greater numbers of disadvantaged students should somehow be weighted differently (more heavily for disadvantaged students). However, the current study forgoes that approach. In this study, while expenditures for each school are pooled across three years (2012-2014) and averaged, expenditures are otherwise left unadjusted.

This study takes a third approach. It compares actual school performance to the performance that would be expected given school demography. It pools expenditures for each school across three years (2012-'14) and averages performance of each school (in terms of points earned on Nevada School Performance Framework) across the same period. It then asks, Taking into account the available resources and demographic make-up of schools, which schools achieve higher results?³

³ Statistical techniques used in this study (i.e., regression analysis) adjust the estimated performance of individual schools in the District so schools that differ demographically can be compared more-readily. However, for reasons that are described in the section titled “Methodological Issues in Analyzing CCSD School Performance and Return on Investment” and in the section titled “Merits of Unadjusted Versus Adjusted Approaches to the Analysis”, caution should be used when interpreting the results of this analysis. Using regression to control for variation in demography does not mean that academic expectations should be less for any

In the final analysis, what matters most is this. Do the results of this work alter how we think and act in ways that translate into better student results? And if so, can it help schools get better faster? This study addresses these questions.

student subgroup. The Board-adopted vision for the Clark County School District expresses a commitment to the academic success for all who attend CCSD schools. "All students progress in school and graduate, prepared to succeed and contribute in a diverse, global society." For this reason, this study presents the results from analysis that statistically adjusts for demography and also results from an analysis that is unadjusted. The two perspectives provide a way to compare and contrast results. Including both perspectives makes it possible to anticipate questions or challenges that might arise.

ACKNOWLEDGMENTS

This undertaking was led by a team of two dozen individuals. Each accepted an invitation to serve that was extended by Clark County School District Superintendent Pat Skorkowsky. The team that was assembled was called the School Comparison Report Subcommittee.

Michael Alastuey	Former Chief Financial Officer, Clark County School District
Hugh Anderson	Managing Director and Partner, Las Vegas HighTower
Stephen Augspurger	Exec. Director, Clark County Assoc. of School Administrators and Professional-Technical Employees
Michael Barton	Chief Achievement Officer, CCSD (co-chair, School Comparison Report Subcommittee)
Nancy E. Brune	Executive Director, the Kenny Guinn Center for Policy Priorities
Jeffrey Cooper	Partner, Bradshaw Smith & Co. LLP and Trustee, Engelstad Family Foundation
Denette Corrales	Senior Vice President, Wells Fargo Bank
Brian Cram	Former Superintendent, Clark County School District
Laura Fucci	Chief Information Officer, City of Henderson
Brent Husson	President, Nevada Succeeds (co-chair, School Comparison Report Subcommittee)
Adam Johnson	Chair, Education Committee of the Clark County Black Caucus
Cindy Johnson	Teacher, May Elementary School, Clark County School District
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Michael Vannozi	Policy Director, Las Vegas Global Economic Alliance
Eva White	Assistant Chief Achievement Officer, Clark County School District
Chris Wynne	Strategic Data Fellow, Clark County School District
Michael Yackira	Former CEO, NV Energy
Linda Young	Vice President, Clark County School District Board of School Trustees

This effort was ably served by two co-chairs who together were the guiding force behind this project. They were Mr. Brent Husson (President of Nevada Succeeds) and Dr. Michael Barton (Chief Achievement Officer for the Clark County School District). An indispensable support for the project was Ms. Roseanne Richards (Director in the Student Achievement Office of the District). The unadjusted analyses were conducted by Dr. Chris Wynne (Strategic Data Fellow). The report was written by Lincy Institute Consultant Dr. Ken Turner.

While this document is provided to the Superintendent of the Clark County School District and is intended for internal District use, every effort has been made to attribute referenced material to the proper and first author. Through peer review and a review by local stakeholders, the District intends to strengthen the analysis and findings. The District intends to correct any oversight or omission if notice is provided.

PHASES OF WORK, CRITERIA FOR SUCCESS, AND PROCESS USED TO REACH CONCLUSIONS

This undertaking has been structured in three phases. Each phase is driven by focus questions that appear below. Altogether, this work will culminate in the production of a model that defines the relationship between school expenditures and school performance as well as a mechanism that seeks to use the results of the model to inform and improve school performance.

Phase 1

Deadline November 14, 2014

Task Address two questions:

- Which schools in the Clark County School District achieve the greatest gains at the lowest annual cost?
- What explains why some schools achieve high-value at low-cost?

Phase 2

Deadline February 26, 2015

Task Address two questions:

- How can input of national and local experts help ensure implementation proceeds in a healthy way?
- Once we couple data on school funding and school performance, what assistance needs to be in place so implementation can support teaching in ways that expand opportunities/outcomes for students?

Phase 3

Deadline June 1, 2015

Task Pursuant to Phase 2 recommendations, improve the dataset, modify the model, and re-run the analysis.

Address five questions:

- Taking into account expenditures and controlling for demography, program, and level, which schools achieve better than expected results?
- Which schools in the Clark County School District achieve the greatest gains at the lowest annual cost?
- How can this information be used to aid in school improvement?
- What are the budget implications?
- How can incentives expand the number of schools achieving higher than expected results??

CRITERIA FOR SUCCESS

From the outset, this project was judged against the following criteria:

- Delivered on time and to specification
- Conforms to requirements of law, contract, and policy
- Advances accountability for students, staff, schools, and parents
- Incorporates actions that are achievable within the existing resources
- Promotes equity, efficiency, and effectiveness in educational programming
- Makes claims that are defensible, valid for their purpose, and based on reliable information
- Increases site-based responsibility as it relates to programming and services for every student
- Able to demonstrate widespread stakeholder support based on 360 degree feedback from the field
- Promotes continuous improvement, greater transparency, and public understanding of causes and remedies
- Provides useful info to staff who are striving to ensure every student exits college-prepared and career-ready
- Supports elements of the strategic plan (found in Board Policy E2, on "Student Achievement")

PROCESS USED TO REACH CONCLUSIONS

The findings and recommendations enclosed in this report were informed by the contributions of a Superintendent-appointed Subcommittee. It consisted of 24 experts from the business community, public policy groups, higher education institutions, the K12 sector, labor unions, and the philanthropic arena. Over the course of a three-month period (August 8, 2014 to November 14, 2014) the members of this School Comparison Report Subcommittee offered valuable insights and timely reviews of drafts. A point of departure for this work was a 2011 study undertaken by the Center for American Progress and titled "Return on Educational Investment: A District-by-District Evaluation of U.S. Educational Productivity."

Through the course of this work, the Subcommittee's understanding of the task evolved. As the Subcommittee came to better appreciate the limits of the existing dataset, the emphasis of the study shifted in a non-trivial but necessary way. As the analysis unfolded, it became clear that this initial effort joined data from two important sources. That is school expenditures on one hand and school performance on the other. It became clear to Subcommittee members that estimating return on investment was beyond their immediate grasp.

Given that reality, the Subcommittee charge was modified. Two follow-up phases of work were added. This will enable District decision-makers to evaluate school effectiveness and efficiency. Assembling performance-focused school-level data that are linked to school spending data will help District staff guide resources toward areas of identified need. This makes it possible to ask questions about how well resources are being used to provide educational outcomes.

By the conclusion of its three-month work, the Subcommittee recognized that key questions regarding "return" or "efficiencies" that were present at the outset of the study remained legitimate questions that would be the focus of future efforts. As a whole, Subcommittee members acknowledge the need to extend this work so additional data can be collected and analytic adjustments can be made that make it possible to reach the central questions that gave rise to this study. That said, members of the Subcommittee collectively support recommendations that are enclosed in this report.

As work continues with Phase 2 and 3, it is anticipated that the direction of the study will be influenced by feedback by three groups. That includes the expert advice of K12 practitioners in the field, feedback from nationally-recognized experts in policy-making and research, and input from local individuals with a personal stake in the Clark County community.

Finally, relying heavily on local practitioners in Phase 2 of this work makes sense because the over-riding purpose of this undertaking is to improve the quality of teaching and learning in schools rather than simply to measure and report on school effectiveness and efficiency.

THEORY OF ACTION

This undertaking relied on a chain of logic. The logic explains how change will lead to improvement. The reasoning involves a set of linked propositions and is sometimes called a “theory of action.” (Haertel, National Academy of Science, 2009).

What follows is the theory of action for this project. This theory of action sets aside causality.

If . . .	Then . . .
<ul style="list-style-type: none"> ▪ We link data on school cost and school performance 	<ul style="list-style-type: none"> ▪ It is possible to systematically identify schools that consistently attain high value at low cost
<ul style="list-style-type: none"> ▪ We have “proof points” or schools whose annual results or yearly gains are better than expected 	<ul style="list-style-type: none"> ▪ We can make sensible comparisons of schools with similar structure that serve similar populations and face similar challenges
<ul style="list-style-type: none"> ▪ Observers see and understand it is possible for other schools facing similar challenges to achieve better results more efficiently and if these “proof points” provide a way to isolate school characteristics and practices that are associated with higher achievement and greater efficiency 	<ul style="list-style-type: none"> ▪ A pathway for improvement exists that can help schools learn from each other about what works in which setting with which student populations and why
<ul style="list-style-type: none"> ▪ Staff members view these “proof points” as meaningful indicators of school quality and accept that a higher level of performance is attainable and if staff members see this as a key to improvement 	<ul style="list-style-type: none"> ▪ Staff will be motivated to learn from colleagues at similar schools that have higher achievement and/or demonstrate greater gains and/or better efficiency (assuming proper incentives and support).
<ul style="list-style-type: none"> ▪ Staff members seek out colleagues to learn about more-effective and/or more-efficient approaches 	<ul style="list-style-type: none"> ▪ Staff will evaluate activity at their own school through the lens of cost and benefit and will choose to alter their own conversations and professional practices accordingly
<ul style="list-style-type: none"> ▪ Staff members pay attention to and monitor the effect of these changes and if staff members systematically work to improve the school’s efficiency and effectiveness 	<ul style="list-style-type: none"> ▪ School performance will rise yearly even as overall District performance improves and achievement per dollar expended increases.

BACKGROUND MATERIALS AND DATA DESCRIPTION

The project took advantage of a District-provided web site where source documents for this project were stored. To view any of the documents used for its work go to this web address.

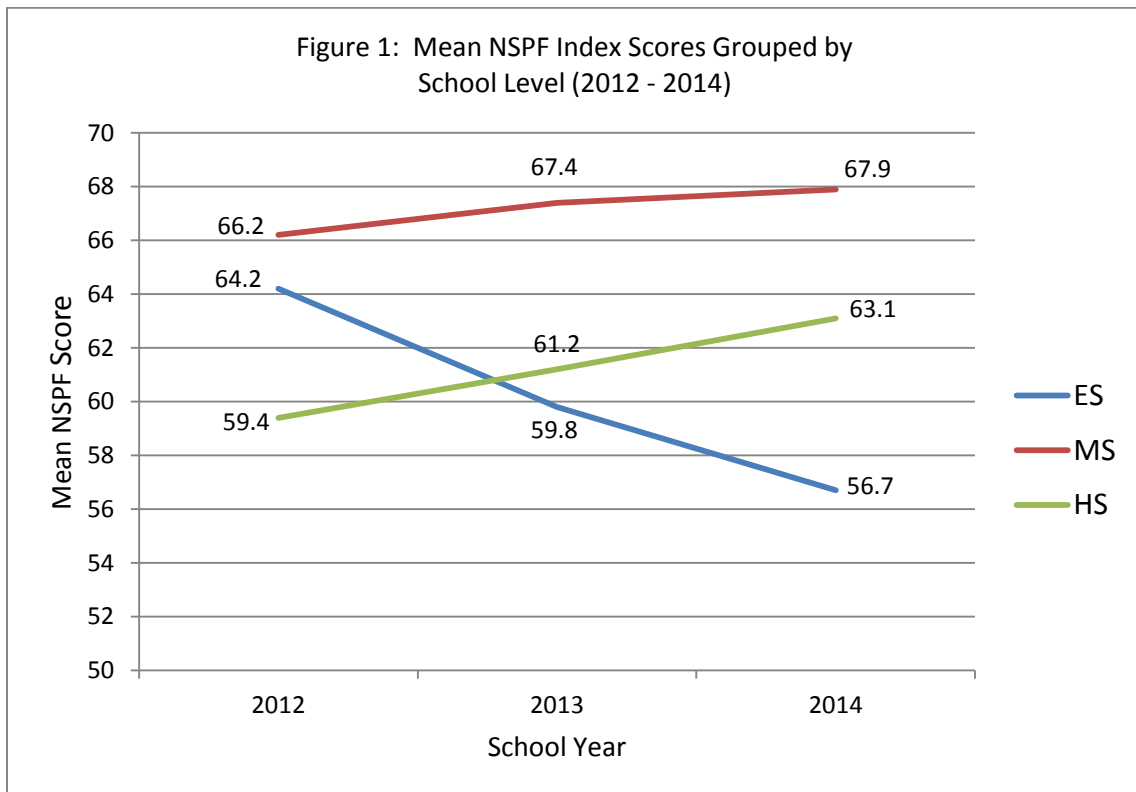
The address is: <https://secure.ccsd.net/internal/documents>

At this web location, those items can be found under the heading of “2014 Documents.” For this study, a total of 40 documents were reviewed by Subcommittee members (totaling 450 pages).

The descriptive statistics that follow provide a glimpse of the data used for this analysis. The sample includes only schools with per pupil expenditure is less than \$13,000. Cases where per pupil expenditure is greater than \$13,000 were set aside.

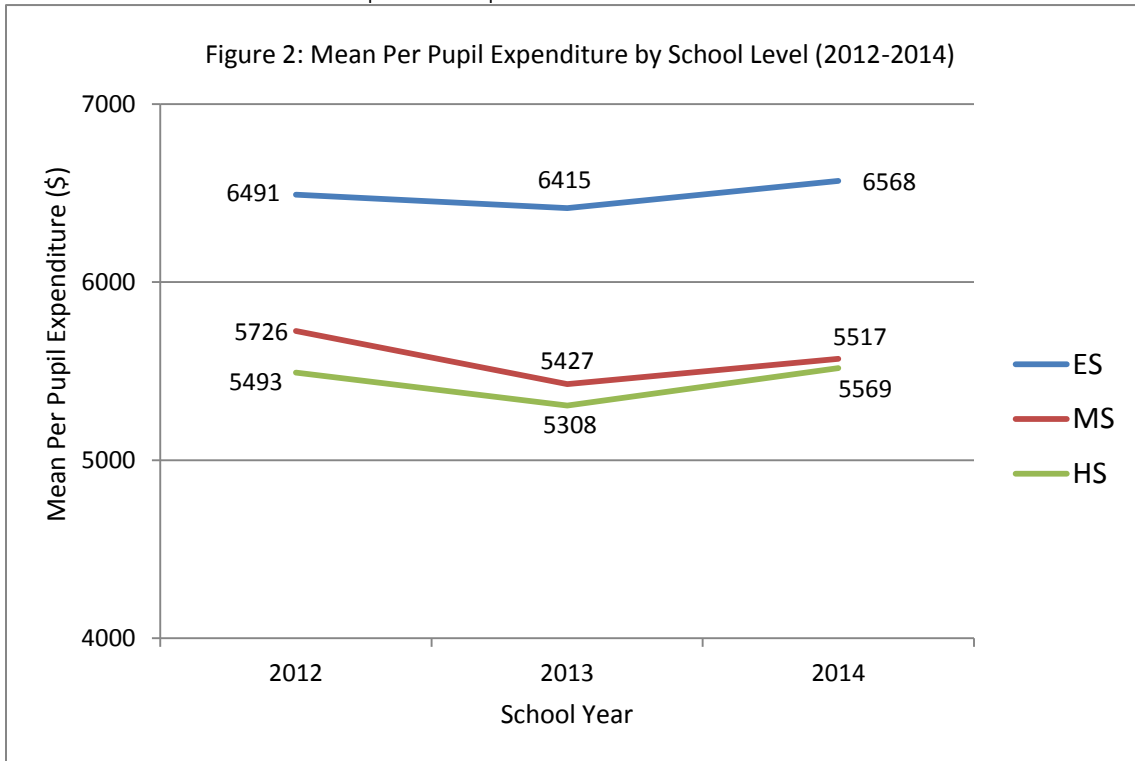
<i>Table 1: Mean NSPF Index Score and Per Pupil Expenditures Grouped by School Level for 2012-2014 (# of schools appears in parentheses following yr)</i>		
School Level	NSPF Index Score Mean (S.D.)	Per Pupil Expenditure Mean (S.D.)
<i>Elementary School</i>		
2012 (n = 208)	64.2 (14.1)	6491.0 (1040.3)
2013 (n = 210)	59.8 (14.5)	6314.9 (987.8)
2014 (n = 211)	56.7 (15.1)	6567.6 (976.1)
<i>Middle School</i>		
2012 (n = 57)	66.2 (13.0)	5725.7 (1361.0)
2013 (n = 56)	67.4 (13.9)	5426.7 (1003.0)
2014 (n = 56)	67.9 (14.6)	5568.6 (1076.8)
<i>High School</i>		
2012 (n = 45)	59.4 (16.3)	5492.9 (971.8)
2013 (n = 45)	61.2 (17.5)	5307.7 (909.2)
2014 (n = 46)	63.1 (18.4)	5516.7 (1029.4)

A basic context for understanding recent trends in NSPF index scores and per pupil expenditure is provided in Table 1, as well as Figures 1 and 2.⁴ Table 1 displays descriptive statistics on both of these variables. The data are disaggregated by school level (elementary, middle, and high school) and school year (2012, 2013, and 2014). On average, index scores have increased consistently in middle schools and high schools, while they have decreased consistently in elementary schools. For example, the mean index score of middle schools increased from 66.2 (2012) to 67.9 (2014), while the mean index score of elementary schools, decreased from 64.2 (2012) to 56.7 (2014). These trends are displayed graphically in Figure 1. It is also worth noting the substantial variation in index scores at each school level across all three school years, as reflected by standard deviations (S.D.) that encompass a wide range on the index score scale. For example, in 2012, the standard deviations for elementary, middle, and high schools are 14.1, 13.0, and 16.3, respectively.



Trends in mean per pupil expenditure differ from trends in index scores. At each of the three school levels – elementary, middle, and high school – mean per pupil expenditure first decreases from 2012 to 2013, and then increases from 2013 to 2014. For example, the mean per pupil expenditure of elementary schools first decreases from \$6491 (2012) to \$6315 (2013), then increases to \$6568 (2014). Interestingly, the mean per pupil expenditure of elementary schools is consistently – and substantially – higher than that of middle schools or high schools. These trends are displayed graphically in Figure 2. Similar to index scores, there is also substantial variation in per pupil expenditure, as reflected by large standard deviations.

⁴ The calculation of per pupil expenditure includes all costs except for capital costs, transportation expenditures, and central office costs (professional development, curriculum development, etc.). Costs from the following sources of funding are included: (1) General; (2) Class Size Reduction; (3) Special Education; (4) State Grants; (5) Federal Grants; (6) Food Services.



In this context and for the purpose of this study, “expenditure” data are intended to include all but capital spending; however, due to an oversight, the expenditure figures cited here do not yet include transportation or other central office expenditures (including professional development, curriculum development, etc.). When the data are re-analyzed during Phase 3 of this study, the dataset will be refreshed to include these central office expenditures.

School Level	Correlation between Index Scores and Per Pupil Expenditure		
	2012	2013	2014
Elementary School	-0.16*	-0.28***	-0.24***
Middle School	0.12	-0.20	0.03
High School	-0.29*	0.11	-0.18

~ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A consistent relationship between index scores and per pupil expenditure could not be found. As displayed in Table 2, the correlations between these variables tend not to be statistically significant at the middle school and high school level. While the correlations at the elementary school level are negative and statistically significant, the magnitudes of these correlations are fairly low, ranging from -0.16 (2012) to -0.28 (2013). Collectively, these correlations do not reveal a strong association between index scores and per pupil expenditure.

For a display of unadjusted results (NSPF points by per pupil expenditures) for all schools see Figures 3, 4, and 5. The displays are scatterplots of 2014 index scores by per pupil expenditure at the elementary, middle, and high school level, respectively. The scatterplots reveal a wide range of variation in index scores at most levels of per pupil expenditure, which confirms that a strong relationship between these two variables is not apparent in an unadjusted analysis. This trend is similar in 2012 and 2013.

This project began with assumptions. One concerned data. To accelerate work, the study used existing data (forgoing the need to collect data). Because both state content standards and assessments in Nevada are undergoing change, the District elected to define school performance using a measure that exists for all Nevada schools. That is the Nevada School Performance Framework of NSPF. For better or worse, NSPF brings together measures of student proficiency (Criterion Referenced Tests of CRTs), measures of student academic growth (again, year to year change in CRTs), gaps (measured by CRTs), graduation rate and college and career readiness (in high schools), and other factors (attendance).

A secondary analysis of existing data like this study often brings with it difficult choices. In this study, the first hurdle was deciding what measure to use to gauge school performance. Because so much change is afoot with the advent of new state content standards and revised assessments in the wings, an early decision was made to use the Nevada School Performance Framework as a gauge of school performance. To be sure, certain advantages accompany use of the NSPF. Chief among them are that with the exception of special schools (serving a tiny fraction of students in the District for whom the state-administered Criterion Referenced Tests are inappropriate) and behavior schools (that serve an incarcerated student population), every school in the District earns a score on NSPF every year. Even as the underlying standards and assessments have undergone revisions for the last four years in Nevada, the NSPF has remained in place.

The drawback of using a measure like NSPF is that it is a blunt tool that may describe school performance but may not provide much insight into changes in the academic performance of students in the care of these schools. As a result, the current study could be strengthened by closer attention to the choice of a measure (or series of measures) to characterize “academic performance.”

METHODOLOGICAL ISSUES IN ANALYZING CCSD SCHOOL PERFORMANCE AND RETURN ON INVESTMENT

There are a couple of methodological issues to consider in attempting to evaluate the schools of the Clark County School District and determining the return on investment (ROI) for spending on education in the district. Most importantly, it is not possible to reasonably estimate the ROI with the available data. However, we can compare the relative performance of schools, but we must adjust for various observable characteristics of the schools and their student populations to make fair comparisons. Each will be addressed in turn as well as detail the statistical estimation procedure used to analyze the schools.

Estimating Return on Investment

Return on Investment (ROI) is the effect of additional spending on some measure of school performance. In this study, we will focus on the Nevada School Performance Framework (NSPF) overall performance index.⁵ We have data on each school in the district including the NSPF performance index and characteristics of its student body — e.g., percent of Limited English proficient (LEP) students, the percent of students receiving free or reduced cost lunches (FRL), the percent of students on an Individualized Educational Plan (IEP), the percent of students who are minority⁶ — as well as the school itself — e.g., high school vs. middle school vs. elementary school, and spending — for three years: 2012 to 2014. Given that the schools in the district vary widely by enrollment, we will focus on spending per student that make spending comparable across them.

Unfortunately, with such observational data we cannot reasonably estimate the ROI. The problem is that there is no independent variation in spending across schools⁷ and this is exacerbated by limited variation in spending over time within a given school. In fact, spending is mostly formulaic with spending often increasing with the percent of challenging students, such as those needing individualized education program (IEP) in a school. This means that we will often find that schools that spend more on average are achieving worse outcomes than those spending less, since these populations show poorer performance on standardized tests and frequently lower graduation rates. We should not, therefore, assume that the ROI is negative as this observable data may suggest. It is hard to believe that spending more leads to worse outcomes for schools. Of course, this does not rule out that additional spending had no or very limited positive impact on outcomes. This is why all we can really do is look at actual school performance (adjusted for school characteristics) and ask which schools seem to be outperforming their peers.

⁵ To undertake and complete this study in 90 days, certain assumptions were made at the outset. One was to use readily-available data. Another was to gauge school performance using the Nevada School Performance Framework. As Appendix A illustrates, each school in the state (with the exception of Special Schools and certain behavior schools) are awarded points on a 100-point scale. These points represent a weighted average of points earned divided by points possible. Points are awarded for: (a) proficiency on the Reading and Math state assessment; (b) longitudinal academic growth; (c) achievement gaps; and (d) “other”. This early decision made it possible to begin the analysis 30 days into the project and to complete the analysis 60 days into the project. However, the decision was not without its drawbacks. One is that the NSPF does not take into account proficiency or growth in English language development. In schools with high percentages of English Language Learners (ELL), it can be expected that ELLs will have to make language growth before they can achieve academic proficiency in content areas. For this reason, the NSPF point scores for schools with high percentages of ELLs may be a blunt measure. For this reason, the section titled “Lines of Future Inquiry” considers the possibility of alternative methods for conceptualizing and gauging school academic performance. Phase 2 and Phase 3 of this project are, in part, intended to surface additional suggestions along this line.

⁶ Table 3 presents a complete list of those variables that are related to race/ethnicity which were included in the analysis. The list includes percent African-American students, percent Hispanic students, percent Native American students, percent Asian students, percent Pacific Islander students, and percent Multi-Ethnic students.

⁷ Formally, spending is not exogenous.

This is further complicated because the mix of spending varies significantly by school. Unfortunately, there is no empirically valid way to adjust this mix to make it comparable across schools. For example, the Center for American Progress in its Return on Investment index for K-12 arbitrarily down weights spending for special education to forty cents on the dollar. While this does make schools that have larger special education population look like they are spending less, they never statistically justify how they came to this figure. Why would this not vary by school or even state? It is purely arbitrary. A better approach, followed in this study, is to directly estimate, for example, how the fraction of special education student affects the performance measure within the statistical model. This allows us to use actual observed data to estimate this relationship instead of arbitrarily imposing it.

In fact, the only real way to calculate a reasonable estimate of the ROI for education in the district would be a randomized control trial where some schools were randomly selected to receive extra funds, say \$500 per student, and see how these schools fared relative to those that did not receive the extra funds.⁸ However, it is not likely that this would be considered ethical or perhaps even legal in Nevada.

Estimating the Relative Rankings of Schools

The question is how to estimate the relative ranking of schools. As we have already discussed any method of ranking must adjust for the characteristics of the schools and their student populations. This is so that we are comparing like schools. For example, consider two schools: one with a large fraction of students who are not native speakers of English and one with very few. Historical data suggests that English language learners tend to perform worse on standardized tests and have lower graduation rates; this in turn leads to lower scores on the NSPF performance index. But can we necessarily say that the school with the fewer English language learners is really better? The statistical model will allow us to adjust for this difference and answer the counterfactual question about how would these schools perform if they had similar student body composition and, therefore, fairly rank their performance.

It is important to note that this does not imply that we are asking less in terms of performance by particular groups of students. We could have policy goal of holding all students to the same standards. The statistical model is just making sure we are not ranking schools purely as a basis of the student composition instead of their value added.

The way we do this is via a hierarchical or multilevel linear model.⁹ The multilevel model is an extension of basic linear regression, one of the most widely used statistical tools employed in applied statistics and the social sciences. In a regression, the observed characteristics¹⁰ are assumed to be linearly related to the outcome of interest, the NSPF performance index in this case. However, since we observe the schools multiple times (which is what makes the model hierarchal), the model allows us to estimate those schools that consistently over- or under- perform their expected values conditional on their observed characteristics. The list of controls used in the analysis can be found in Table 3.

⁸ It would be crucial that the schools chosen were truly randomly selected. Most importantly, the selection of which schools received the extra funds could not be based on any of their observed characteristics.

⁹ These models are also known as random coefficient models, mixed effects models, varying parameter models, and Empirical Bayes models in various academic literatures. All of these models are mathematically identical. For more complete discussion of these models see, for example, Gelman and Hill (2007) or Beck and Katz (2007)

¹⁰ Often referred to interchangeably as covariates, controls, regressors, or independent variables.

Table 3: Controls Used in Hierarchal Linear Regression Model
Program Type: Comprehensive Magnet, CTA, CSN
Percent African-American Students
Percent Hispanic Students
Percent Native American Students
Percent Asian Students
Percent Pacific Islander Students
Percent Multi-Ethnic Students
Percent of Students which Receiving Free of Reduced Cost Lunch
Percent of Student which are Limited English Proficient
Percent of Students which have Independent Educational Plans
Spending Per Student

Given the difference between schools types, the model is fit separately on high schools, middle schools, and elementary schools to again insure that we are comparing like schools. This systematic over- or under- performance is direct measure of the performance of the schools. It is on the same scale as the original NSPF index. For example, a school that has a value of 10 is on average outperforming its peers by 10 percentage points on the NSPF performance index.

FITTED MODEL AND DATA DISPLAYS

The variables included in the regression are listed in Table 1. The formal statistical model that is estimated is:

$$Score_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$$

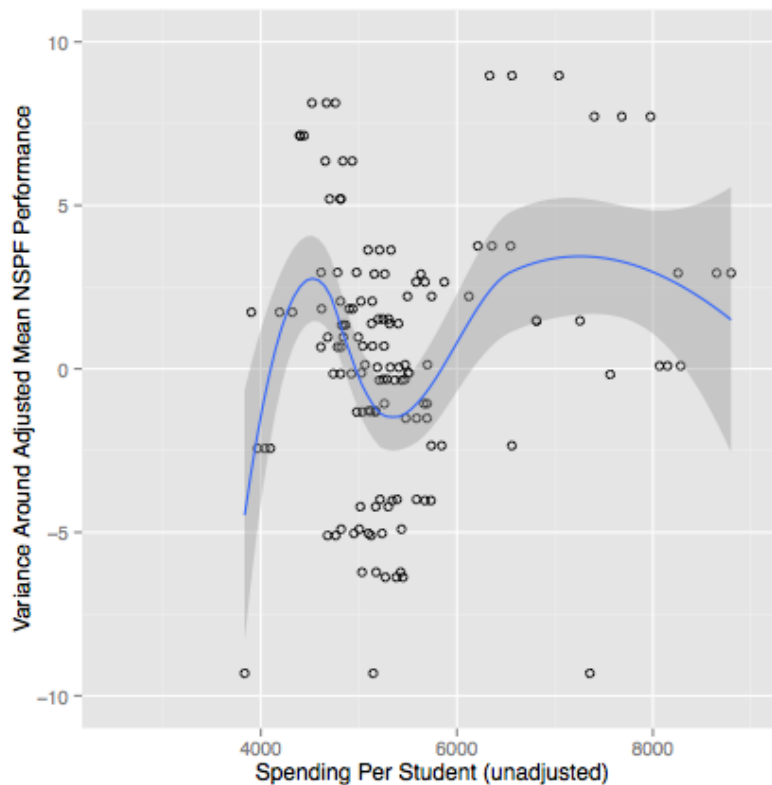
$$\alpha_i \sim N(\alpha, \Gamma)$$

$$\varepsilon_{it} \sim N(0, \Sigma)$$

where X_{it} contains all of the variables listed in Table 1. Where α_i are the “random effects” that show systematic over- or under- performance on the NSPF after controlling for the school characteristics in X_{it} .

If we consider the figure of estimated school performance versus spending for the CCSD High Schools (below), we note that the vertical axis is the result of the hierarchical linear model (HLM) showing the systematic over- or under- performance of a given school on the NSPF Performance index and the horizontal axis is total spending per student. The given dots represent an actual high school in a given year, but we have removed the four schools that have unusually high spending per student. Thus each high school, therefore, appears on this graph three times — once each for 2012, 2013, and 2014. Consider the lone dot at the lower left corner that has spending at just under \$4000 per student and a relative performance of around -9.0. This is for Academy of Individualized Study Jr./Sr. (AIS, Jr./Sr.)

The line in the graph is known as a loess regression line. Informally, a loess regression line is a flexible smoother that shows the overall pattern in the data. More formally, a loess regression curve refers to a smooth curve through a set of data points obtained with a statistical technique whereby when each smoothed value is given by a weighted quadratic least squares regression over the span of values of the y-axis scattergram. The sample display that follows illustrates this.



Here we see that at low levels of per capital spending small increases in spending are associated with improved performance but at moderate level of spending between \$4000 and \$5000, additional spending is actually correlated with lower performance. The grey area around the curve is the confidence interval for this non-parametric regression line. Overall, there does not seem to be a very strong relationship between spending and a given school's performance on the NSPF index.

Turning our attention to what happens when the model "adjusts" for a demographic characteristic like free and reduced price lunch (FRL), we note that when Hierarchical Linear Modelling is used to fit a model to the data, this is what is being modeled and this is how the inclusion of a variable like free and reduced price lunch (FRL) plays a role in the interpretation of results. The regression estimates the linear (partial) correlation between the regressors and the outcome of interest, NSPF index in this case. For example, we might estimate that a one percentage point increase in the fraction of FRL students in a school is associated with a decrease of 2% on the NSPF index holding all other school characteristics constant (i.e., the variable in Table 1). Then given all the values for all of the variables that describe the school in the model we can generate a predicted value for a given school (sometimes this is called a production function). This is how we would expect a school of a given set of characteristics to perform in terms of NSFP index. We can then look at how this prediction varies from the actual school performance over the three years that we observe it. If the school constantly outperforms this prediction, the α_i for this school would be positive.

Now it could be the case that two schools have the same α_i , but have very different predicted NSPF scores. For example, consider two high schools in the Clark County School District with similar demographic characteristics but one is a CSN program and one is a regular comprehensive program. The model predicts that the CSN school will have a higher NSFP score (by about 22 points), but it could be that the comprehensive school is outperforming its characteristics, i.e., larger α_i , than the CSN school. In this sense the regression has leveled the playing field between schools with different characteristics (CSN vs. comprehensive). Ultimately, the model developed using Hierarchical Linear Modelling is determining which schools systematically outperform their peers.

Table 4: Parameters identified for the Hierarchical Linear Model

	High Schools	Middle Schools	Elementary Schools
Intercept	76.07* [63.88; 88.79]	85.91* [73.61; 99.18]	83.51* [71.91; 95.54]
Behavior Program	-27.42* [-38.54; -15.38]		
CSN Program	22.04* [12.58; 31.71]		
CTA Program	15.04* [6.22; 23.98]		
Magnet Program	5.00 [-0.78; 11.01]	6.98* [2.69; 11.47]	12.15* [4.25; 20.17]
Spend Per Capita (scaled)	0.65* [0.24; 0.97]	-0.52* [-0.92; -0.22]	0.30 [-0.71; 1.25]
Pct. African-American	-25.49 [-52.08; 0.43]	-43.35* [-67.41; -23.01]	-8.04 [-27.01; 10.46]
Pct. Hispanic	-32.20* [-54.02; -12.18]	-5.98 [-34.89; 18.74]	22.22 [-5.74; 49.20]
Pct. Native American	90.46 [-170.53; 368.09]	177.27 [-105.80; 438.31]	-149.18 [-350.86; 52.65]
Pct. Asian	-6.49 [-42.31; 28.05]	49.74* [18.28; 79.31]	73.64* [33.72; 112.59]
Pct. Pacific Islander	-115.00 [-330.66; 103.90]	59.14 [-133.15; 247.90]	-151.09* [-277.09; -25.34]
Pct. Multi-Ethnic	71.74 [-54.57; 195.93]	121.26* [6.59; 232.56]	-30.90 [-93.31; 31.73]
Pct. FRL	11.18 [-11.79; 35.94]	-35.85* [-55.85; -12.57]	-42.36* [-58.19; -26.09]
Pct. LEP	-2.87 [-32.84; 26.63]	18.47 [-19.18; 56.86]	-17.06 [-47.17; 13.64]
Pct. IEP	-162.46* [-265.11; -60.09]	-5.82 [-71.76; 63.28]	-22.33 [-71.08; 26.52]
AIC	898.20	1101.67	4700.71
BIC	949.72	1146.14	4763.13
Log Likelihood	-432.10	-536.84	-2336.36
Deviance	864.20	1073.67	4672.71
Num. obs.	153	177	638
Num. groups: school	53	59	215
Variance: school.(Intercept)	34.21	9.50	54.82
Variance: Residual	17.53	33.30	67.04

* 0 outside the confidence interval

MERITS OF UNADJUSTED VERSUS ADJUSTED APPROACHES TO THE ANALYSIS

The preface of this paper describes the merits of using statistical machinery to level the playing field, so to speak. This study took a middle path, opting to present results both in an unadjusted manner and also estimating the expected NSPF performance for each school, after controlling (or adjusting) for demography, level, and program.

It is worth reiterating that the current study did not adjust expenditures based on student demographics.

Turning our attention to unadjusted displays, we consider Figure 9. That figure shows the general form of a distribution when schools are displayed along two dimensions (academic performance in terms of NSPF points on one hand versus per pupil expenditures on the other hand). The upper left quadrant appears in green because it represents the ideal where high performance is matched with low expenditures. By contrast, the lower right quadrant appears in a red hue because it represents a condition where expenditures are high yet performance is low.

There are noteworthy limits to the current study. For instance, while the analysis conducted for the current study set out to identify how many and which schools demonstrated uncommon success in terms of gains from year to year with respect to educational output (aka NSPF) per dollar expended, the study has not yet successfully gauged year to year gain. For reasons explained in the section on “Methodological Issues in Analyzing School Performance and Return on Investment,” what the current study did succeed in accomplishing was to identify which school did better than predicted by a model that adjusted for demography, level, and program. Within categories of schools (say, CTAs or CSNs or rural schools or schools that serve high percentages of students on free or reduced price lunch), the model illustrates which schools make the most efficient use of available resources and which do even better than you would expect (once demography is taken into account).

Nonetheless, the red arrows in Figure 10 illustrate that the ultimate aim is for all schools to move to the upper left quadrant.¹¹

Finally, we note that the study set out to rate each school and so it did, both adjusted and unadjusted. However, estimates for each individual school are not included for one reason. This report is still a work in progress. It is marked “Interim Subcommittee Report for the Superintendent: School-Level Results Unavailable While Peer Review Is Underway and Data Are Being Validated” until the dataset is certified as accurate and complete, the peer review is finalized, and the model is revised to take account of feedback received from local stakeholders.

¹¹ Figure 10 depicts the desired migration path of schools in an ideal world. In practice, all things being equal, as the academic performance of schools improves and more schools are located above the midline that bisects the vertical axis, it is conceivable and even likely that the Districtwide mean academic performance (expressed in terms of NSPF points) could climb. Likewise in practice, all things being equal, as the efficiency of schools improves and more schools are located to the left of the midline that bisects the horizontal axis, it is conceivable and even likely that the Districtwide mean annual expenditures per student could decline. Nevertheless, the conceptual goal remains unchanged. That is, the dual aim for any given school is to alter practices in ways that contributes to improved academic performance and improved efficiency.

DISCUSSION, FINDINGS, AND RECOMMENDATIONS

For all the attention public education receives in the news, you might expect to find better understanding of the connection between school funding and school performance. Yet, there is a surprising absence of information showing whether the value of the education students receive is worth the dollars expended. Because we lack a good way to view this, we rely on anecdotes about schools that are uncommonly successful in converting scarce funds into high student achievement. The absence of a better way to think about this raises a concern. It is the prospect that poorly-performing schools remain in place or schools that expend funds inefficiently continue to operate. If that happens, resignation can set in when the public wrongly concludes that nothing better is possible. What is needed is a convincing way to tell whether schools deliver value that is worth the funds expended. And proof points are needed to show it is feasible to attain high value at low cost.

This study set out to address two questions:

- Which schools in the Clark County School District achieve the greatest gains at the lowest annual cost?
- What explains why some schools achieve high-value at low-cost?

While the model that was developed as part of this study does not specifically address gains, the model does define school performance in terms of NSPF points. Figures 3, 4, and 5 illustrate the point in an unadjusted way. Figures 6, 7, and 8 illustrate the point, adjusting school performance based on student demographic characteristics. While a school-by-school listing of results does not appear in this paper, a data visualization tool (a software application using Tableau) has been produced that provides that detail. Because the data are still being validated and the model modified (through Phases 2 and 3), the school-by-school listing is not available at the time of printing.

Figures 9 and 10 illustrate this point conceptually. With respect to expenditure, the model relies on expenditures as a point in time estimate. Figures 9 and 10 simplify what is ideal and what is not (in terms of a ratio of NSPF points-to-expenditures). Locating each individual school in one of four quadrants provides a way to tell whether the ratio of NSPF points-to-dollars places the school in a quadrant that is: (a) high performance and low cost; (b) high performance and high cost; (c) low performance and low cost; or (d) low performance and high cost.

The “Methodological Issues in Analyzing School Performance and Return on Investment” section of this paper defined and detailed how the limits of the data used for this study constrained the District’s ability to reach and adequately answer the first question (“Which schools in the Clark County School District achieve the greatest gains at the lowest annual cost?”) That section describes the difficulty.

“It is not possible to reasonably estimate the ROI with the available data. However, we can compare the relative performance of schools.” Explaining further, “there is no independent variation in spending across schools and this is exacerbated by limited variation in spending over time within a given school . . . This is why all we can really do is look at actual school performance (adjusted for school characteristics) and ask which schools seem to be outperforming their peers.”

Nonetheless, with respect to the first question, the unadjusted displays found in Figures 3, 4, and 5 of the current study identify schools in the upper left quadrant (high performance at low cost).

The jury is still out with respect to the second research question (“What explains why some schools achieve high-value at low-cost?”).

That said, this study does carry good news.

1. A dataset has been established that links school performance data and school expenditure data.
2. A peer review that is scheduled (called Phase 2 of this work) to occur following completion of this initial exploratory analysis will be paired with efforts to gather feedback from local stakeholders. Together, this will surface suggested modifications to this analysis that will focus new more-productive and potentially-helpful lines of inquiry.
3. A follow-up to the peer review is scheduled to occur in Phase 3. As part of this stage of work, the model will be revised to incorporate the most promising and useful suggestions from peer review and local stakeholders.
4. Recent additions to this dataset include variables from human resources that can potentially be useful in future analyses.
5. A visualization tool created by District staff makes it possible for staff to query the data using on-screen sliders and dials. This makes the data more accessible, thereby increasing the likelihood that meaningful change will ensue.
6. A better understanding exists now within a broad base of staff and community about the merits of various analytic models. Among these are adjusted and unadjusted approaches.
7. The study is already generating interest in the form of questions. Why do elementary-level expenditures outpace secondary-level expenditures (in contrast to a national trend otherwise)? What explains why elementary level performance on NSPF declined so precipitously even as secondary level performance has improved? What can be learned (possibly through case studies) from schools that deliver extraordinary performance on NSPF at low per pupil expenditures even as they serve heavily disadvantaged student populations? What accounts for the rapid improvements in performance at relatively modest levels of per pupil expenditures by certain schools that were recipients of added support due to their status either as Turnaround Schools or Zoom Schools?

LINES OF FUTURE INQUIRY

Possibilities include but are not limited to the following:

- Identify analytic strategies that make it feasible to resolve and overcome a challenge identified by Jonathan Katz. That is the claim that there is insufficient variance in discretionary spending between and among schools to support estimation of ROI. If the claim made by Jonathan Katz cannot be overcome, then consider recasting how the study is conceptualized, the data are conditioned, the analysis is structured, or the study is executed.
- Reach a key research question (“Which schools in the Clark County School District achieve the greatest gains at the lowest annual cost?”) by conditioning the data differently and/or collecting more data and/or conceptualizing the model differently and/or using a different measure to define school performance in ways that allow us to model change over time. Accordingly, the goal of Phase 3 of this study will be to revise the existing model by replacing the current measure of school academic performance (points earned on NSPF) with variables that better portray year-to-year improvements in student proficiency on state assessment. And because 7 years of longitudinal academic growth data exist, the possibility of extending the sample frame to include a wider time frame will be explored.
- Revise the existing model by replacing the current measure of school academic performance (points earned on NSPF) with variables that portray College and Career Readiness. Consider defining College and Career Readiness using measures that are already available including student participation in Advanced Placement courses and/or International Baccalaureate programs, student performance on Advanced Placement exams and/or International Baccalaureate diploma exams, successful student completion of state-approved Career and Technical Education courses, student dual credit earning, etc. Of course, the results will then only be meaningful to high schools.
- Fold into the dataset and subsequently into the model other variables of interest (if they contribute to a model that better describes the phenomenon of interest). This could include teacher years of experience, teacher stability in a school (e.g., percentage of licensed staff in a school that have three years or fewer years of experience), leadership stability (e.g., length of principal tenure at a school), teacher shortage (percentage of teaching spots filled at a school by substitute or guest teachers), flex budgeting (e.g., whether schools qualify for and use flexible budgeting), highly disadvantaged student populations (schools with large percentages of minority students, and large percentages of students on free or reduced price lunch, and students who are ELLs, etc.).
- Use plain language to portray findings from the model Katz developed. For instance, the model provides an “over-under” estimate for each school. The question is this. Given annual per student expenditures and adjusting for school demography, level, and program, how many and which schools perform better than expected on NSPF (or “over-perform”) and how many and which do not perform as expected (or “under-perform”)?
- Gather data (going forward) that makes it possible to model change in performance over time. This could include adding successive years of data with each new school year.
- Explain a negative correlation in high school with respect to ELLs but the absence of a significant correlation at the elementary level. Determine why percent ELL is not a significant correlate in school academic performance. Is it related to a concentration of schools with high percentages of ELLs in the lower half of the distribution (Fig. 9)?
- Generate suggestions related to incentives that can address the question “How can incentives expand the number of schools that achieve high-value at low-cost?” Said differently, “How do we link school funding and performance to create incentives that motivate staff to get better faster?” While these questions were not reached by the current study, they remain questions of interest.

CONCLUSION

This study began with a puzzle.

Setting aside causality, can we credibly examine whether or not differential levels of school expenditures are associated with differential school performance (in terms of points on the Nevada School Performance Framework), and if so, can we describe how dollars make a difference and use this information in any meaningful or helpful way for improvement purposes? While the study begins to provide a way to think about these issues, it arguably raises more questions than it answers.

This study ends with a simple truth. What matters most is not that what has been accomplished but what happens next. An indicator of the importance of this work will be how results are greeted.

If silence is the response, it may point to a lack of awareness of the linkage between school expenditures and school performance. That should prompt efforts to raise awareness.

Rejection of the study findings or its premise (or even outright antagonism) could signal shortsightedness or worse. After all, it is easier to ignore a blind spot and defend the status quo rather than peer behind the veil to test our claims and assumptions about the proper connection between school expenditures and school performance.

Regardless of the response, what is paramount is that attention is given to the impact of this work on our most-vulnerable populations. In an ideal world, healthy self-reflection would lead to improved opportunities and outcomes for all students and especially for those with the steepest climb.

Optimistically, the goal is quite simply to bring a new thinking to bear. A healthy initial reaction will be if study results generate interest, reflection, and professional dialog. If the study shifts conversation in ways that elevate understanding and alter behavior then it can lead to helpful changes in how resources are allocated in the future. The most hopeful sign will be if conversation is sustained and grows . . . and if changes contribute to improved effectiveness and efficiency within the District. If that occurs, it can mean a brighter outlook for young people, taxpayers, and Clark County as a whole.

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APPENDIX A: NEVADA SCHOOL PERFORMANCE FRAMEWORK, AN OVERVIEW

On August 8, 2012, U.S. Secretary of Education Arne Duncan wrote to the Nevada Superintendent of Public Instruction. A portion of that letter follows. It describes that the Nevada Department of Education (NDE) had successfully submitted an application seeking flexibility from the federal government.

Last fall, the U.S. Department of Education (Department) offered States the opportunity to request flexibility from certain requirements of the Elementary and Secondary Education Act of 1965 (ESEA), as amended by the No Child Left Behind Act of 2001, in exchange for rigorous and comprehensive plans designed to improve educational outcomes for all students, close achievement gaps, increase equity, and improve the quality of instruction. This flexibility is intended to support the groundbreaking reforms already taking place in many States and districts that we believe hold promise for improving outcomes for students. We are encouraged by the innovative thinking and strong commitment to improving achievement for all students that is evident in Nevada's request. I am pleased to approve Nevada's request for ESEA flexibility . . .

A cornerstone of the successful state application is Nevada's School Performance Framework (NSPF). In part, the Nevada application (submitted on July 21, 2012, titled "NDE ESEA Flexibility Request") describes NSPF this way.

The NSPF is built upon analyses of schools' results from multiple measures, conceived through a weighted formula of 40% Nevada Growth Model, 30% Proficiency, 20% Subpopulation Gaps, and 10% Other Indicators. These measures are undergirded by a point-based system, assigning school classifications of 5-Star, 4-Star, 3-Star, 2-Star, or 1-Star.

Therefore, the NSPF is set against a 100-point index derived primarily from indicators around growth, status, and gap at the elementary and middle school levels; and status, gap, graduation, and career and college readiness at high school. The performance indicators ultimately selected for inclusion in the NSPF were meant to portray student achievement in both a criterion and normative sense.

The values within these index tables then become the criterion by which all schools are evaluated each year. The percentage of students meeting their adequate growth percentiles (AGPs) is another indicator of progress (growth) toward proficiency.

Schools can only earn the highest available points for proficiency by achieving at the 95th percentile. Additionally, in order to attain five-star status, schools that earn maximum proficiency rates must score within the top ranges of growth, gap, and graduation (where applicable) rates; thereby also demonstrating that students at all ability levels are demonstrating above-average rates of growth in five-star schools.

The official NDE web site describes in detail how public schools in the state earn star status. In general, stars are awarded based on the number of points earned divided by the number of points possible. While the general structure of the NSPF is the same for elementary, middle and high school, the specific criteria differs somewhat. The description that follows explains in greater detail. The source is <http://nspf.doe.nv.gov>.

Schools receive scores that represent a weighted sum derived from broad categories of performance. For elementary and middle schools, this includes four broad categories:

- Overall proficiency of students
- Year-to-year academic growth
- Subgroup gaps in achievement
- Other (average daily attendance)

While the first three categories pertain to state assessment, the last does not (“Other”). Each of the three categories that involve state assessment is subdivided. Each of these subject-area categories is then further subdivided:

- Reading (or English Language Arts)
- Mathematics

For high schools, there are six broad categories:

- Proficiency and academic growth
- Subgroup gaps in achievement
- Graduation rate
- Subgroup gaps in graduation
- College and career readiness
- Other (average daily attendance, credit deficiency)

The overall mark that a school earns is based on a 100-point scale. The points that a school can earn are distributed across the broad categories in the following way:

Elementary and Middle Schools

- | | |
|---|------------|
| - Overall proficiency of students | 30 points |
| - Year-to-year academic growth | 40 points |
| - Subgroup achievement gaps (English learners, Special Education, Free/reduced lunch) | 20 points |
| - Other (average daily attendance) | 10 points |
| - Total | 100 points |

High Schools

- | | |
|--|------------|
| - Proficiency and academic growth | 30 points |
| - Subgroup gaps in achievement (English learners, Special Education, Free/reduced lunch) | 10 points |
| - Graduation rate | 15 points |
| - Subgroup gaps in graduation (English learners, Special Education, Free/reduced lunch) | 15 points |
| - College and career readiness (college remediation, AP, SAT/ACT) | 16 points |
| - Other (average daily attendance, credit deficiency) | 14 points |
| - Total | 100 points |

ELEMENTARY AND MIDDLE SCHOOLS

Performance Indicators

The performance indicators in 2012 are as follows.

1. Growth Measure of Achievement

Student Growth is a measure of performance on the State assessments over time. Students who perform similarly on the first administration of the test are compared to each other after the second. Each student's relative performance to each other is measured as a percentile. This value is called the Student Growth Percentile or SGP. Separate SGP determinations are made for Reading/ELA and Math.

2. Status Measure of Achievement

Status is a measure of student performance based on a single administration of the State assessment. Cut scores are set that determine the achievement level needed to be proficient on the assessments. Status Measures of Achievement are determined by calculating the percent of students in the school who met or exceeded standards on the State assessments. School-level calculations are made for Reading/ELA and Math.

3. Reductions in Achievement Gaps

Student achievement targets to meet proficiency on the State assessments within three years are determined for each elementary and middle school student. These targets are called Adequate Growth Percentiles or AGP. Reduction in Achievement Gap is based on the percent of IEP, ELL or FRL students who meet their AGP targets. Separate calculations are made for Reading/ELA and Math. Subgroups are identified as students who are on an Individual Education Plan (IEP), are English Language Learners (ELL) or receive Free or Reduced-Price Lunch (FRL).

4. Other Indicator

Currently, the Other Indicator is a measure of the student average daily attendance or ADA for a school.

How is the NSPF index score computed?

The Nevada School Performance Framework index score is a composite of several performance indicators, each worth a predetermined maximum number of points. Each performance indicator is itself a composition of multiple factors. The index score is the sum of all of these factors that is then measured against the star rating criteria.

Elementary/Middle School Index (100 points possible)		
Growth (40 points possible)		
	Math	Reading
School Median Growth Percentile (MGP)	10	10
Overall % of Students Meeting Adequate Growth Percentile (AGP)	10	10
Status (30 points possible)		
Overall % of Students Meeting Proficiency Expectations	15	15
Gap (20 points possible)		
% of IEP, ELL and FRL Students Meeting AGP	10	10
Other Indicator (10 points possible)		
Average Daily Attendance (ADA)	10	

HIGH SCHOOLS

Performance Indicators

The performance indicators in 2012 are as follows:

1. Status/Growth Measure of Achievement

The Status/Growth Measure is a combination of status and growth performance measures. The measure includes the percent of students who were proficient on the State assessments as 10th graders, the percent of 11th grade students who were proficient on the assessments by spring of the 11th grade and the Median Growth Percentile or MGP for 10th graders. The School Median Growth Percentile is a summary of Student Growth Percentiles (SGP) for a school. SGP is a measure of student achievement over time that compares the achievement of similar groups of students from one assessment administration to the next. Separate calculations are made for Reading/ELA and Math for each of the three performance indicators.

2. Reductions in Achievement Gaps

High school achievement gaps are calculated as the difference between the subgroup proficiency rate and the statewide proficiency rate for the "all students" group. Subgroups are identified as students who are on an Individual Education Plan (IEP), are English Language Learners (ELL) or receive Free or Reduced-Price Lunch (FRL). Since this value is computed as a difference, negative numbers are possible. When this measure is reported as zero it means there is no difference between the proficiency of the subgroup and the statewide proficiency rate.

3. Graduation Measures

High school graduation is a combined measure of the school's graduation rate and a subgroup graduation gap analysis. Graduation gaps are defined as the difference between each subgroup's graduation rate and the statewide graduation rate. Subgroups are identified as students who are on an Individual Education Plan (IEP), are English Language Learners (ELL) or receive Free or Reduced-Price Lunch (FRL).

4. College and Career Readiness

This indicator represents a combination of multiple measures of College and Career Readiness. It includes the percent of students requiring remediation in Nevada colleges and universities, the percent of students earning advanced diplomas, the percent of students passing Advanced Placement exams and the percent of students participating in the ACT or the SAT.

4. Other Indicators

Currently, Other Indicators is a measure of the student Average Daily Attendance or ADA for a school and the percent of 9th grade students who have earned at least five credits by the end of 9th grade.

How is the NSPF index score computed?

The Nevada School Performance Framework index score is a composite of several performance indicators, each worth a predetermined maximum number of points. Each performance indicator is itself a composition of multiple factors. The index score is the sum of all of these factors that is then measured against the star rating criteria.

High School Index (100 points possible)		
Status/Growth (30 points possible)		
	Math	Reading
Overall % of 10th Grade Students Meeting Proficiency Expectations	5	5
Cumulative % of 11th Grade Students Meeting Proficiency Expectations	5	5
School Median Growth Percentile for 10th Grade (MGP)	5	5
Gap (10 points possible)		
Cumulative % of 11th Grade IEP, ELL, FRL Proficiency Gap	5	5
Graduation (30 points possible)		
Overall Graduation Rate	15	
Graduation Rate Gap for IEP, ELL and FRL Students	15	
College and Career Readiness (16 points possible)		
% of Students in NV Colleges Requiring Remediation	4	
% of Students Earning an Advanced Diploma	4	
AP Proficiency	4	
ACT/SAT Participation	4	
Other Indicators (14 points possible)		
Average Daily Attendance (ADA)	10	
% of 9th Grade Students who are Credit Deficient	4	

How is a school performance index score computed?

The Nevada School Performance Framework or NSPF produces an index score based on 100 points for each of Nevada's public schools. The basis was determined using the performance of Nevada schools from the 2010-2011 school year. These thresholds determine leveled criteria that are rooted in the relative performance of Nevada schools. All of the indicators in the NSPF are measured against established criteria which define 5 levels. The maximum points possible for each indicator are determined by schools that perform at the 95th percentile of schools in that index. In this way, the NSPF sets high but attainable goals for all of Nevada's schools. The indicator levels and associated points can be found on the tables below. Please note that some of the point criteria differ from year to year. Ensure that the point index criteria and the school report you are using are from the same school year.

(source: Nevada Department of Education, <http://nspf.doe.nv.gov/Home/Points>)

Elementary School Point Attribution					
Status (School) Points	3	6	9	12	15
Reading/ELA Proficiency Rate	< 35	≥ 35 and < 49	≥ 49 and < 70	≥ 70 and < 81	≥ 81
Math Proficiency Rate	< 44	≥ 44 and < 61	≥ 61 and < 80	≥ 80 and < 90	≥ 90
Growth (School) Points	2	4	6	8	10
Median Reading/ELA SGP	< 34	≥ 34 and < 44	≥ 44 and < 58	≥ 58 and < 67	≥ 67
Median Math SGP	< 32	≥ 32 and < 43	≥ 43 and < 58	≥ 58 and < 69	≥ 69
% Meeting Reading/ELA AGP	< 35	≥ 35 and < 48	≥ 48 and < 68	≥ 68 and < 79	≥ 79
% Meeting Math AGP	< 34	≥ 34 and < 46	≥ 46 and < 66	≥ 66 and < 79	≥ 79
Gap (Subgroup) Points	0	1	2	3.33	3.33
% FRL Meeting Reading/ELA AGP	< 31	≥ 31 and < 43	≥ 43 and < 61	≥ 61 and < 71	≥ 71
% FRL Meeting Math AGP	< 30	≥ 30 and < 42	≥ 42 and < 59	≥ 59 and < 71	≥ 71
% ELL Meeting Reading/ELA AGP	< 9	≥ 9 and < 18	≥ 18 and < 38	≥ 38 and < 56	≥ 56
% ELL Meeting Math AGP	< 14	≥ 14 and < 27	≥ 27 and < 50	≥ 50 and < 66	≥ 66
% IEP Meeting Reading/ELA AGP	< 1	≥ 1 and < 15	≥ 15 and < 36	≥ 36 and < 58	≥ 58
% IEP Meeting Math AGP	< 9	≥ 9 and < 20	≥ 20 and < 48	≥ 48 and < 68	≥ 68
Gap (Supergroup) Points	0	3	6	10	10
% Supergroup Meeting Reading/ELA AGP	< 31	≥ 31 and < 42	≥ 42 and < 58	≥ 58 and < 68	≥ 68
% Supergroup Meeting Math AGP	< 28	≥ 28 and < 41	≥ 41 and < 58	≥ 58 and < 70	≥ 70
Other Indicator Points	2	4	6	8	10
All Students ADA	< 94	≥ 94 and < 95	≥ 95 and < 96	≥ 96 and < 97	≥ 97

Middle School Point Attribution					
Status (School) Points	3	6	9	12	15
Reading/ELA Proficiency Rate	< 28	≥ 28 and < 40	≥ 40 and < 62	≥ 62 and < 70	≥ 70
Math Proficiency Rate	< 9	≥ 9 and < 33	≥ 33 and < 57	≥ 57 and < 71	≥ 71
Growth (School) Points	2	4	6	8	10
Median Reading/ELA SGP	< 30	≥ 30 and < 43	≥ 43 and < 53	≥ 53 and < 60	≥ 60
Median Math SGP	< 26	≥ 26 and < 42	≥ 42 and < 55	≥ 55 and < 61	≥ 61
% Meeting Reading/ELA AGP	< 16	≥ 16 and < 29	≥ 29 and < 49	≥ 49 and < 57	≥ 57
% Meeting Math AGP	< 14	≥ 14 and < 27	≥ 27 and < 42	≥ 42 and < 53	≥ 53
Gap (Subgroup) Points	0	1	2	3.33	3.33
% FRL Meeting Reading/ELA AGP	< 18	≥ 18 and < 26	≥ 26 and < 36	≥ 36 and < 44	≥ 44
% FRL Meeting Math AGP	< 13	≥ 13 and < 25	≥ 25 and < 37	≥ 37 and < 43	≥ 43
% ELL Meeting Reading/ELA AGP	< 1	≥ 1 and < 2	≥ 2 and < 9	≥ 9 and < 21	≥ 21
% ELL Meeting Math AGP	< 5	≥ 5 and < 10	≥ 10 and < 22	≥ 22 and < 33	≥ 33
% IEP Meeting Reading/ELA AGP	< 1	≥ 1 and < 4	≥ 4 and < 12	≥ 12 and < 20	≥ 20
% IEP Meeting Math AGP	< 2	≥ 2 and < 8	≥ 8 and < 18	≥ 18 and < 25	≥ 25
Gap (Supergroup) Points	0	3	6	10	10
% Supergroup Meeting Reading/ELA AGP	< 15	≥ 15 and < 25	≥ 25 and < 33	≥ 33 and < 41	≥ 41
% Supergroup Meeting Math AGP	< 11	≥ 11 and < 23	≥ 23 and < 35	≥ 35 and < 42	≥ 42
Other Indicator Points	2	4	6	8	10
All Students ADA	< 92	≥ 92 and < 94	≥ 94 and < 96	≥ 96 and < 99	≥ 99

High School Point Attribution

Status/Growth (School) Points	1	2	3	4	5
10th Reading/ELA Proficiency Rate	< 21	≥ 21 and < 41	≥ 41 and < 63	≥ 63 and < 83	≥ 83
10th Math Proficiency Rate	< 19	≥ 19 and < 40	≥ 40 and < 66	≥ 66 and < 86	≥ 86
10th Reading/ELA MGP	< 33	≥ 33 and < 45	≥ 45 and < 57	≥ 57 and < 73	≥ 73
10th Math MGP	< 26	≥ 26 and < 41	≥ 41 and < 57	≥ 57 and < 74	≥ 74
11th Reading/ELA Proficiency Rate	< 45	≥ 45 and < 70	≥ 70 and < 88	≥ 88 and < 99	≥ 99
11th Math Proficiency Rate	< 42	≥ 42 and < 61	≥ 61 and < 87	≥ 87 and < 99	≥ 99
Gap (Subgroup) Points	0	0.5	1	1.5	1.67
11th IEP Reading/ELA Proficiency Gap	< -63	≥ -63 and < -51	≥ -51 and < -33	≥ -33 and < -9	≥ -9
11th IEP Math Proficiency Gap	< -59	≥ -59 and < -47	≥ -47 and < -27	≥ -27 and < -5	≥ -5
11th LEP Reading/ELA Proficiency Gap	< -71	≥ -71 and < -66	≥ -66 and < -51	≥ -51 and < -33	≥ -33
11th LEP Math Proficiency Gap	< -64	≥ -64 and < -57	≥ -57 and < -33	≥ -33 and < -10	≥ -10
11th FRL Reading/ELA Proficiency Gap	< -40	≥ -40 and < -15	≥ -15 and < -1	≥ -1 and < 18	≥ 18
11th FRL Math Proficiency Gap	< -27	≥ -27 and < -16	≥ -16 and < 6	≥ 6 and < 22	≥ 22
Gap (Supergroup) Points	0	1.5	3	4.5	5
11th Supergroup Reading/ELA Proficiency Gap	< -46	≥ -46 and < -20	≥ -20 and < -6	≥ -6 and < 16	≥ 16
11th Supergroup Math Proficiency Gap	< -46	≥ -46 and < -22	≥ -22 and < 1	≥ 1 and < 21	≥ 21
Graduation (Overall) Points	0	0	9	12	15
Graduation Rate	< 11	≥ 11 and < 64	≥ 64 and < 83	≥ 83 and < 97	≥ 97
Graduation Gap (Subgroup) Points	1	2	3	4	5
FRL Graduation Gap	< -41	≥ -41 and < -6	≥ -6 and < 18	≥ 18 and < 38	≥ 38
IEP Graduation Gap	< -60	≥ -60 and < -48	≥ -48 and < -20	≥ -20 and < 4	≥ 4
ELL Graduation Gap	< -60	≥ -60 and < -51	≥ -51 and < -38	≥ -38 and < -12	≥ -12
Graduation Gap (Supergroup) Points	3	6	9	12	15
Supergroup Graduation Gap	< -60	≥ -60 and < -13	≥ -13 and < 14	≥ 14 and < 33	≥ 33
College & Career Readiness Points	4	3	2	1	0
% Need NSHE Remediation	< 13	≥ 13 and < 24	≥ 24 and < 52	≥ 52 and < 73	≥ 73
	0	1	2	3	4
% Earning Advanced Diploma	< 1	≥ 1 and < 18	≥ 18 and < 40	≥ 40 and < 57	≥ 57
% ACT/SAT Participation	< 1	≥ 1 and < 3	≥ 3 and < 36	≥ 36 and < 66	≥ 66
% Passing AP Course	< 1	≥ 1 and < 9	≥ 9 and < 34	≥ 34 and < 99	≥ 99
Other Indicators (School) Points	2	4	6	8	10
All Students ADA	< 85	≥ 85 and < 92	≥ 92 and < 95	≥ 95 and < 99	≥ 99
	4	3	2	1	0
% 9th Grade Credit Deficient	< 1	≥ 1 and < 7	≥ 7 and < 22	≥ 22 and < 82	≥ 82

APPENDIX B: GLOSSARY

“Adequate Yearly Progress” means the measure by which schools, districts, and states are held accountable for student performance under Title I of the *No Child Left Behind Act of 2001 (NCLB)*. AYP was introduced into federal law in the 1994 reauthorization of the Elementary and Secondary Education Act. Under *NCLB*, AYP is used to determine if schools are successfully educating students. *NCLB* requires states to use a single schools accountability system to determine whether all students, as well as individual subgroups, are making progress toward meeting state academic content standards. The goal is for all students to reach proficiency in reading and math by 2014 as measured by performance on state tests. Progress on those standards must be tested yearly in grades 3 through 8 and in one grade in high school.

“Adjusted” means that analysis takes into account (and statistically controls for) the varied demography of schools. An adjusted analysis is often used when an investigation is being undertaken that involves data that vary widely. The argument in favor of “adjusting” is simply that it makes an apples-to-apples comparison possible even in the presence of data that vary widely in their characteristics. In a sense, “adjusting” levels the playing field.

“ACT” means the American College Testing Program established on August 21, 1959. This test is used by many colleges and universities in the United States to assist in the selection of students.

“ADA” means Average Daily Attendance

“Advanced Placement” means a series of high school courses developed by the College Board which provide students with the opportunity to take tests (called Advanced Placement exams) that can earn them college-level course credit.

“AGP” means Adequate Growth Percentile. This is the year-to-year rate of longitudinal academic growth needed by a school to achieve its target proficiency level.

“AIS Jr./Sr.” means Academy of Individualized Study Junior and Senior High School

“AP” means Advanced Placement

“AYP” means Adequate Yearly Progress

“CCSD” means Clark County School District

“Comprehensive” means a particular type of high school that is neither a vocational high school nor a high school that is exclusively focused on a specific career field. Comprehensive high schools generally offer a wide range of college preparatory courses

“Credit Deficient” means a high school student who is not on pace to collect enough course credits to graduate on time.

“CRT” means Criterion Referenced Tests that are annually administered by the State of Nevada.

“CSN” means College of Southern Nevada. In the context of high schools within the Clark County School District, CSN high schools means schools that students attend which concurrently enroll students in programs that culminate in a high school diploma and also in an associate degree diploma.

“CTA” means Career and Technical Academy

“Demography” means free or reduced price lunch (FRL), English learners (ELL), or Individualized Educational Plan (IEP)

“E2” means Governance Policy related to “Student Achievement.” It outlines Board-approved District vision, beliefs, strategic imperatives, and evaluation parameters. It is at http://www.ccsd.net/trustees/pdf/governance/E-02_P.pdf

“Educational output” means points from the Nevada School Performance Framework (hereafter referred to as “NSPF”).

“ELA” means English Language Arts.

“ELL” means English language learner”

“English Language Learner” means any student whose first language is not English and who is not yet fluent with respect to English (in terms of reading, writing, listening and speaking).

“ES” means elementary school

“ESEA” means the Elementary and Secondary Education Act which was enacted in 1965 by the federal government. It prescribes how the federal government directs funds toward K12 public education.

“Free or Reduced Price Lunch” means the national school lunch program. This is a federally assisted lunch program that has been in existence since 1946 which has provided low cost or free lunches to economically-disadvantaged public school students whose families can show they are near or below the poverty level.

“FRL” means free or reduced price lunch

“HLM” means hierarchical linear modelling

“HS” means high school

“IEP” means individualized educational plan

“Individualized Educational Plan” means a plan that is jointly developed by school staff and a student’s parents or guardians and is intended to guide the learning program of a student who qualifies for Special Education Services. The plans are required of all public schools that receive federal aid under the federal Individuals with Disabilities Education Act.

“LEP” means limited English proficiency

“MGP” means Median Growth Percentile. This is the middle value within the range of all individual academic growth percentiles for students at a particular school

“MS” means middle school

“n” means number or sample size

“NAEP” means National Assessment of Educational Progress

“NDE” means Nevada Department of Education

“NSHE” means Nevada System of Higher Education

“NSPF” means Nevada School Performance Framework (see Appendix A for a detailed description)

“Open Book Portal” means a School District web page (<http://www.ccsd.net/district/open-book/index-data.php>). Located at this web page are a series of interactive tools that allow a user to inspect department-by-department appropriations, review staff positions by functional area, analyze budget and staffing in Food Services, review the budgeted funds and expenditures for grant funded projects, and scrutinize the expenditures for a particular District program.

“Proof Points” means objective and quantifiable evidence that supports a particular claim.

“Return on Investment” refers to educational output per dollar expended.

“ROI” means return on investment.

“SAT” means Scholastic Achievement Test that is produced by the Educational Testing Service for use by colleges and universities in the screening of applicants.

“S.D.” means standard deviation

“SGP” means Student Growth Percentile. This is a measure of longitudinal academic growth of a student over time.

“Unadjusted” means that a model is used to describe a relationship between two factors like school performance and per pupil spending is established in a straightforward manner without benefit of any statistical controls.

Unadjusted Displays of NSPF by Per Pupil Expenditures (for High Schools, Middle Schools, and Elementary Schools)

Figure 3: Unadjusted display of NSPF points by per pupil expenditures for high schools (Note that “expenditures” include all but capital spending, transportation spending, or other central office expenditures such as professional development, curriculum development, etc.)

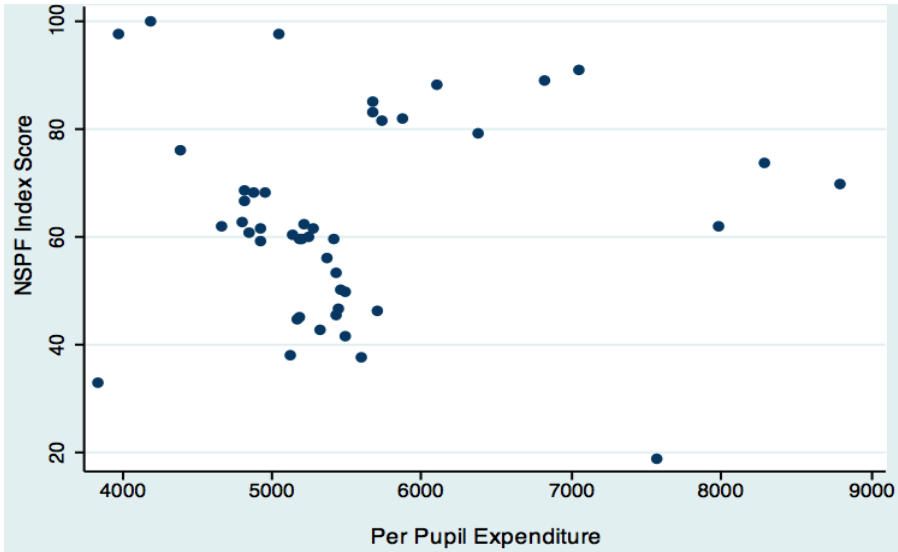


Figure 4: Unadjusted display of NSPF points by per pupil expenditures for middle schools (Note that “expenditures” include all but capital spending, transportation spending, or other central office expenditures such as professional development, curriculum development, etc.)

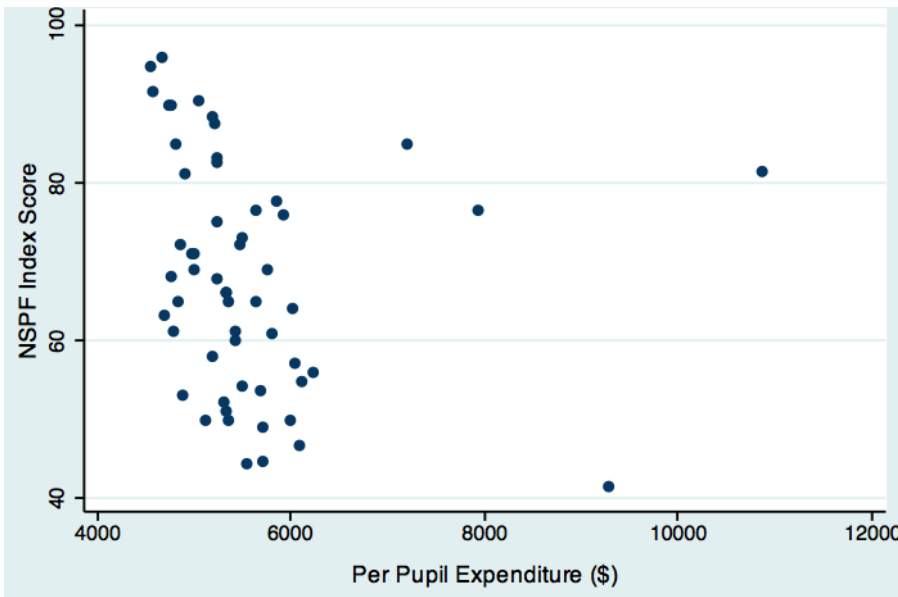


Figure 5: Unadjusted display of NSPF points by per pupil expenditures for elementary schools (Note that “expenditures” include all but capital spending, transportation spending, or other central office expenditures such as professional development, curriculum development, etc.)

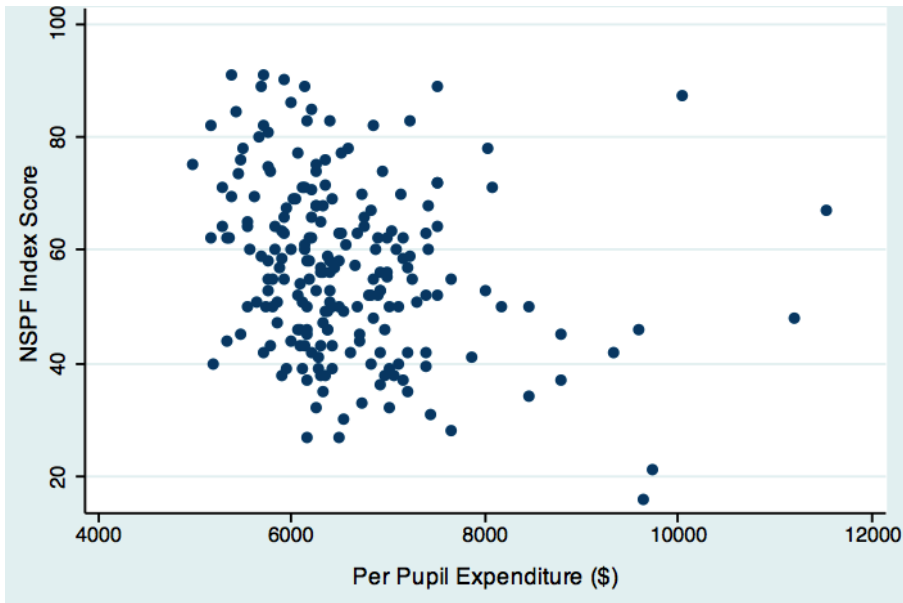


Fig. 6: How HSs compare on NSPF taking into account expenditures and controlling for demography, level, and program

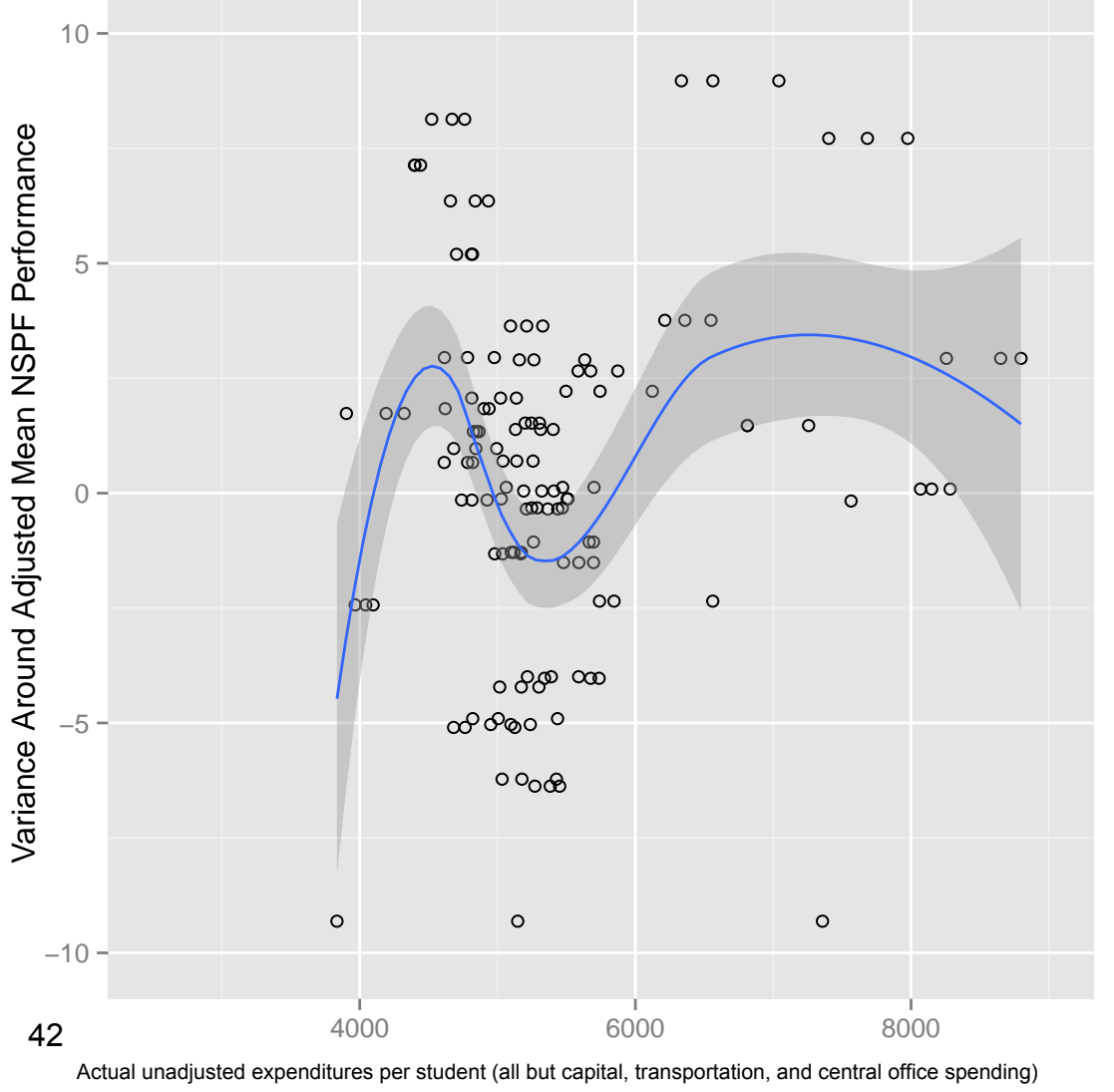


Fig. 7: How MSs compare on NSPF taking into account expenditures and controlling for demography, level, and program

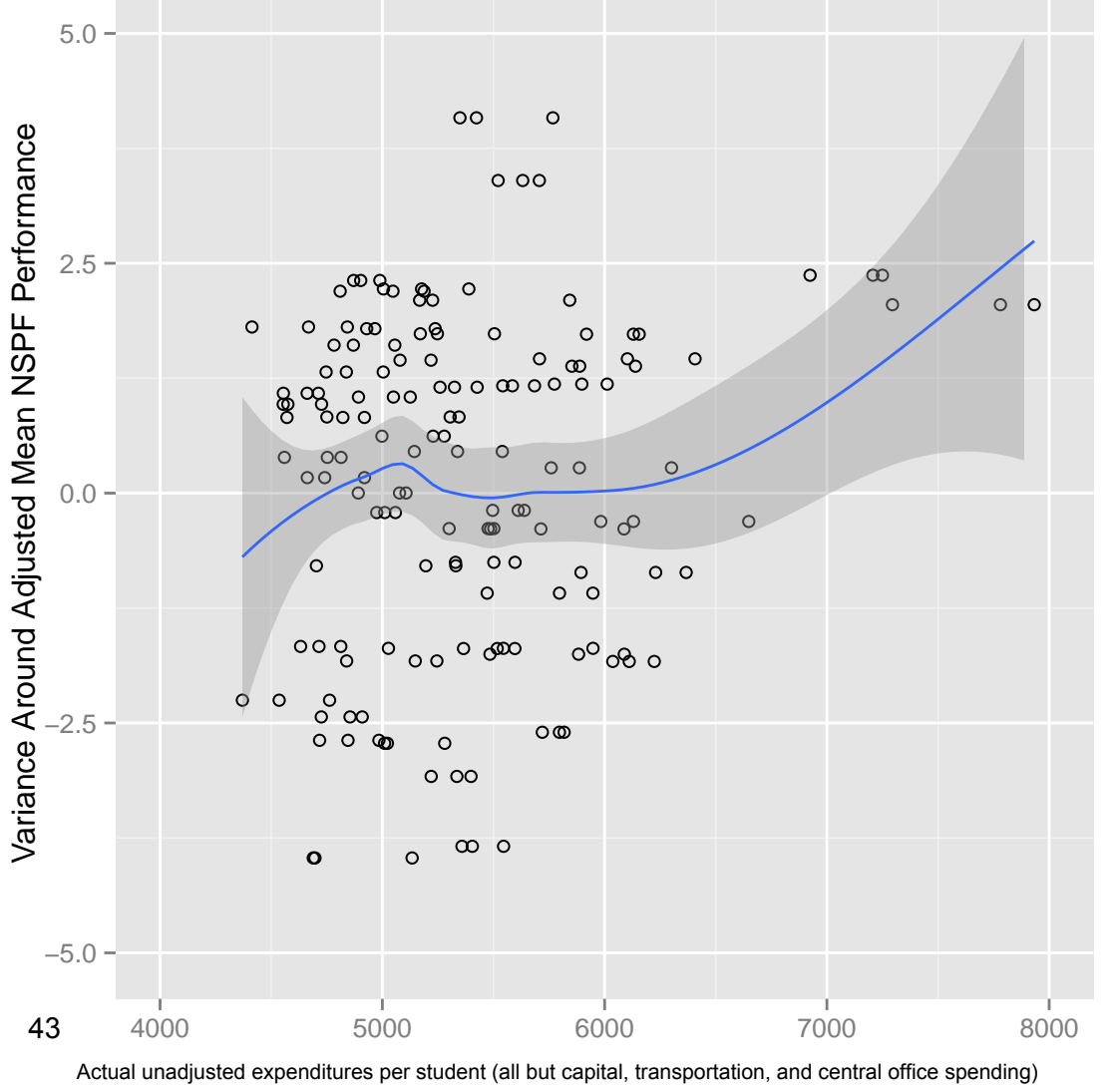


Fig. 8: How ESs compare on NSPF taking into account expenditures and controlling for demography, level, and program

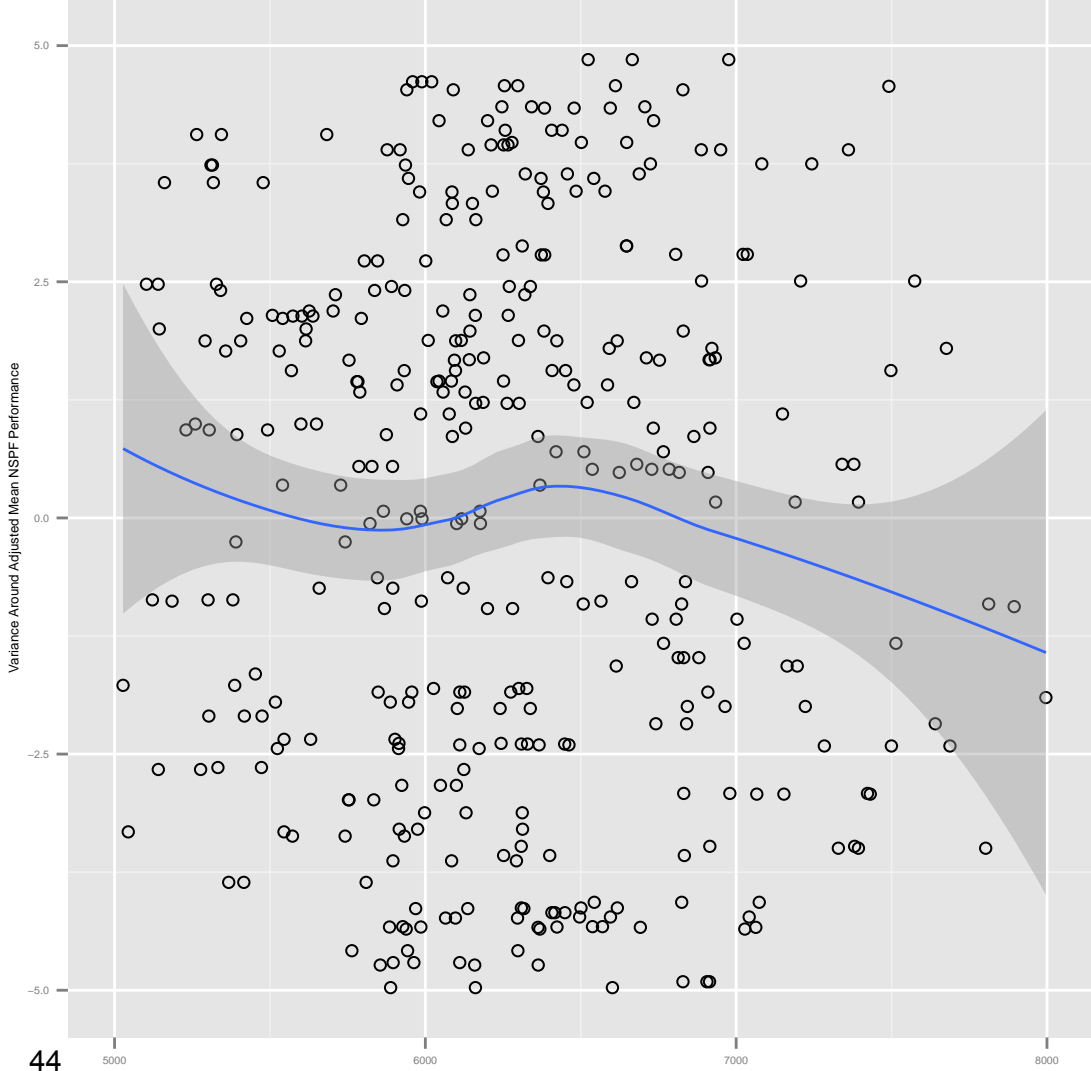
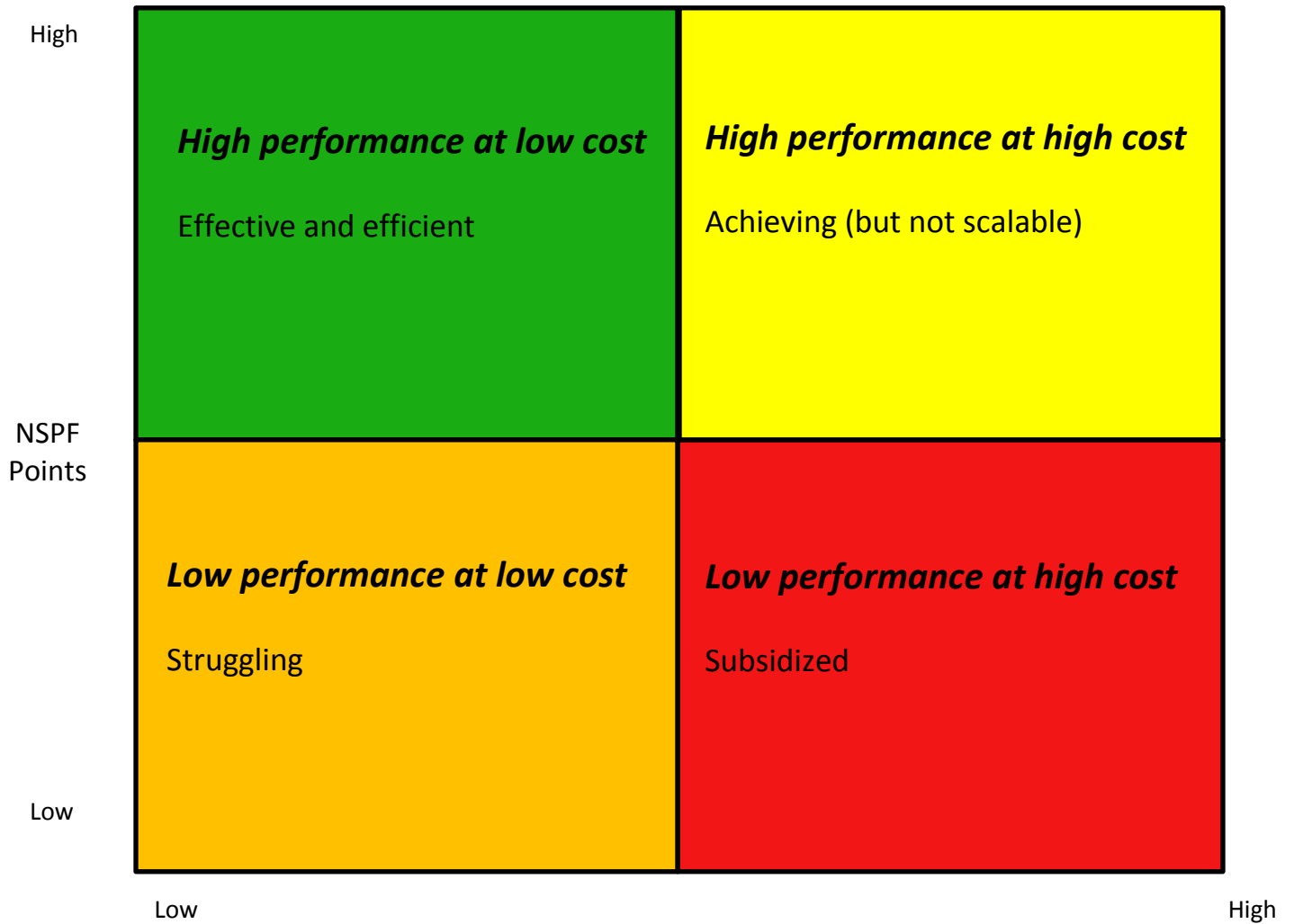
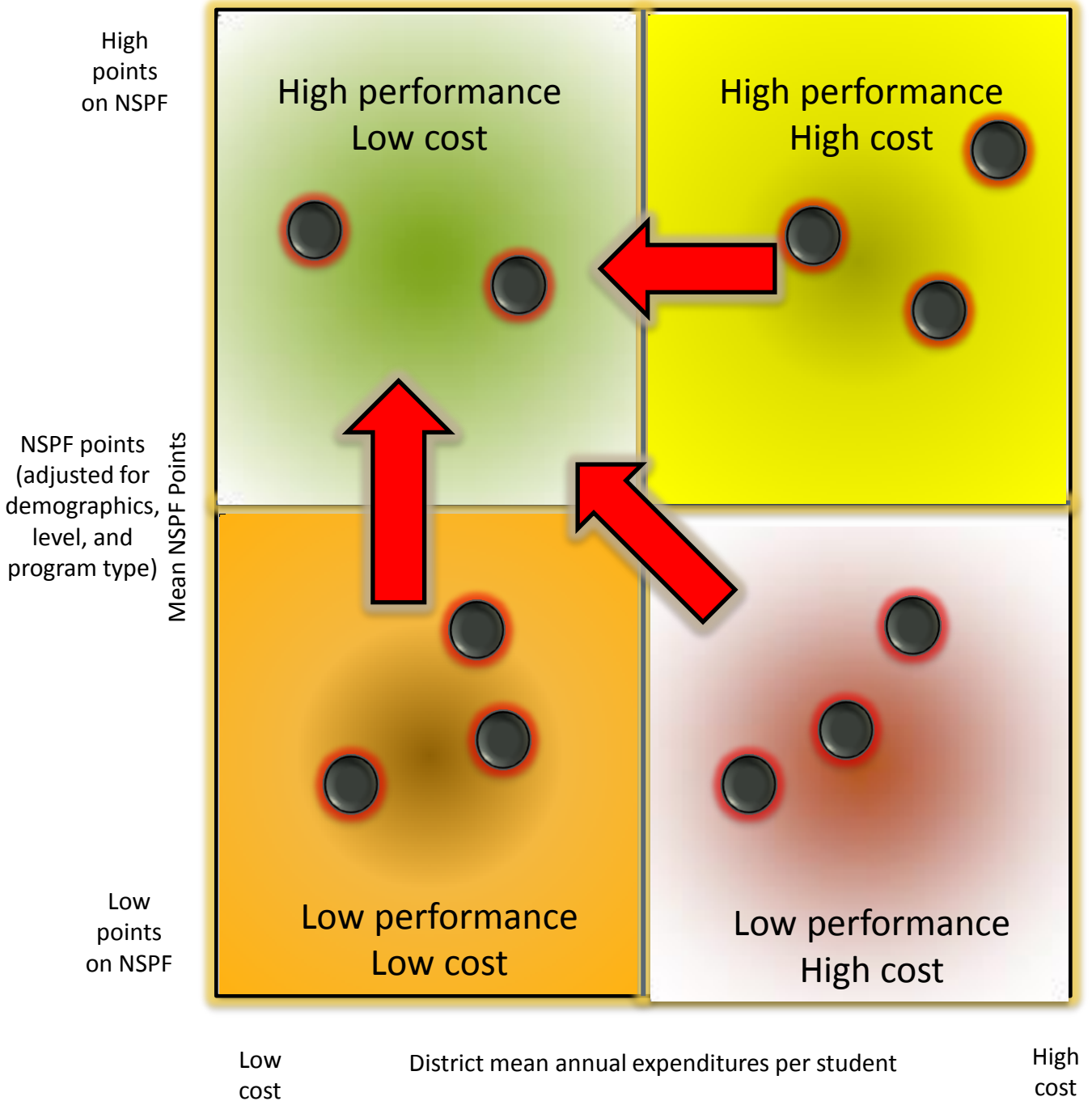


Fig. 9: Sample Display of NSPF Points by Annual Per Pupil Expenditures



Unadjusted expenditures per student (all but capital, transportation, and central office spending)

Fig. 10: Expected Change as Effectiveness and Efficiency Improve



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