

Education

Briefing Series

*Factors Correlated
with Educational
Attainment*



Applied Analysis has been asked by the Las Vegas Chamber of Commerce to examine various aspects of Nevada's system of elementary and secondary education in public schools ("K-12"). One such aspect is the extent to which student achievement is related or unrelated to socio-economic factors and/or measures of school operations, including, without limitation, financial resources. This briefing examines the most commonly cited factors, analyzing each against student performance on standardized exams and graduation rates in all 50 states and the District of Columbia.

Nevada's student test scores frequently fall below national averages, and legislative records indicate population characteristics and school resources have been deliberated, as either assets or challenges, to educational success. However, broad consensus has yet to emerge as to which, if any, of these factors might be most influential, thereby offering a means to improve Nevada's schools. This analysis is intended to provide some perspective relative to this discussion; it is not intended to be comprehensive or conclusive, as the universe of what is not considered is much larger than what is. Intuitively, educational achievement is likely affected by any number of intangibles such as student self-discipline, continuity of experience or culture, examples set by role models or availability of educational resources at home -- this analysis does not address intangibles. Rather, it briefly examines published demographic information and certain measures of institutional resources, offering correlations against the outcome of nationally-administered student achievement tests and graduation rates. State rankings in each category are also provided.

As emphasized in a previous briefing paper in this series, comparisons and analyses of student achievement among states should be carefully qualified since national exams are administered to a relatively small percentage of students.¹ These qualifications aside, such scores are considered relevant by many observers of K-12 education and are the best information available to compare and contrast student achievement nationally. The outcomes considered in this analysis are the National Assessment of Educational Progress (NAEP), the SAT Reasoning Test (formerly Scholastic Aptitude Test) administered by the College Board, the ACT (American College Testing) examination, and high school graduation rates. These outcomes were measured against the following variables.

Socio-Economic and Demographic Variables

- Median household income
- Per capita Income
- Mobility of population
- Native English speaking population
- Poverty rate
- High school attainment
- College attainment
- Minority share of population
- Average unemployment

School Operations Variables

- Total and current expenditure per student
- Student-teacher ratio
- Students per school
- Average teacher salary
- Post-graduate teachers
- Experienced teachers
- Students per school district

¹ See, K-12 Student Achievement Testing. Las Vegas Chamber of Commerce Education Briefing Series, Volume 1, Issue 1. Prepared by Applied Analysis (February 2010).

FINDINGS IN SUMMARY

Measures of student achievement tend to be highly correlated with factors outside the control of the “education system” itself. Exhibit 1 on page four provides a correlation summary for all the factors considered in this analysis. Factors with the highest correlation to student performance on standardized exams in reading and math given to elementary and middle school students included the percentage of the population living in poverty, how often a family moved from place-to-place, the share of the population that is a minority, the average rate of unemployment and the educational attainment of the parents. The same variables were also most highly correlated to high school graduation rates.

School operating variables tended to be much less significant. The number of students per district was indirectly correlated to student achievement on standardized exams (e.g., larger districts tended to have lower scores) but not graduation rates. Large class sizes were negatively correlated with elementary school students’ reading abilities, but not math scores at either the elementary or secondary level or high school graduation rates. Total and operating education expenditures per student were not significant predictors of student achievement on standardized exams at the elementary and middle school level, nor were they correlated in any significant way with high school graduation rates. Variables with statistically significant correlations to high school graduation rates included the number of students per school and experience of teachers.

Two additional observations emerged from this analysis. The significance of each factor to the various education outcomes was determined through a series of statistical correlation matrices. Notably, the best “predictor” of whether students will graduate high school did not come from our list of socio-economic or school operating variables, but from within the list of outcomes itself. Student achievement on 4th grade reading and mathematics exams was more statistically correlated with high school graduation rates than any of the external variables analyzed (See Exhibit 2). Correlations to 8th grade reading and math abilities were higher still. The premise that success in early grades increases the probability of graduation seems virtually self-evident, but population mobility should also be considered. In order to conclusively pursue the relationship between 4th and 8th grade achievement and the current graduation rates, data for today’s high school students would have to be drawn from NAEP records up to eight years old from the states in which such students resided at that time, an exercise well beyond the scope of this analysis. Notwithstanding this consideration, the notion that success in high school relies on effective education in the early grades should not be dismissed or discounted.

Though individual variables exhibited greater, lesser or mixed influence on educational outcomes, a secondary analysis that looked at all inputs and all outputs combined, as opposed to individual variables correlated on a one-to-one basis, showed strong, positive relationship (See Exhibit 3). As a group, composite socio-

Education Briefing Series

economic and school operating variables were highly correlated to composite standardized test scores and graduation rate outcomes. While some states appeared to get more out of their education system compared to what they put in (e.g., North Dakota reported an average ranking of 22nd for the socio-economic and school operations input variables and an average national ranking of 10th in terms of education outcomes on standardized test score performance and high school graduation rates), others reported underperformance (e.g., the District of Columbia reported an average ranking of 26th for education input variables while ranking dead last in terms of education outcomes), states that put more “in” tended to get more “out” and vice versa. Nevada reported an average input ranking of 37th and an average outcome ranking of 42nd. Nevada’s average education input ranking was second lowest behind Arizona, which reported an average ranking of 38th. Nevada’s composite education output ranking (42nd) was behind only the District of Columbia (50th), Mississippi (44th), and Louisiana, New Mexico and South Carolina all which reported an average education output ranking that placed approximately at 43rd nationally.

Exhibit 1

Summary of Individual Correlations for Educated-Related Inputs and Education-Related Outcomes

(Pearson's Correlations*)

	EDUCATIONAL OUTCOMES											High School Graduation Rate ⁴		
	NAEP (4th Grade) ¹		NAEP (8th Grade) ¹		SAT ²				ACT ³					
	Math	Reading	Math	Reading	Math	Reading	Writing	Composite	English	Math	Reading		Science	Composite
Socio-Economic Variables														
Median Household Income	0.336	0.255	0.322	0.259	-0.300	-0.374	-0.332	-0.338	0.479	0.625	0.489	0.433	0.536	0.177
Per Capita Income	0.125	0.154	0.084	0.094	-0.307	-0.333	-0.270	-0.306	0.309	0.407	0.278	0.201	0.321	0.074
Household Mobility	-0.318	-0.456	-0.241	-0.365	0.084	0.140	0.036	0.088	-0.473	-0.375	-0.329	-0.372	-0.403	-0.306
Interstate Mobility	-0.265	-0.323	-0.235	-0.308	-0.257	-0.162	-0.239	-0.221	-0.263	-0.211	-0.160	-0.277	-0.220	-0.302
Native English Speaking Population	-0.124	-0.203	-0.131	-0.219	-0.345	-0.422	-0.395	-0.390	0.092	0.291	0.114	0.040	0.155	-0.238
Poverty Rate	-0.732	-0.593	-0.720	-0.673	-0.086	-0.012	0.007	-0.031	-0.577	-0.671	-0.680	-0.714	-0.666	-0.527
High School Attainment	0.618	0.472	0.646	0.646	0.240	0.202	0.153	0.200	0.371	0.467	0.514	0.573	0.478	0.575
College Attainment	0.228	0.246	0.205	0.184	-0.301	-0.332	-0.281	-0.307	0.388	0.491	0.381	0.301	0.413	0.173
Minority Share	-0.580	-0.606	-0.589	-0.671	-0.411	-0.437	-0.401	-0.420	-0.321	-0.178	-0.392	-0.460	-0.325	-0.610
Average Unemployment	-0.503	-0.509	-0.481	-0.507	-0.207	-0.188	-0.172	-0.191	-0.412	-0.358	-0.447	-0.498	-0.413	-0.395
School Operations Variables														
Total Expenditure Per Student	0.152	0.214	0.095	0.149	-0.415	-0.445	-0.384	-0.418	0.311	0.402	0.280	0.222	0.323	0.095
Current Expenditure Per Student	0.195	0.266	0.133	0.194	-0.400	-0.423	-0.356	-0.396	0.402	0.444	0.348	0.291	0.391	0.164
Student-Teacher Ratio	-0.267	-0.369	-0.191	-0.231	0.017	0.001	-0.035	-0.005	-0.201	-0.098	-0.106	-0.134	-0.127	-0.161
Students Per School	-0.145	-0.097	-0.220	-0.247	-0.469	-0.528	-0.476	-0.495	0.010	0.071	-0.078	-0.156	-0.007	-0.430
Average Teacher Salary	0.013	0.030	-0.032	-0.031	-0.378	-0.451	-0.365	-0.401	0.293	0.412	0.224	0.176	0.312	-0.023
Post-Graduate Teachers	0.047	0.234	0.023	0.131	-0.110	-0.130	-0.079	-0.107	0.211	0.159	0.178	0.171	0.187	-0.055
Experienced Teachers	0.135	0.168	0.128	0.200	0.224	0.280	0.260	0.256	-0.014	-0.154	-0.013	0.038	-0.052	0.288
Students Per District	-0.257	-0.334	-0.346	-0.371	-0.318	-0.351	-0.341	-0.339	-0.149	-0.041	-0.188	-0.226	-0.139	-0.254

***Pearson's Correlations**

The correlation between two variables generally reflects the degree to which those same variables are related. The most common measure of correlation is the Pearson Product-Moment Correlation ("Pearson's Correlations"). Pearson's correlation reflects the degree of linear relationship between two variables. It ranges from +1 to -1. A correlation of +1 indicates that there is a perfect positive linear relationship between the two variables being analyzed; a value of -1 means there is a perfect negative relationship between two variables. Scores approaching zero, by contrast, are highly independent of one another. Importantly, Pearson's Correlation only identifies linear relationships between two variables; other non-linear relationships might also exist.

Cells highlighted in green indicate statistical significance between the two intersecting variables at the 95-percent confidence level (e.g., there is a statistically significant relationship between a state's poverty rate and its students' performance on 4th grade NAEPs math exams). Statistical significance essentially means that the identified relationship between the two variables is unlikely to be simply a matter of chance. With 51 observations (i.e., the 50 states and the District of Columbia) statistical significance is reached at the 95-percent confidence level when the correlation coefficient (figures in the table above) exceeds .273; statistical significance at the 99-percent confidence interval is reached when the coefficient reaches .354. Positive numbers indicate a direct relationship, where higher input values are associated with higher outcome values (e.g., higher rates of high school attainment among the adult population are associated with higher graduation rates for current students). By contrast, negative values reflect an indirect relationship, where higher input values are associated with lower outcome values (e.g., larger class sizes are associated with lower reading test scores for 4th grade students).

¹Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009.

²Source: The College Board, 2009 SAT State Reports, <http://professionals.collegeboard.com/data-reports-research/sat/cb-seniors-2009>.

³Source: ACT, 2009 ACT State Reports. <http://www.act.org/news/data/09/states.html>.

⁴Source: Education Week December 2008. http://www.edweek.org/apps/dc2008/state_compare.html#table_1.

Exhibit 2 Summary of Various Correlations to High School Graduation Rates

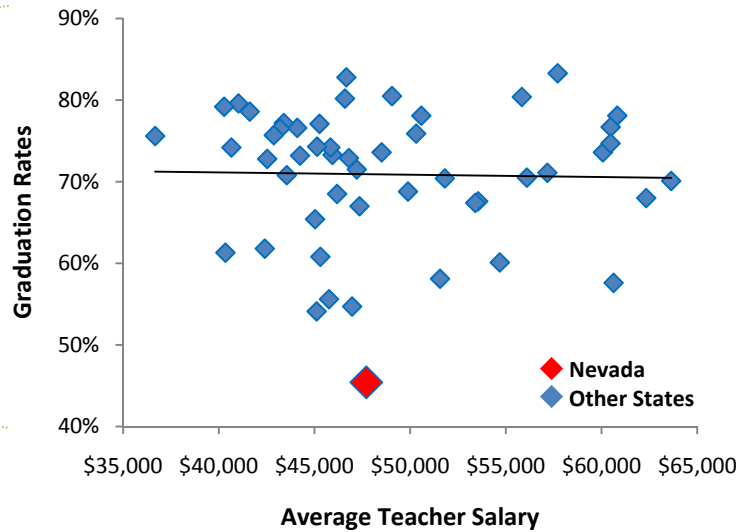
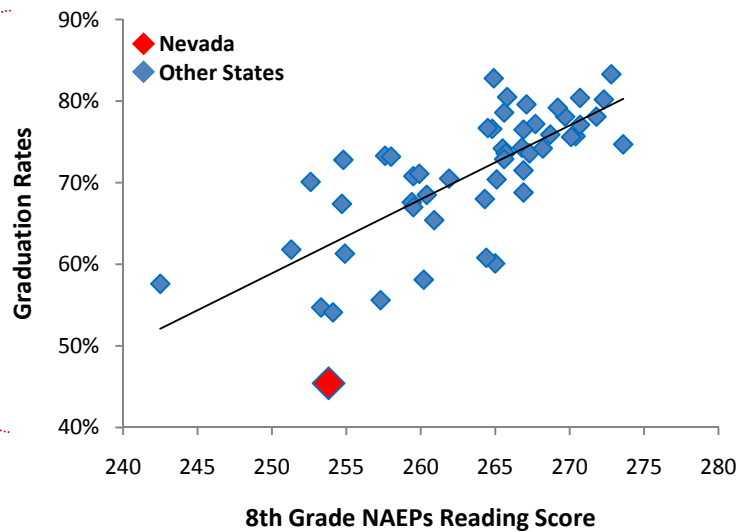
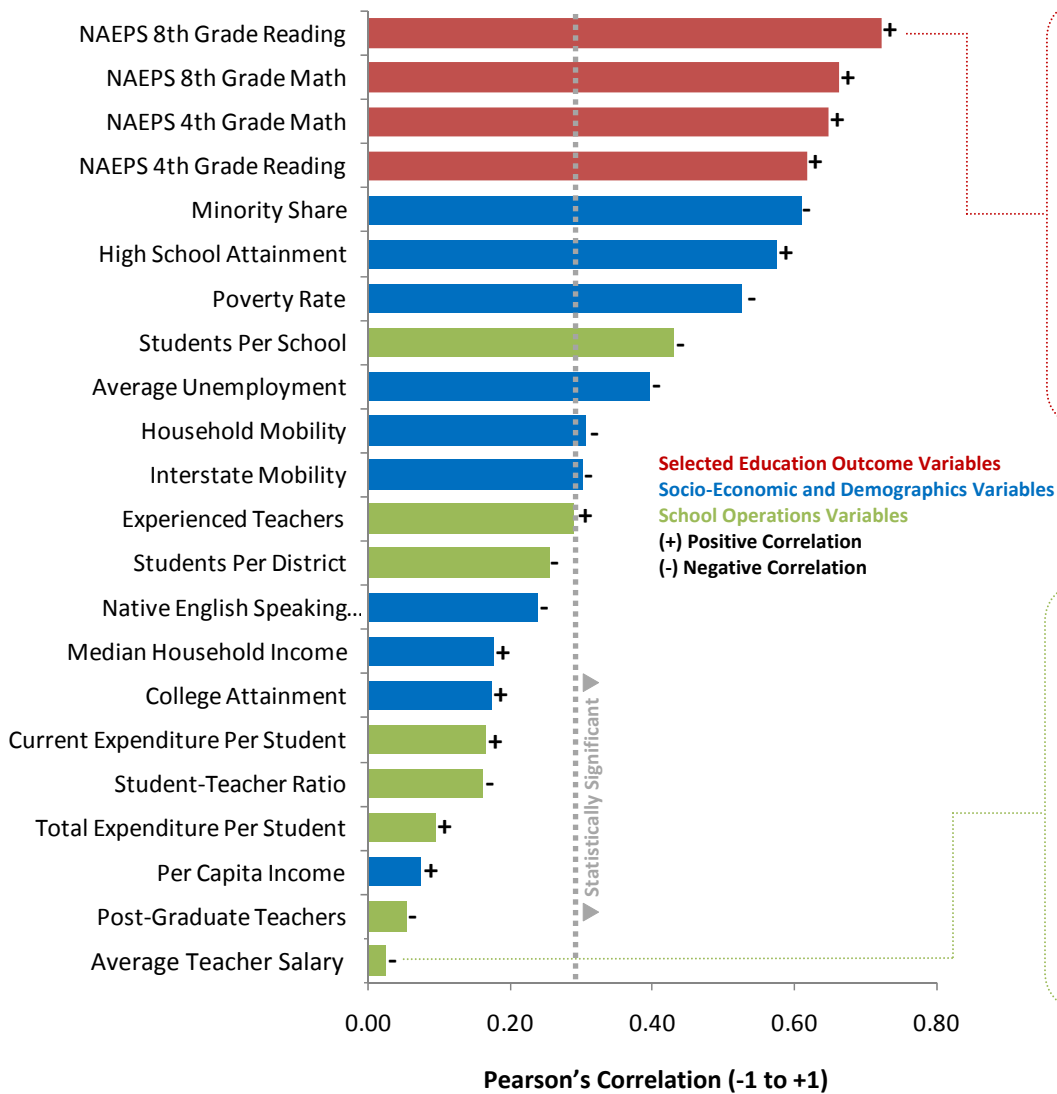
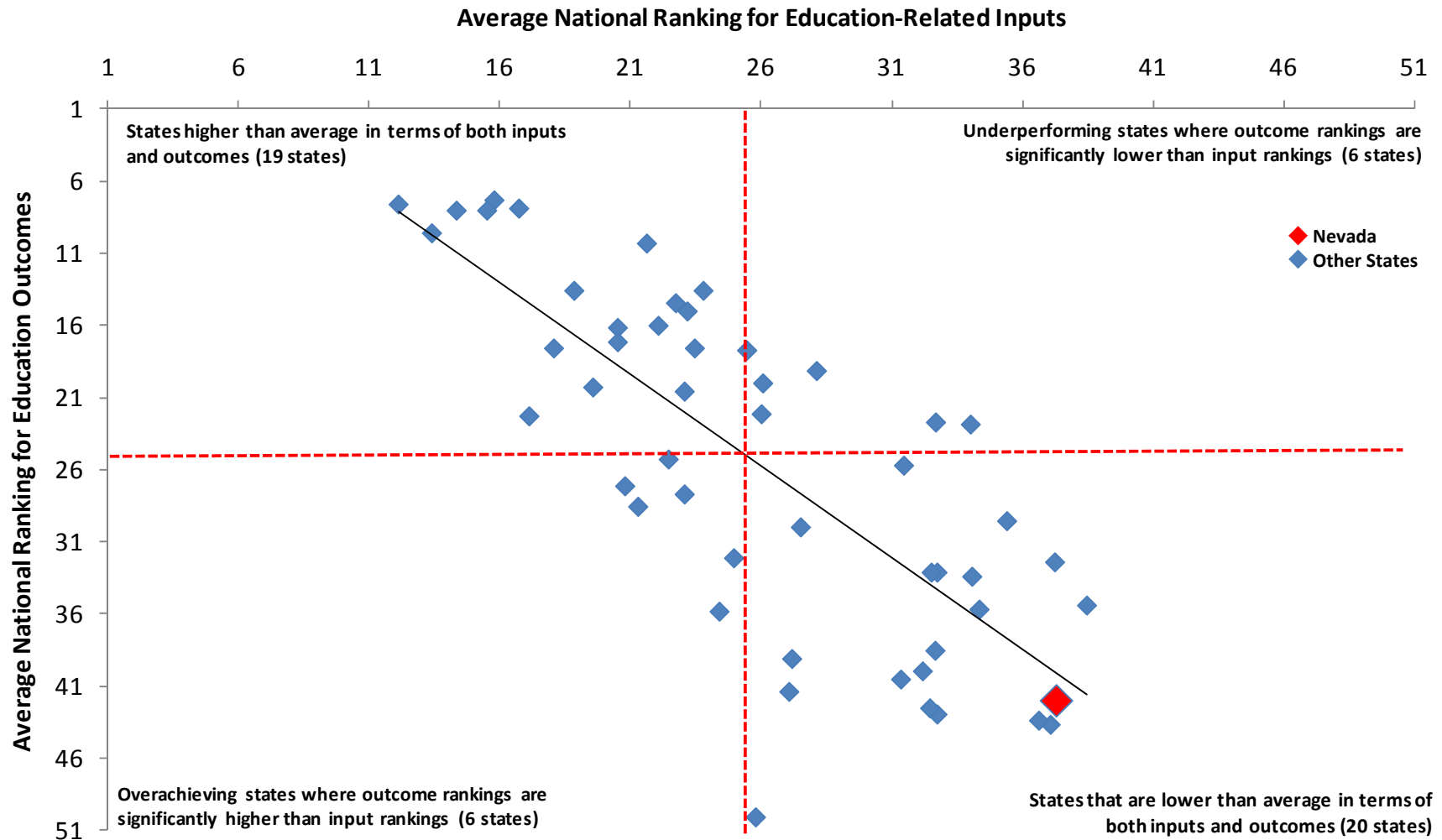


Exhibit 3

Summary of Composite Correlations for Educated-Related Inputs and Education-Related Outcomes



Note: Input rankings include all socio-economic and demographic variables analyzed in this report and detailed in Exhibit 1. Each input variable was weighted equally. Outcome rankings includes 4th and 8th grade NAEP’s scores, graduation rates and composite SAT and ACT scores (categorical scores for each subject area (e.g., SAT math) were omitted from this analysis). Each education outcome variable was also equally weighted. The composite correlation shown above merely demonstrates that when taken together, the average state rankings for factors commonly linked to education tend to be highly correlated with common measures of student and/or school performance. Nevada (◆), for example, reports an average state ranking for education inputs of 37th, which is the second lowest in the nation; at the same time, the state reports an average outcome ranking of 42nd nationally, also among the nation’s lowest.

RESULTS OF CORRELATION BASED ANALYSES

In addition to Exhibits 1 through 3 on the preceding pages, the results of this analysis are summarized in two detailed exhibits provided in the briefing appendix. Appendix 1 provides a summary of the national rankings for all of the socio-economic and school operating variables analyzed as well as all of the educational outcome data. Appendix 2 provides scatter-plot charts for each individual correlation, illustrating the relative strength and direct or indirect nature of the relationship. The sections that follow briefly outline the results of each analysis.

We have included an analysis of correlations between both the SAT and ACT college entrance exams because of their recurring place within the student-achievement dialog; however, individual variable outcomes have been discounted for purposes of this preliminary analysis. Results on these exams are highly influenced by the number of students taking these exams. Nevada, for example, reported an average ACT score of 21.5 in 2009, better than the national average (21.1) and ranking 28th among the 50 states and the District of Columbia. That said, only 30 percent of Nevada graduates took the exam. The only state with average ACT scores below Nevada's that also reported a lower share of its graduates sitting for the exam was Alaska, where 29 percent of graduates took the exam and reported an average score of 21.0. There are also some internal inconsistencies between the two exams. Massachusetts' students, for example, rank 1st in the nation on the ACT exam but 27th in the nation on the SAT, while Michigan graduates ranked 6th on the SAT but 47th on the ACT. The latter example is largely the result of administering the ACT to all 11th grade students in Michigan, one of several states that have adopted the exam as a requirement. The result is a mixed bag of consistent and inconsistent results, some significant and some not. While there are meaningful insights that can be drawn from these outcomes, additional study that is beyond the scope of this analysis would be required to fully flesh them out.

SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS

Median Household Income

Source: U.S. Census Bureau

Definition: Median household income is the value that divides the income distribution to two equal groups, half having incomes above the median, half having incomes below the median. The median is essentially the center point that does not reflect the skewing in a simple average that can occur from clusters of very high or very low household incomes on one side of the distribution. The most recent data available are for 2008.

Rankings:

U.S. Average: \$52,029
 Nevada Average: \$56,432
 Nevada Ranking: 16th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
4 th Grade Mathematics Ability (+)	4 th Grade Reading Ability
8 th Grade Mathematics Ability (+)	8 th Grade Reading Ability
SAT Math Score (-)	High School Graduation
SAT Reading Score (-)	
SAT Writing Score (-)	
SAT Composite Score (-)	
ACT English Score (+)	
ACT Math Score (+)	
ACT Reading Score (+)	
ACT Science Score (+)	
ACT Composite Score (+)	

Commentary: Students in states with higher median household incomes tend to do better on 4th and 8th grade math exams, although no similar correlations were found for reading performance or high school graduation rates. Inconsistent correlations are present between SAT and ACT college entrance exams and show no statistically significant correlation to high school graduation rates. Correlations appear to be largely influenced by the population of students taking the exam in each state. When reviewed against combined composite score for ACT and SAT, no consistent significant relationship is present.

Per Capita Income

Source: U.S. Department of Commerce Bureau of Economic Analysis, U.S. Census Bureau

Definition: Per capita income is the mean money income received computed for every man, woman and child in the state. It is derived by dividing the total income of all people 15 years old and over in a geographic area by the total mid-year population in that area. Unlike median household income, per capita income will reflect clusters of higher or lower income groups within the income distribution. The most recent data available are for 2008 and dollars are reflective of that year and not adjusted for inflation.

Rankings:

U.S. Average: \$40,208
 Nevada Average: \$41,182
 Nevada Ranking: 18th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
SAT Math Score (-)	4 th Grade Reading Ability
SAT Reading Score (-)	4 th Grade Mathematics Ability
SAT Composite Score (-)	8 th Grade Reading Ability
ACT English Score (+)	8 th Grade Mathematics Ability
ACT Math Score (+)	SAT Writing Score
ACT Reading Score (+)	ACT Science Score
ACT Composite Score (+)	High School Graduation

Commentary: Per capita personal incomes demonstrated less of a relationship to student achievement than median household incomes. Inconsistent correlations are again present between SAT and ACT college entrance exams and no correlation to high school graduation rates or elementary or secondary performance are present. Significant correlations appear to be largely influenced by the population of students taking the exam in each state. When reviewed against combined composite score for ACT and SAT, no significant relationship present.

Household Mobility

Source: U.S. Census Bureau

Definition: Household mobility is the percentage of the population for which their current residence is different from their residence one year prior. The most recent data available are for 2008.

Rankings:

U.S. Average: 15.6%

Nevada Average: 21.0%

Nevada Ranking: 50th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
4 th Grade Reading Ability (-)	8 th Grade Mathematics Ability
4 th Grade Mathematics Ability (-)	SAT Math Score
8 th Grade Reading Ability (-)	SAT Reading Score
ACT English Score (-)	SAT Writing Score
ACT Math Score (-)	SAT Composite Score
ACT Reading Score (-)	
ACT Science Score (-)	
ACT Composite Score (-)	
High School Graduation (-)	

Commentary: Continuity of the educational experience is not only relevant, but appears to be highly correlated to student achievement measures at all levels. States reporting a higher likelihood to move from one house to another also reported lower standardized test scores in 4th and 8th grade reading as well as 4th grade math and graduation rates. ACT exams were also negatively correlated to mobility at significant levels. Nevada had the second highest rate of household movement in the nation (behind only Alaska), suggesting measures aimed at helping students adjust and assimilate into new environments may be particularly important.

Interstate Mobility

Source: U.S. Census Bureau

Definition: The percentage of the population for which their current residence is in a different state from their residence one year prior. The most recent data available are for 2008.

Rankings:

U.S. Average: 2.4%
 Nevada Average: 4.7%
 Nevada Ranking: 47th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
4 th Grade Reading Ability (-)	4 th Grade Mathematics Ability
8 th Grade Reading Ability (-)	8 th Grade Mathematics Ability
ACT Science Score (-)	SAT Math Score
High School Graduation (-)	SAT Writing Score
	SAT Reading Score
	SAT Composite Score
	ACT English Score
	ACT Math Score
	ACT Reading Score
	ACT Composite Score

Commentary: Moving between states has a similar, but not necessarily greater, relationship to student achievement than does moving house-to-house generally. That said, moving from one state to another is negatively correlated to student achievement in 4th and 8th grade reading as well as high school graduation rates. Nevada reports the 5th highest interstate mobility rate in the nation, and it is also worth noting that two years ago (2006), Nevada was second only to the District of Columbia. The Great Recession has slowed the mobility rate across the nation and in Nevada. This high rate of interstate mobility may also suggest that many of the attainment challenges facing Nevada students are the result of prior educational experiences outside of the state.

Native English Speaking Population

Source: U.S. Census Bureau

Definition: Population 5 years and over that speaks a language other than English at home. The most recent data available are for 2008.

Rankings:

U.S. Average: 19.7%
 Nevada Average: 27.9%
 Nevada Ranking: 47th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
SAT Math Score (-)	4 th Grade Reading Ability
SAT Writing Score (-)	4 th Grade Mathematics Ability
SAT Reading Score (-)	8 th Grade Reading Ability
SAT Composite Score (-)	8 th Grade Mathematics Ability
ACT Math Score (+)	ACT English Score
	ACT Science Score
	ACT Reading Score
	ACT Composite Score
	High School Graduation

Commentary: An estimated 28 percent of Nevada’s households report speaking a language other than English in their homes. While the number of non-English speakers, particularly those speaking Spanish, is commonly cited as an underlying cause for poor overall student performance, the number and strength of the correlations are modest at best and at times inconsistent. New Jersey reports comparable share of populations that are not native speakers (27.9 percent), while also reporting significantly higher-than-average test scores for 4th grade and 8th grade students in math and reading. Similarly, New York and Texas have higher percentages of non-native English speakers yet New York exceeds the national average score in all four NAEP tests, and Texas exceeds the national average in two of the NAEP tests. Nevada falls well below the national average in all four exams. Mississippi and Washington, D.C., by contrast, report lower shares of non-native speakers and significantly lower test scores than those reported for Nevada. While it is intuitive that English language learners would have a more difficult time in school and might be expected to perform at lower levels on standardized exams, as witnessed across all levels of the SAT exam; taken alone, the simple fact that a population prefers to communicate in a language other than English does not appear to be a reliable predictor of educational attainment in public schools.

Poverty Rate

Source: U.S. Census Bureau

Definition: Poverty rate is the number of individuals considered in poverty as a percentage of the total population in a geographic area. Poverty status is defined by family. The characteristics of the family used to determine the poverty threshold are: number of people, number of related children under 18 and whether or not the primary householder is over age 65. The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. Family income is compared to the poverty threshold, if that family's income is below that threshold, then the family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but are updated for inflation using Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (e.g., public housing, Medicaid and food stamps). The most recent data available are for 2008.

Rankings:

U.S. Average: 16.5%

Nevada Average: 13.2%

Nevada Ranking: 21st

Correlations (positive/negative):

Significantly Correlated With

- 4th Grade Reading Ability (-)
- 4th Grade Mathematics Ability (-)
- 8th Grade Reading Ability (-)
- 8th Grade Mathematics Ability (-)
- ACT English Score (-)
- ACT Math Score (-)
- ACT Science Score (-)
- ACT Reading Score (-)
- ACT Composite Score (-)
- High School Graduation (-)

Not Significantly Correlated With

- SAT Math Score
- SAT Writing Score
- SAT Reading Score
- SAT Composite Score

Commentary: No socio-economic variable is more closely related to elementary and middle school student test scores in math and reading than the percentage of a state's population living in poverty. Nevada has historically fared well in this category, although the state's poverty rate is assuredly on the rise. Poverty is also highly correlated to the high-school graduation rate, ranking third behind only the high school attainment rate of the adult population and share of the population that is a minority.

High School Attainment

Source: U.S. Census Bureau

Definition: The percentage of the population that is 25 years and over with at least a high school diploma, GED or equivalent alternative. The most recent data available are for 2008.

Rankings:

U.S. Average: 85.0%

Nevada Average: 83.5%

Nevada Ranking: 40th

Correlations (positive/negative):

Significantly Correlated With

- 4th Grade Reading Ability (+)
- 4th Grade Mathematics Ability (+)
- 8th Grade Reading Ability (+)
- 8th Grade Mathematics Ability (+)
- ACT English Score (+)
- ACT Math Score (+)
- ACT Science Score (+)
- ACT Reading Score (+)
- ACT Composite Score (+)
- High School Graduation (+)

Not Significantly Correlated With

- SAT Math Score
- SAT Writing Score
- SAT Reading Score
- SAT Composite Score

Commentary: The percentage of the population with at least a high school degree tends to reflect two important characteristics of a state’s economy: (1) the educational requirements to secure gainful employment within the core economy; and (2) the educational attainment of the adult population, including the parents of school-age children. High school attainment of the adult population is highly correlated with student achievement on standardized tests at all levels as well with graduation rates. For a very long time, Nevada’s workforce prospered with less need for extensive educational training, at least not the kind that comes in a traditional classroom setting. As the economy slows, the transitional difficulties of retraining and repositioning an uneducated workforce is apparent as is the potential for a race to the bottom with less educated parents less able to provide help and support to their children to supplement what they are not getting from an overcrowded, under-resourced or otherwise insufficient public school system.

College Attainment

Source: U.S. Census Bureau

Definition: The percentage of the population that is 25 years and over with at least a bachelor’s degree or higher. The most recent data available are for 2008.

Rankings:

U.S. Average: 27.7%

Nevada Average: 21.9%

Nevada Ranking: 46th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
SAT Math Score (-)	4 th Grade Reading Ability
SAT Writing Score (-)	4 th Grade Mathematics Ability
SAT Reading Score (-)	8 th Grade Reading Ability
SAT Composite Score (-)	8 th Grade Mathematics Ability
ACT English Score (+)	High School Graduation
ACT Math Score (+)	
ACT Science Score (+)	
ACT Reading Score (+)	
ACT Composite Score (+)	

Commentary: Unlike high school attainment, college attainment does not appear to be highly correlated with student achievement. Relationships to SAT and ACT scores are significant, but are inconsistent and are likely impacted by secondary factors. Notably, states like Massachusetts have among highest population shares with a college degree and report among the highest levels of student achievement while jurisdictions like Washington, D.C. also report a very high ratio of its population that is college educated, but a very poor student achievement record. Perhaps more important, is the middle of the distribution where the relationship between the college education of the population and student achievement is essentially white noise.

Minority Share

Source: U.S. Census Bureau

Definition: While Hispanic origin is considered an ethnicity, not a race, and Hispanics may be of any race, this definition identifies those in the population as being other than “non-Hispanic white” per the Census 2000 questions on race. The original race data from the 2000 Census is modified to reflect changes in the population up to the most recent data available, 2007.

Rankings:

U.S. Average: 34.0%

Nevada Average: 42.0%

Nevada Ranking: 46th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
4 th Grade Reading Ability (-)	ACT Math Score
4 th Grade Mathematics Ability (-)	
8 th Grade Reading Ability (-)	
8 th Grade Mathematics Ability (-)	
SAT Math Score (-)	
SAT Writing Score (-)	
SAT Reading Score (-)	
SAT Composite Score (-)	
ACT English Score (-)	
ACT Science Score (-)	
ACT Reading Score (-)	
ACT Composite Score (-)	
High School Graduation (-)	

Commentary: The share of the population classified as a “minority” is the variable most closely correlated to educational attainment of the 18 education-related inputs reviewed in this analysis. Reporting a statistically significant relationship to every educational outcome barring ACT math scores, the share of the population that is a minority had the greatest individual correlation (in terms of relative strength) to both 4th grade reading and high school graduation rates. Certainly there are causal factor impacting these relationships, as simply classifying oneself as non-Hispanic white has little to do with the ability to read, write or learn algebra. That said, the degree to which minority status of the resident population and student achievement walk hand in hand is nothing short of compelling.

Average Unemployment (Last 10 Years)

Source: U.S. Census Bureau

Definition: The number of unemployed as a percent of the labor force. Unemployment rate is calculated on a monthly basis and averaged over a ten-year period. While data is available through February 2010, to keep consistent with variables in this study, the most recent data used is through 2008.

Rankings:

U.S. Average: 5.0%
 Nevada Average: 5.0%
 Nevada Ranking: 31st

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
4 th Grade Reading Ability (-)	SAT Math Score
4 th Grade Mathematics Ability (-)	SAT Writing Score
8 th Grade Reading Ability (-)	SAT Reading Score
8 th Grade Mathematics Ability (-)	SAT Composite Score
ACT English Score (-)	
ACT Math Score (-)	
ACT Science Score (-)	
ACT Reading Score (-)	
ACT Composite Score (-)	
High School Graduation (-)	

Commentary: It would appear that economic stability is also highly correlated with educational attainment for K-12 students. Higher rates of unemployment over an extended period of time indirectly correlate to 4th and 8th grade math and reading scores at statistically significant levels. The same is true for high school graduation rates; and, there is at least some indication of an indirect relationship between longer-run unemployment rates and student performance on college entrance exams.

SCHOOL OPERATIONS AND RESOURCE ALLOCATIONS

Total Expenditures Per Student

Source: U.S. Department of Education

Definition: The sum of all expenditures, including capital outlay and interest on school debt, used in public elementary and secondary education divided by the number of all pupils enrolled during the fall. Expenditures for instruction, administration, operations, property, buildings, health, attendance, speech pathology services, curriculum development, staff training, libraries, media and computers are included. The most recent data available are for fiscal year 2007.

Rankings:

U.S. Average: \$11,417
 Nevada Average: \$10,084
 Nevada Ranking: 35th

Correlations (positive/negative):

Significantly Correlated With

SAT Math Score (-)
 SAT Writing Score (-)
 SAT Reading Score (-)
 SAT Composite Score (-)
 ACT English Score (+)
 ACT Math Score (+)
 ACT Reading Score (+)
 ACT Composite Score (+)

Not Significantly Correlated With

4th Grade Reading Ability
 4th Grade Mathematics Ability
 8th Grade Reading Ability
 8th Grade Mathematics Ability
 ACT Science Score
 High School Graduation

Commentary: Perhaps the most commonly cited factor assumed to impact student performance, total spending per student on education appears to have very little correlation to key student achievement metrics. Although independently significant, ACT and SAT scores are inconsistent as total spending is associated with both higher (ACT) and lower (SAT) outcomes. Opponents to increasing school funding commonly cite Washington, D.C. as the example of why more funding does not result in better student performance, as the District spends more than \$19,000 per student each year and reports among the lowest test scores in the nation and a sub 60-percent high school graduation rate. Those same critics tend to omit that the next four highest spending states, New Jersey (\$17,955 per student), New York (\$17,636 per student), Wyoming (\$16,318 per student) and Connecticut (\$16,182 per student) all tend toward the higher end of the student achievement spectrum. There is also the common example of Utah, which spends a mere \$7,272 per student, but reports higher-than-average attainment in most outcome categories and graduates an impressive 79 percent of its students. Again, left out of the discussion

Education
**Briefing
Series**

are low-spending states like Tennessee (\$7,927 per student) and Mississippi (\$8,265 per student), both with unenviable student achievement records. In reality, there are 27 states (including Nevada) clustered between \$9,700 and \$12,000 per student. These states range from among the nation's highest achieving to those on the opposite end of the same continuum.

Current Expenditures Per Student

Source: U.S. Department of Education

Definition: The sum of all expenditures, excluding capital outlay and interest on school debt, used in public elementary and secondary education divided by the number of all pupils enrolled during the fall. Expenditures for instruction, administration, operations, property, recurring building operations and maintenance, health, attendance, speech pathology services, curriculum development, staff training, libraries, media and computers are included. The most recent data available are for fiscal year 2007.

Rankings:

U.S. Average: \$9,683
 Nevada Average: \$7,806
 Nevada Ranking: 45th

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
SAT Math Score (-)	4 th Grade Reading Ability
SAT Writing Score (-)	4 th Grade Mathematics Ability
SAT Reading Score (-)	8 th Grade Reading Ability
SAT Composite Score (-)	8 th Grade Mathematics Ability
ACT English Score (+)	High School Graduation
ACT Math Score (+)	
ACT Reading Score (+)	
ACT Science Score (+)	
ACT Composite Score (+)	

Commentary: The average school spends 85 percent of education funding on school operations; in Nevada, this figure is 77 percent, a difference mainly attributable to higher-than-average expenditures on school construction. Logically, “current” education expenditures might be expected to be more highly correlated with student achievement than total expenditures; however, this does not appear to be the case for the same reasons outlined in the previous analysis of total education expenditures. While there are some notables on either end of the education-spending spectrum, the high degree of dispersion within the center of the data set suggest that current spending is, at best, a secondary factor.

Student-Teacher Ratio

Source: U.S. Department of Education

Definition: The total number of students divided by the total number of instructional teachers. The most recent data available are for the 2006-2007 school year.

Rankings:

U.S. Average: 15.5:1

Nevada Average: 18.5:1

Nevada Ranking: 46th

Correlations (positive/negative):

Significantly Correlated With

4th Grade Reading Ability (-)

Not Significantly Correlated With

4th Grade Mathematics Ability
 8th Grade Reading Ability
 8th Grade Mathematics Ability
 SAT Math Score
 SAT Writing Score
 SAT Reading Score
 SAT Composite Score
 ACT English Score
 ACT Math Score
 ACT Reading Score
 ACT Science Score
 ACT Composite Score
 High School Graduation

Commentary: A recurring theme in discussions of school performance and efficiency, the number of students per classroom is a statistically significant predictor of reading performance for elementary school students. Although trending toward an indirect relationship in other educational outcome metrics, none meets the statistical test of significance. Notably, all 10 of the states with the smallest class sizes reported higher-than-average math scores for 4th grade students; this figure was 5 in 10 for the 10 states with the largest class sizes. By 8th grade, the number of small-class-size states reporting higher-than-average math scores drops to 9 in 10, while the number of overachieving larger-class-size states increase to 6 in 10.

Students Per School

Source: U.S. Department of Education

Definition: The total number of students divided by the total number of instructional school facilities. The most recent data available are for the 2006-2007 school year.

Rankings:

U.S. Average: 498
 Nevada Average: 719
 Nevada Ranking: 51st

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
SAT Math Score (-)	4 th Grade Reading Ability
SAT Writing Score (-)	4 th Grade Mathematics Ability
SAT Reading Score (-)	8 th Grade Reading Ability
SAT Composite Score (-)	8 th Grade Mathematics Ability
High School Graduation	ACT English Score
	ACT Math Score
	ACT Reading Score
	ACT Science Score
	ACT Composite Score

Commentary: Size of the school is highly correlated to high school graduation rates, but not reading or math test scores at the elementary or middle school level. It is also a statistically significant predictor of SAT score performance. The negative correlation between graduation rates and the size of the school and the share of students likely to graduate (i.e., the larger the schools in a state, the lower the graduation rate tends to be) is the highest of any on the school operations side of the analysis ledger. This fact notwithstanding, in terms of relative significance, it trails the share of the population that is a minority, the poverty rate and high school attainment of the adult population by a sizable margin.

Education Briefing Series

Average Teacher Salary

Source: National Education Association

Definition: The sum of all teachers' salaries divided by the number of teachers. The most recent data available are for 2008.

Rankings:

U.S. Average: \$48,909
 Nevada Average: \$47,710
 Nevada Ranking: 22nd

Correlations (positive/negative):

Significantly Correlated With	Not Significantly Correlated With
ACT English Score (+)	4 th Grade Reading Ability
ACT Math Score (+)	4 th Grade Mathematics Ability
ACT Composite Score (+)	8 th Grade Mathematics Ability
SAT Math Score (-)	8 th Grade Reading Ability
SAT Writing Score (-)	ACT Reading Score
SAT Reading Score (-)	ACT Science Score
SAT Composite Score (-)	High School Graduation

Commentary: The salaries paid to teachers appear to have little bearing on student achievement. Seven states reported paying teachers \$60,000 or more per year on average, three of which reported higher-than-average reading and math scores in both 4th and in 8th grade, two of which lower-than-average reading and math scores in both 4th and 8th grade, and two of which reported some higher and some lower scores on the NAEPs exams. The average graduation rate among those states paying teachers \$60,000 or more was 71.3 percent; 1.6 percentage points lower than the graduation rate among those paying teachers \$42,500 or less (the lowest seven states). This may be attributable to the higher cost of attracting teachers to lower achieving school districts, or the cost of employing teachers in areas with higher costs of living.

Post-Graduate Teachers

Source: U.S. Department of Education

Definition: The number of teachers who have obtained a master’s degree or higher as a percent of all teachers. The most recent data available are for the 2003-2004 school year.

Rankings:

U.S. Average: 40.9%

Nevada Average: 48.9%

Nevada Ranking: 14th

Correlations (positive/negative):

Significantly Correlated With

Not Significantly Correlated With

- 4th Grade Reading Ability
- 4th Grade Mathematics Ability
- 8th Grade Mathematics Ability
- 8^h Grade Reading Ability
- SAT Math Score
- SAT Writing Score
- SAT Reading Score
- SAT Composite Score
- ACT English Score
- ACT Math Score
- ACT Composite Score
- ACT Reading Score
- ACT Science Score
- High School Graduation

Commentary: The share of K-12 teachers with post-graduate credentials is not statistically correlated to any of the education outcomes included in this study.

Experienced Teachers

Source: U.S. Department of Education

Definition: The number of teachers who have more than ten-years experience working in the classroom as a percent of all teachers. The most recent data available are for the 2003-2004 school year.

Rankings:

U.S. Average: 54.9%

Nevada Average: 49.2%

Nevada Ranking: 50th

Correlations (positive/negative):

Significantly Correlated With

- SAT Reading Score (+)
- High School Graduation (+)

Not Significantly Correlated With

- 4th Grade Reading Ability
- 4th Grade Mathematics Ability
- 8th Grade Mathematics Ability
- 8th Grade Reading Ability
- SAT Math Score
- SAT Writing Score
- SAT Composite Score
- ACT English Score
- ACT Math Score
- ACT Composite Score
- ACT Reading Score
- ACT Science Score

Commentary: The number of teachers with 10 or more years of experience is one of only two school operations variables statistically correlated with high school graduation rates (the other being the average number of students per school). Although the top 10 states in terms of teacher tenure include two with graduation rate in the 50's (i.e., South Carolina, 55.6 percent and Louisiana, 54.7 percent) they report an average graduation rate of 72.1 percent. Notably, this is nearly 5 percentage points higher than the bottom 10 states, which include three states with graduation rates above 70 percent but an overall average of just 67.3 percent.

Students Per School District

Source: U.S. Department of Education

Definition: The total number of students divided by the total number of school districts. A school district is defined by a geography for which the public schools within that area are administered together. The most recent data available are for the 2006-2007 school year.

Rankings:

U.S. Average: 3,581

Nevada Average: 26,118

Nevada Ranking: 47th

Correlations (positive/negative):

Significantly Correlated With

- 4th Grade Reading Ability (-)
- 8th Grade Mathematics Ability (-)
- 8th Grade Reading Ability (-)
- SAT Reading Score (-)
- SAT Math Score (-)
- SAT Writing Score (-)
- SAT Composite Score (-)

Not Significantly Correlated With

- 4th Grade Mathematics Ability
- ACT English Score
- ACT Math Score
- ACT Composite Score
- ACT Reading Score
- ACT Science Score
- High School Graduation

Commentary: Among school operations variables, the number of students per district is the second most significant for 4th grade math and the only variable with a statistically significant correlation to 8th grade reading and mathematics. Larger district states include Hawaii and Washington, D.C., which operate single-district jurisdictions. Although there are some large district states that are standouts in certain areas (e.g., Maryland), there is a clear indirect relationship between the average size of school districts and the performance of 4th and 8th grade students on nationally standardized math and reading exams.

METHODOLOGY

The correlations herein are based on calculation of the Pearson Product Moment Correlation (Pearson's Correlation or Pearson's R), reflecting the degree of linear relationship between two variables. Pearson's Correlations range from +1.0 to -1.0, with +1.0 indicating a perfect positive linear relationship between the two variables analyzed; a value of -1.0 means there is a perfect negative relationship between the two variables. Scores approaching zero, by contrast, are highly independent of one another. Importantly, Pearson's Correlation only identifies linear relationships between two variables. Other non-linear relationships might also exist.

This analysis briefly examines published demographic information and certain measures of institutional resources, and offers correlations against the outcome of nationally administered student achievement tests and provides a ranking of states. Data was drawn from sources considered appropriate for this analysis. Student test scores were taken from the College Boards, American College Testing, and the National Assessment of Educational Progress, which are testing programs conducted by separate organizations. Information related to income and poverty, population mobility, language, minority status and educational attainment was taken from the U.S. Census Bureau sources. Data on student enrollment, school districts, number of schools, school expenditures and number of teachers was drawn from the National Center for Educational Statistics within the U.S. Department of Education. Graduation rates were taken from Education Week, a publication of Editorial Projects in Education, Inc., which sourced the data to the U.S. Department of Education.

APPLICABILITY OF FINDINGS AND LIMITATIONS OF UNDERLYING DATA

This analysis looks at how various socio-economic and school operations factors relate, positively or negatively, to education-related outcomes. This is statistical exercise based on readily available information obtained from third-party data providers. In reality, student outcomes are extremely complex. While this analysis attempts to identify meaningful trends at the state level, there is any number of reasons why the students at one school or within a single school district might succeed or fail. Moreover, what works for one state, district or school may not work for another. The sole intent of this analysis is to provide an analytical context for on-going dialog and a foundation for future study. It is not intended to be comprehensive and should not be interpreted conclusive in its findings.

Education Briefing Series

Pearson's Correlations have important limitations and may be affected by the distribution of the underlying data, including the presence of outliers. Steps were taken to minimize the impacts of these limitations; however, additional research and analysis would be required to more comprehensively understand how changes to one or more education input variables would lead to a desirable outcome in terms of student achievement in Nevada or within its various school districts.

Any comparison of student achievement should be made with the clear understanding that measuring student proficiency is not only subject to the accuracy and statistical soundness of the testing processes conducted by school jurisdictions and national testing organizations, but is also highly subject to the alignment between the knowledge and skills as taught and the knowledge and skills tested. The ongoing controversy among educators as to the usefulness and accuracy of various tests in measuring desired skills and abilities is not treated here, but is relevant consideration potentially impacting the results of this analysis.

While a number of variables were used in this study, it is important to note the timing of each as to better understand the effects it may have on the statistical outcomes. The source and definition of each variable has already been described in the preceding text and while we have no reason to doubt the accuracy of these data, we do not guarantee it. Nevertheless, each of the socio-economic inputs, excluding per capita income and average unemployment, were gathered from the United States Census Bureau. Data from the Census Bureau is based upon an ongoing survey sent to a sample population. It is used to describe the characteristics of a population, to help communities determine where to locate services and allocate resources. While the survey is ongoing, it is important to note that historical data can change due to modifications in methodology or if new information that was previously unavailable becomes accessible. The information used is the latest available on file with the U.S. Census Bureau (2008). All 2008 data tables were released Tuesday, September 29, 2009.

Per capita income was collected for the year 2008 from the U.S. Bureau of Economic Analysis. The data was released October 16, 2009. These were revised estimates from previous releases. These estimates incorporated the results of the comprehensive revision to the national income and product accounts released in July 2009. Per capita income was computed using midyear population estimates from the Census Bureau, released April 2009; and, along with population, these data were revised back to the year 2000.

Average unemployment was collected from the U.S. Bureau of Labor Statistics (BLS). This data is often revised, typically over the previous 12-month period. Our data consists of the years 1999-2008 and was retrieved from the BLS during the month of January 2010. This is the latest available data at the date of this report.

Education Briefing Series

School operation variables, excluding average teacher salary, were collected from United States Department of Education. The Department's repository at the National Center for Educational Statistics typically releases data approximately two years after the survey year. This has to do more with the timing of acquisition, aggregation and distribution of information from a large number of entities including schools, districts and other state agencies. Financial survey information, such as expenditures, is from the year 2007, while non-fiscal data such as students per school and students per school district is from 2006. Survey data on teachers such as level of education and years of experience are released less frequently, with the latest available survey data from 2003 to 2004. The data used was the latest available to the public.

Average teacher salary is sourced to a private organization, the National Education Association, which serves education professionals. The Association publishes an annual ranking based on a survey of questions regarding education conditions including salary. The information contained in this study is from 2008 and is the latest available data. Salary data was not adjusted for state cost-of-living factors, which might materially impact the relative value of reported salaries.

The National Assessment of Educational Progress exams are the only nationally administered exams for 4th and 8th grades. The results are therefore also held by the U.S. Department of Education and released two years following the collection of data. The 2009 year data used herein is the latest available.

SAT and ACT data is more readily available as the private organizations which administer each exam releases high-level summary data by state during the fall following the previous school year, but same calendar year. The latest data available is for the 2009 school year.

High school graduation rates were taken from the nonprofit organization, Editorial Projects in Education, Inc. with support from the Bill & Melinda Gates Foundation. The latest available data used herein is from the 2008 school year and is provided by the U.S. Department of Education. It was released in December of 2008. Data for 2009 had not yet been released at the time this report was published.

End Notes:

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Education Briefing Series

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