



THE WASHINGTON STATE BOARD OF EDUCATION

A high-quality education system that prepares all students for college, career, and life.

Title:	Data Spotlight - Opportunity to Learn Index	
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Policy Considerations / Key Questions:	<p>A draft Opportunity to Learn (OTL) Index was created to support the national and peer state comparisons required for the Statewide Indicators of Educational System Health. Some key questions you might consider in advance of the SBE meeting include:</p> <ul style="list-style-type: none"> • Are the four broad opportunity categories (inputs) adequate? Should other broad categories be added or these be changed? • Are the number and types of measures assigned to the appropriate broad category? If not, how could or should the measures be reorganized? • What other measures could be included in the OTL to help explain differences in educational outcomes nationally and between the peer states? 	
Possible Board Action:	<input type="checkbox"/> Review <input type="checkbox"/> Approve	<input type="checkbox"/> Adopt <input checked="" type="checkbox"/> Other
Materials Included in Packet:	<input checked="" type="checkbox"/> Memo <input type="checkbox"/> Graphs / Graphics / Other <input type="checkbox"/> Third-Party Materials <input type="checkbox"/> PowerPoint	
Synopsis:	<p>The Board will see a presentation on a preliminary version of a state-level Opportunity to Learn Index. The OTL ranks all 50 states on a total of 20 measures. Four measures represent education outcomes and 16 measures represent some form of educational access or opportunity placed into four broad categories or indicators.</p> <ul style="list-style-type: none"> • On the Educational Outcomes (outputs) indicator, Washington performs a little below the national average. • On the four Opportunity (inputs) indicators, individually and in combination, Washington performs marginally to well below the national average. <p>Based on a handful of educational outputs, this preliminary OTL Index may be providing evidence that the educational system in Washington is not highly ranked nationally and may not be comparable to the peer states. Unlike previous work reported as part of the Statewide Indicators of Educational System Health, the reader can begin to make some high level inferences as to why the performance of Washington’s students is a little below average.</p>	

The OTL memo and images are best viewed in the online color version.



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OPPORTUNITY TO LEARN INDEX

Policy Considerations

With assistance from partner agencies, the Washington State Board of Education (SBE) is charged with establishing goals and reporting on the goal attainment for the statewide indicators of educational system health under RCW 28A.150.550. Section (5)(c) specifies that the performance goals for each indicator must be compared with national data in order to identify whether Washington student achievement results are within the top ten percent nationally or are comparable to results in peer states with similar characteristics as Washington. If comparison data show that Washington students are falling behind national peers on any indicator, the report must recommend evidence-based reforms targeted at addressing the indicator in question.

The Opportunity to Learn (OTL) memo and images are best viewed in the online color version.

Summary

An Opportunity to Learn (OTL) Index was created to support the national and peer state comparisons required for the Statewide Indicators of Educational System Health specified in RCW 28A.150.550. The OTL ranks all 50 states on a total of 20 measures. Four measures represent education outcomes and 16 measures represent a form of educational access or opportunity placed into four broad categories.

Summary Table: Shows the ranking of Washington on the broad categories of the OTL Index.

Indicator Category	National Ranking	National Percentile Rank	Peer State Ranking
Educational Outcomes	32 nd	36 th	8 th
Family and Health*	28 th	44 th	8 th
Community*	28 th	44 th	8 th
Education (K-12) Expenditure*	39 th	22 nd	7 th
School*	43 rd	14 th	9 th
Overall Opportunity	40th	20th	9th

*Note: These indicators are viewed as inputs that are statistically associated with or related to the education outcomes or outputs.

Based on the Educational Outcomes used here, this preliminary OTL provides evidence that the educational system in Washington is not highly ranked nationally and is not similar to the peer states. Unlike previous work reported as part of the Statewide Indicators of Educational System Health, the reader can begin to make some high level inferences as to why the performance of Washington's students is a little below average.

The OTL is presented here for the purpose of starting a discussion about the types of opportunity measures to collect and how to organize those measures into broader categories. Possible improvements for the measures are included at the end of each section.

Background Information and Organization of the Memo

In previous Board discussion, members articulated that additional information should be analyzed to provide the context needed to make the national and peer state comparisons required under state law. At the March 2016 board meeting, the Board heard a presentation on the Statewide Indicators of the Educational System showing that Washington is not on track to meet the state's ambitious goals, Washington is not highly ranked nationally on educational outcomes, and Washington's performance is generally not comparable to peer states. Board members posed a number of questions about these results, including the following.

- Can we identify the practices and structures utilized in states that have better educational outcomes and would we support or advocate for those practices in Washington?
- Are there social or economic frameworks in place in other states or regions that might be bolstering the education outcomes for those states?

To this end, staff developed a preliminary version of an Opportunity to Learn Index (OTL) for the purpose of comparing Washington's performance on various indicators to the peer states and nationally. The OTL is built on the premise that the family environment, community, school, and other factors related to educational spending contribute to the overall opportunities for educational success for children.

This memo is organized as follows.

- First, the reader is provided with an overview and brief description of the measures included in each of the OTL indicators.
- Second, the relative performance on the Educational Outcome indicator is provided.
- Then, the overall performance on the combination of the four opportunity indicators is described.
- Finally, each of the four opportunity indicators is described individually and the performance on each of the individual measures is provided.
- Appendix A at the end of this memo contains information about the methodology used to develop the OTL and many of the statistical calculations.

Statistical Terminology used in this Work

Individual measures that were vastly different from one another were transformed into **standard scores** (sometimes referred to as **z-scores**). The standard score specifies how far above or below the mean a given raw score is, in standard deviation units. The mean value is assigned a standard score of zero. A raw score above the mean converts to a positive standard score, while a raw score below the mean converts to a negative standard score. A standard score of -0.500 represents a raw score one-half of a standard deviation below the mean.

This work made extensive use of correlations and the **correlation coefficients** are reported here as the **Pearson R** value. Remember that correlations range from 0 to 1.00 and can be positive or negative.

It is important to remember that correlational research (like that here) **does not imply causality**. That is, we cannot say that low educational outcomes are a result of low educational spending, but we can say that states with lower educational outcomes tend to fund education at lower levels.

Results

This preliminary OTL Index combines 16 indicators into four broad categories into a single metric to quantify the relative opportunity for educational success in each state. The OTL also combines four additional indicators (educational outputs) into a single Education Outcome category that serves as an overall outcome measure. In this manner, the Educational Outcome measures can be regressed on the four categories of educational opportunity individually and in combination to assess or measure the strength of the statistical model.

The five broad categories of input and output measures are summarized below and are described in more detail in Table 1.

- The **Family and Health** category is meant to examine access to health care, parental awareness or guidance, and overall health of the child. However, the category may also be capturing elements of poverty and chronic absenteeism. The combination of the four measures is a very good predictor of Education Outcomes as indicated by a moderately strong and positive correlation coefficient ($R = 0.695$). In other words, as overall health and parental guidance increases, educational outcomes tend to increase.
- The **Community** category is designed to measure the access to early learning and to quantify the characteristics of the neighborhood framed in poverty status and safety. When combined, the four variables are a good predictor of the Education Outcomes and this is indicated by a moderate and positive correlation coefficient ($R = 0.559$). The correlation coefficient shows that states with higher percentages of children living in safe neighborhoods in lower poverty areas that have good access to early childhood education are associated with higher educational outcomes.
- The **Educational (K-12) Expenditures** category is intended to characterize the impacts of educational funding on the educational outcomes. The measures are meant to capture the level to which schools are funded and the degree of equitable funding. The variables yielded a weak to moderate and positive correlation coefficient ($R = 0.400$) with the Education Outcomes. The analysis shows that states with higher educational funding and more equitable distribution of school funds are associated with higher educational outcomes.
- The **School** category is intended to be a measure of the impacts of school characteristics on the educational outcomes. The combination of measures is meant to capture information about schools that are partly under the control of schools and districts. The variables yielded a strong and negative correlation coefficient ($R = -0.731$) with the Education Outcomes. The inclusion of race/ethnicity demographics means that the combination of measures are most likely capturing some components or elements of poverty. The correlation coefficient shows that states with higher student to staff ratios, higher percentages of students in the targeted subgroup (Native Americans, Black, Hispanic, and Pacific Islanders), and teachers with greater concerns about unexcused absences are associated with lower educational outcomes.
- The **Educational Outcomes** category measures reading and math scores in the 4th and 8th grade, high school engagement and graduation, and postsecondary education engagement.
- The **Overall Opportunity** category is the combination of the **Health and Family, Community, Educational Expenditures, and Schools** categories.

Table 1: Summary of indicators for the OTL Index.

Family and Health	Community	Educational (K-12) Expenditures	School	Educational Outcomes
Percent of children whose parents had predictive concerns about their development 2012	Percent of 3 and 4 year olds attending preschool 2012-14	Regionally adjusted per pupil expenditures in 2013	Student to teacher ratio	Percent of children scoring at or above proficient on the 2015 NAEP Reading and Math
Percent of children in excellent or very good health 2011-12	Percent of eligible children in kindergarten 2012-14	McLoone Index 2013, a measure of equitable funding	Student to teacher aide or para-professional ratio	Adjusted Cohort Graduation Rate in 2014
Percent of children with health insurance	Percent of children not living in high poverty areas 2009-2013	Percent of district funds derived locally 2013-14	Percent of students who are Hispanic, Black, Pacific islander or Native American	Percent of teens 16-19 who are attending school or working
Birth rate not to teen mothers 2013	Percent of children who live in safe communities 2012	Percent of taxable resources spent on education 2013	Percent of teachers who believe tardiness and class skipping are a problem at their school	Percent of young adults 18-24 who are enrolled in or completed college 2013

A simple regression analysis shows that the Overall Opportunity measure accounts for approximately 56.7 percent of the variance found in the Educational Outcomes indicator. The amount of the variance explained by a similarly designed multiple regression model increases to approximately 59.4 percent. In other words, approximately 40 percent of the variance found the Educational Outcomes is explained by other measures not included in the statistical model. An example of a measure likely to contribute to the model is access to effective educators, but while the measure may be comparable within states, the measure most likely is not comparable between all 50 states.

The idea behind this type of work is to maximize the amount of variance in the dependent variable accounted for by the independent variables. In other words, higher percentages of variance accounted for translates to stronger statistical models and a better understanding of the relationship between educational opportunity and outcomes. One of the next steps of this work would be to examine and include other measures that would increase the strength of the statistical model.

Educational Outcomes

The OTL Index ranking for all 50 states for the Educational outcomes is shown on Figure 1. The educational outcome measures are briefly described in Table 1 and in more detail in Appendix A. The educational outcomes included here are meant to capture a view of student academic performance in elementary and middle school, high school engagement and graduation, and post-secondary engagement in education.

In a general sense, the Education Outcomes are highest or best in the New England states, relatively high in the upper Mississippi Valley, and lowest in the southern and southwestern states. For the combination of outcome measures, Washington ranks 32nd out of the 50 states which means that 31

states performed better than Washington on the combination of outcomes. The table embedded in Figure 1 shows Washington ranks near the bottom (8th out of nine) of the peer state comparison.

Figure 1: Shows the relative ranking of the 50 states on the combination of four education outcome measures.

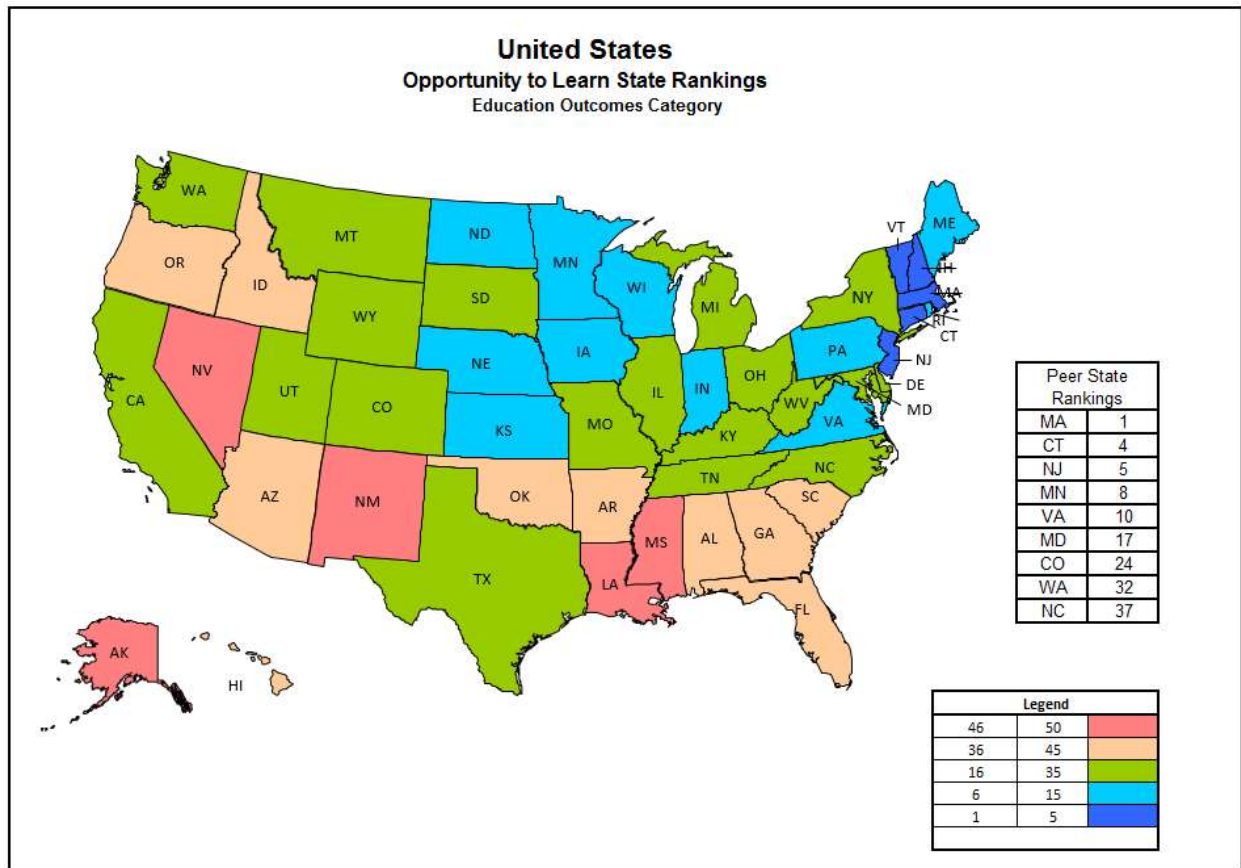


Table 2: Shows the standard scores for the measures comprising the Educational Outcome Indicator.

Education Outcome Indicator (Measures)	Standard Score	Interpretation of Standard Score
Percent of children scoring at or above proficient on the NAEP Reading and Math (combined) in 2015	0.89824	This value is well above the national average.
Adjusted Cohort Graduation Rate in 2014	-0.75583	These values are marginally to well below the national averages.
Percent of teens 16-19 who are attending school or working	-0.47895	
Percent of young adults 18-24 who are enrolled in or completed college 2013	-0.60432	
Summary of the Four Measures	-0.23521	This value is a little lower than the national average.

Washington children performed almost a full standard deviation higher than the national average on the NAEP outcome measure, but performed below average on the high school engagement, graduation, and post-secondary measures (Table 2). In contrast, Massachusetts, Connecticut, and New Jersey scored above the national average and higher than Washington on all the outcome measures. Each of these three peer states have summarized values more than a standard deviation higher than the national average and each state is ranked in the top five of the 50 states.

The Adjusted Cohort Graduation Rate (ACGR) is often used in national comparisons because the calculation is consistent across the country. However, the reported ACGR does not take into account the different graduation requirements from one state to another and does not factor in the different diploma types between states. An improved measure might include a graduation measure composed of a combination of graduation rate, graduation requirements (credits and assessment), and diploma options.

The measure of the percentage of teens (16 to 19 years old) who are attending school or working may not be the optimal measure of high school engagement for the following reasons.

- A positive outcome would be indicated for a student who dropped out of high school and is working at a low-wage unskilled job. This is not viewed as a positive outcome, but would be indicated as such.
- A negative outcome would be indicated for a 17 year-old student who graduated early and might be taking a 'lag-year' to explore the most appropriate post-secondary options. This is not necessarily a negative outcome but it may present in that manner.

Overall Educational Opportunity

When the four educational outcome measures are considered in combination, the analysis shows that the educational outcomes for Washington are lower than desired (36th percentile nationally) and lower than most peer states. The next step would be to look at other aspects of all 50 states in hopes of identifying conditions or factors that exist in other states that may be contributing to or associated with higher educational outcomes.

When the four broad categories of educational opportunity are combined, Washington ranks 40th out of the 50 states (Figure 2). This means that Washington is in the bottom quartile nationally with respect to educational opportunity based on the measures described earlier. On the combination of indicators and measures, Washington's performance is the lowest of the peer states.

The New England states (shown in shades of blue and dark blue on Figure 2) and some Midwestern states are the highest ranked based on the combination of the four broad categories of opportunity measures. The southwest, southern, and western states are characterized by lower overall opportunity measures.

Of the four broad categories of opportunity measures, Washington performs a little below the national average on the School (K-12) Expenditure indicator and substantially lower than the national average on the School indicator. Washington scores near the national average on the Family and Health indicator and the Community indicator (Table 3). In contrast, Connecticut, Massachusetts, and New Jersey perform well above the national average on each of the four broad categories and are among the highest ranked nationally.

Figure 2: Shows the relative ranking of the 50 United States on the overall Opportunity to Learn.

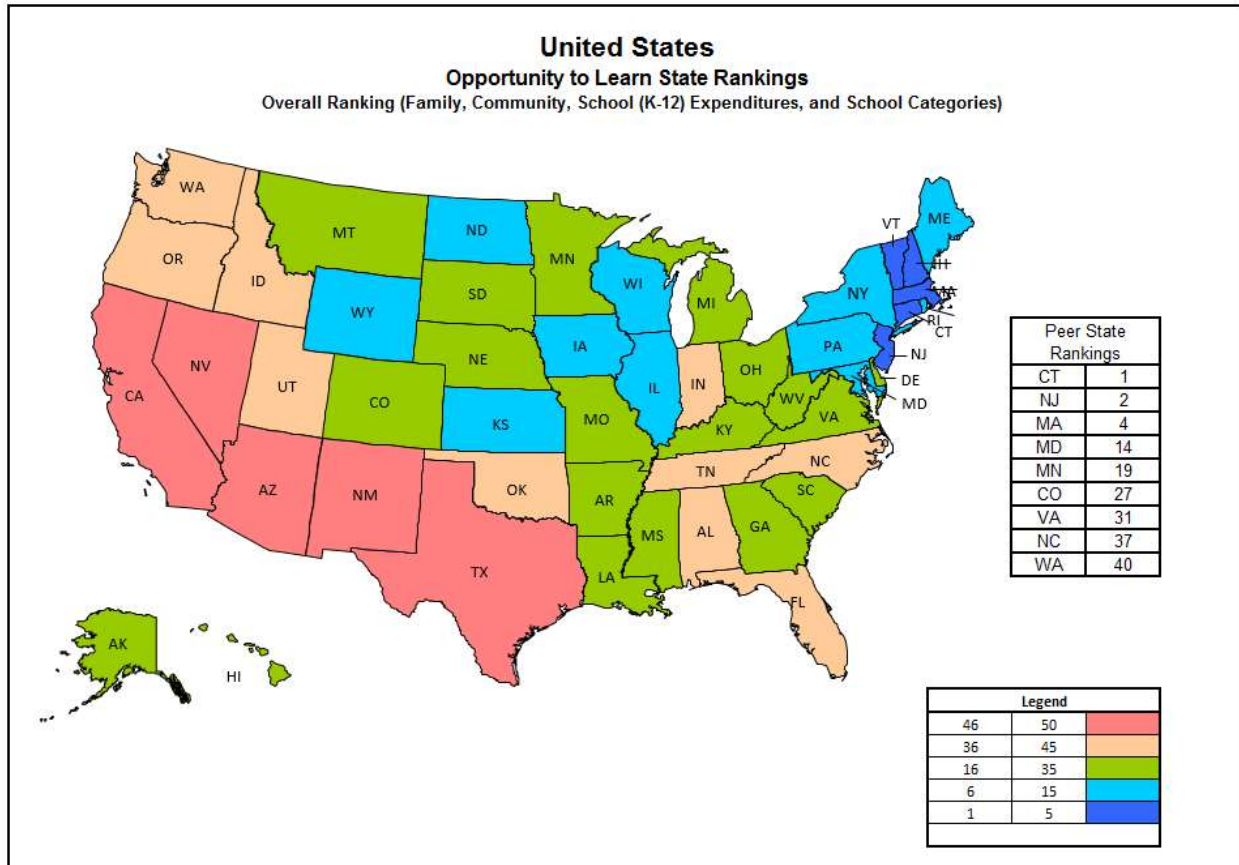


Table 3: Shows the standard scores for Washington for the four broad categories of opportunity indicators and the educational outcome indicator.

Indicator	Average of Standardized Values	Interpretation of Standardized Values	National Ranking ⁺
Education Outcomes	-0.23521	A little lower than the national average.	32
Family and Health*	-0.00706	Approximately the same as the national average.	28
Community*	-0.09172		28
School (K-12) Expenditures*	-0.36202	A little lower than the national average.	39
Schools*	-0.70497	Substantially lower than the national average	43
Summary of Opportunity Measures*	-0.29145	A little lower than the national average.	40

*Note: These indicators are viewed as inputs that are statistically associated with or related to the education outcomes or outputs.

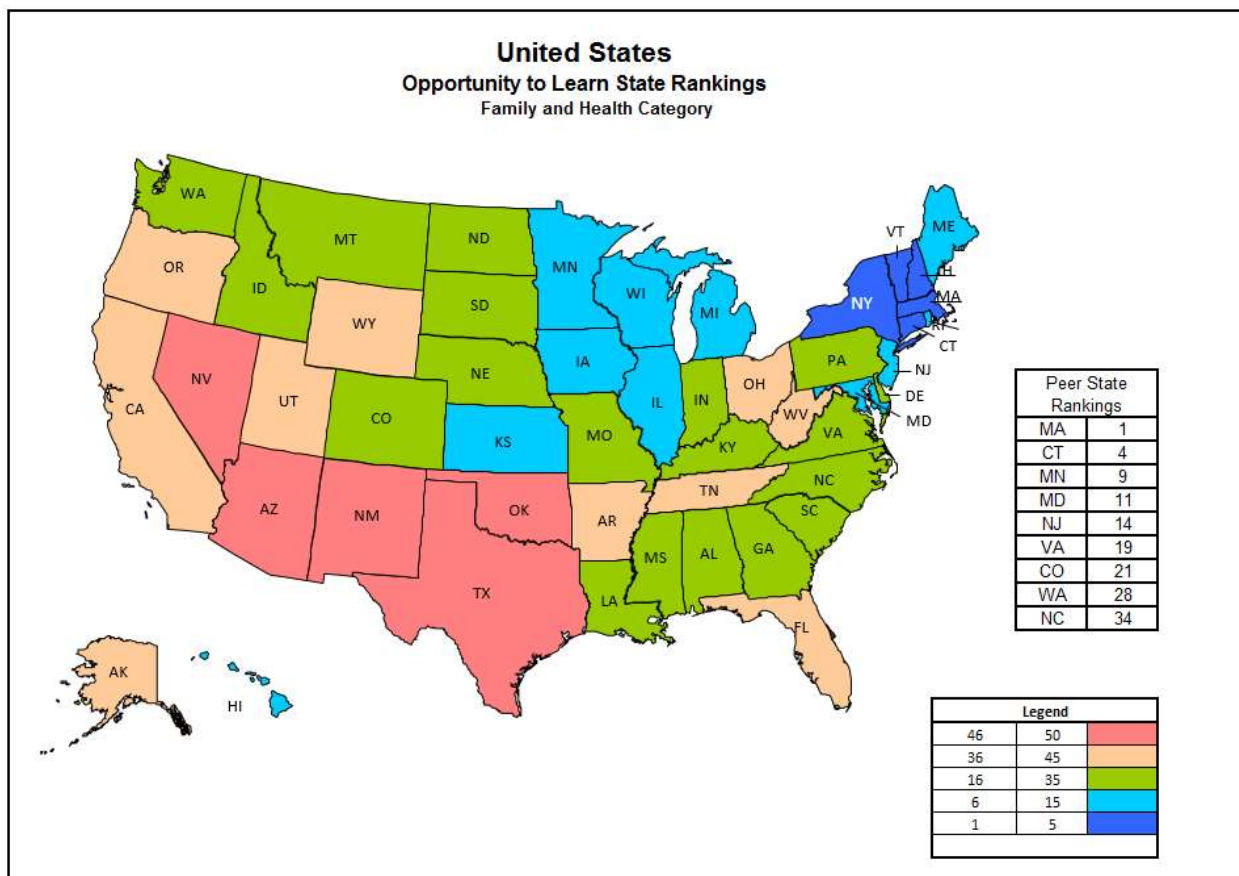
*Note: The highest ranked state is ranked as 1 and the lowest ranked state is ranked as 50.

Family and Health Opportunities

The Family and Health indicator is meant to measure the quality and engagement of parents or guardians. Three of the measures capture the engagement of the parents or guardians in recognizing the possible need for special needs screening, and the parents’ ability to rear a physically healthy child. The fourth measure captures the ability of young adults to develop healthy perspectives later in life through the prevention of or reduced incidences of teen pregnancy. The underlying premise of this indicator is that healthy children making good choices in life will have better opportunities for educational success.

The Family and Health category showed a moderately strong and positive correlation to the educational outcome measures, which supports the underlying premise. The highest performing states on this combination of measures are in the Northeast and upper Midwest, while the lowest performing states are in the South and Southwest. For the Family and Health measures, Washington ranked 28th out of the 50 states and ranked 8th of the nine peer states (Figure 3). When it comes to health and well-being, Washington children are average when compared nationally but are not necessarily comparable to the peer states.

Figure 3: Shows the relative ranking of the 50 states on the Family opportunity indicator.



Washington students performed below the national average on the percent of children whose parents had concerns about the development of their child and the percent of children who were in good or excellent health. Washington students were above the national average on the percent of children with health insurance and on the measure of teen mother birthrate. In combination, the four measures are nearly identical to the national average.

Table 4: Shows the standard scores for the measures included in the Family and Health indicator.

Family and Health Indicator (Measures)	Standardized Measure	Interpretation of the Standardized Values
Percent of children whose parents had predictive concerns about their development 2011-12	-0.36685	The negative values are a little below the national average and the positive values are a little higher than the national average. The summarized value is nearly identical to the national average.
Percent of children who are in excellent or very good health 2011-12	-0.60573	
Percent of children with health insurance	0.27243	
Birth rate not to teen mothers 2013	0.67190	
Summary of the Four Measures	-0.00706	

Interpreting the meaning of the measure of the percent of children whose parents had predictive concerns about their development in 2011-12 is not entirely obvious for the following reasons. If the value for this measure is on the higher side, at least two interpretations are possible.

1. Many young children with a disability might be expected to have in lower educational outcomes.
2. The parents are well informed on the topic of young child development and seek screening and services. With the early support, educational outcomes might be expected to be on the higher side.

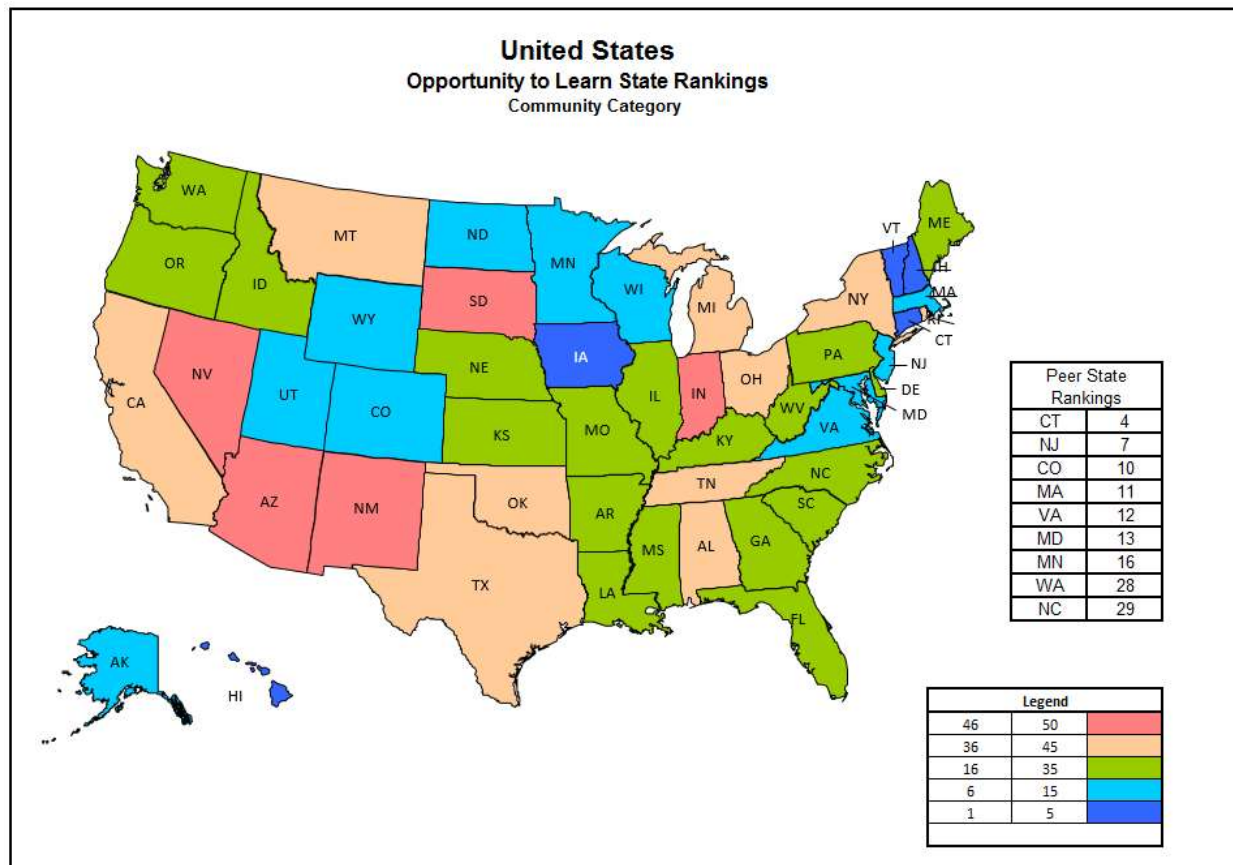
So it is possible that the same higher-than-average values for the measure might be associated with opposing outcomes. The measure has a weak and negative correlation to educational outcomes, which means that bullet one from above is how one might interpret the result. However, the measure is included in the category based on the premise of bullet two. Some reconsideration of the measure in the category will be given.

Community

The Community indicator is designed to quantify the access to and enrollment in early learning and to quantify the general characteristics of neighborhoods across the state framed in poverty status and safety. Two separate measures reflect the percent of children enrolled in early childhood education programs and enrolled in kindergarten. The two other measures quantify the percent of children not living in high poverty areas and the percent living in safe communities. The premise here is that parents will enroll their children in early learning opportunities where available and that children living in healthy environments will experience greater educational opportunities.

The combination of measures showed a moderate and positive correlation ($R = 0.498$) with the Education Outcomes, which supports the underlying premise. The highest performers on this measure are in the New England area, the upper Midwest, and some Mountain West states. The lowest performers are in the South, Southwest, and a handful of Ohio Valley states. Washington ranked 28th out of the 50 states and ranked 8th of the nine peer states (Figure 4). For the Community measures representing early learning opportunities and community wealth and safety, Washington was average when compared nationally but performed lower than most of the peer states.

Figure 4: Shows the relative ranking of the 50 states on the Community opportunity indicator.



Washington performed lower than the national average on the early learning opportunities, average for the percent of children living in safe communities, and well above average on the percent of children not living in high poverty areas. Washington performed much lower than Connecticut, Massachusetts, and New Jersey on the percentages of children enrolled in preschool and kindergarten. However, Washington performed significantly higher than Connecticut, New Jersey, and Massachusetts on the measures of the percentages of children not living in high poverty areas and living in safe communities. Even though the children living in Connecticut, New Jersey, and Massachusetts face greater out-of-school challenges, they perform better on the educational outcome measures.

Table 5: Shows the standard scores for the measures included in the Community Indicator.

Community Indicator	Standard Score	Interpretation of Standard Score
Percent of 3 and 4 year-olds attending preschool 2012-14	-0.79560	Substantially and a little lower than the national average.
Percent of eligible children in kindergarten 2012-14	-0.43204	
Percent of children not living in high poverty areas 2009-13	0.80507	Substantially higher than the national average.
Percent of children who live in safe communities 2011-12	0.05569	Similar to the national average
Summary of Measures	-0.09172	

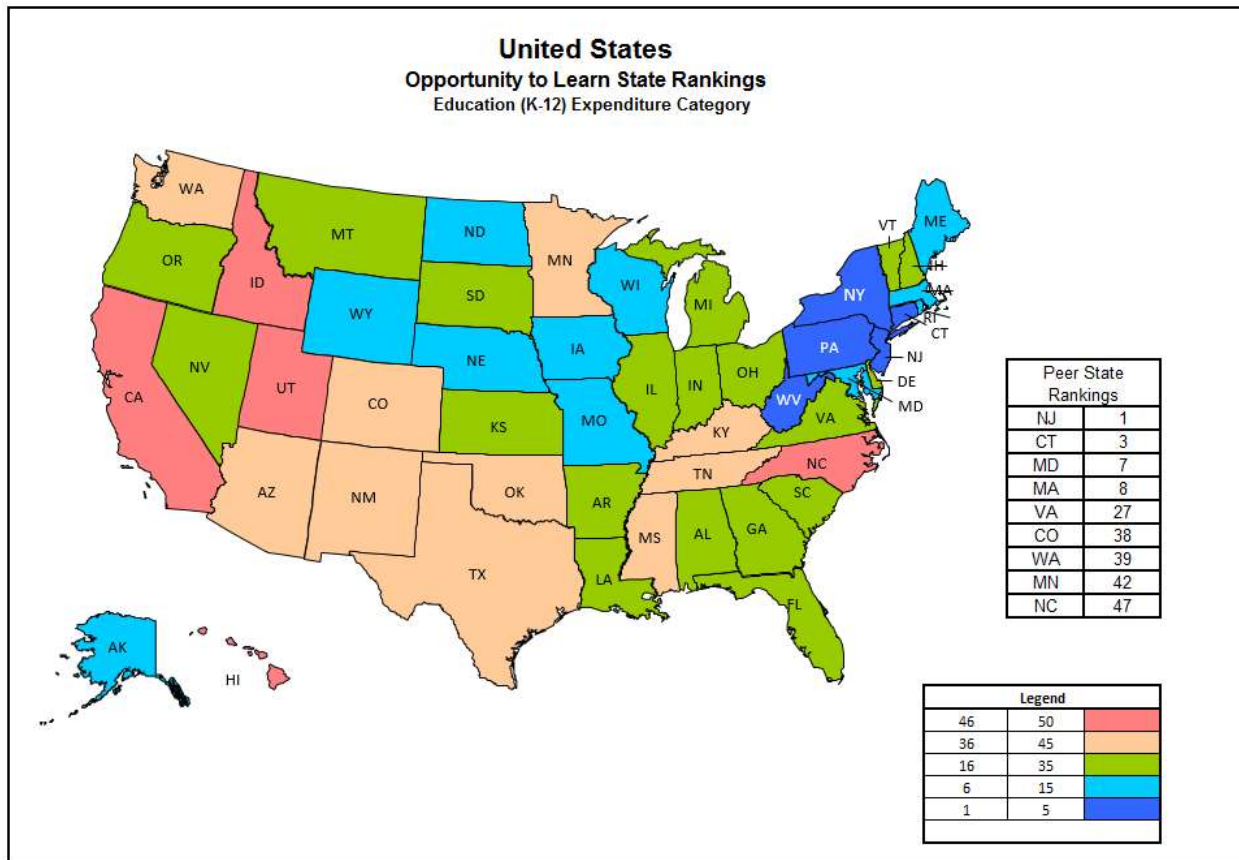
The measure of the percent of eligible children enrolled in kindergarten was shown to have a moderate to weak and negative correlation to educational outcomes, which was a curious finding. The premise for including the measure in the category was that educational outcomes would be higher in a state when more children were enrolled in kindergarten, but just the opposite was indicated. States with higher rates of kindergarten enrollment tended to have lower educational outcomes. The decision to include this measure in the category will be re-evaluated.

A moderately strong correlation coefficient ($R = 0.700$) was indicated for the percent of children not living in high poverty areas and the percent of children who live in safe communities, but this would be expected. It is debatable whether the two metrics are measuring the same thing because not all poor communities are unsafe. As an example, large proportions of some southern states may be viewed as poor but are otherwise safe and nurturing environments for the most part. For this reason, both of the metrics were retained in the category, at least for the time being.

Education Expenditures

The Educational (K-12) Expenditure measures were designed to establish the relationship (if any) of K-12 educational expenditures and educational outcomes. The regionally adjusted per pupil expenditures was the only measure to individually indicate a significant correlation to the educational outcomes, but the combination of the four school expenditure measures showed a moderate and positive correlation ($R = 0.400$) to the combined Education Outcomes measure.

Figure 5: Shows the relative ranking of the 50 states on the Education (K-12) Expenditure indicator.



The highest performing states on the K-12 expenditure indicator are in lower and upper New England and in the middle to upper Midwest. The lowest performing states are in the South and West. Washington ranked 39th out of the 50 states and ranked 7th of the nine peer states (Figure 5). For the K-12 school expenditure measures, Washington was below average when compared nationally and performed better than only two of the peer states.

These measures appear to show that Washington distributes educational funds in an equitable manner, but does not fund education to a level similar to high performing peer states. For the most part, the higher performing peer states allocate a higher percentage of tax revenues to education and this likely contributes to significantly higher per pupil funding.

Table 6: Shows the standard scores for the measures used for the School Expenditure indicator.

Education (K-12) Expenditures	Standard Score	Interpretation of Standard Score
Regionally adjusted per pupil expenditures in 2013	-0.83364	All of the measures are substantially lower than the national average, except for the McLoone Index measure, which is substantially higher than the national average.
McLoone Index 2013, a measure of equitable funding. Actual spending as a percent of the amount to bring all students to the median spending level.	0.99554	
Percent of district funds derived locally 2013-14	-0.56476	
Percent of taxable resources spent on education 2013	-1.04522	
Summary of Measures	-0.36202	

The McLoone Index value is a ratio of the total amount spent on pupils below the median to the amount that would be needed to raise all students to the median per pupil expenditure in the state. The index defines perfect equity as a situation in which every district below the state median (of per pupil expenditures) spends at least as much as median. The McLoone Index ranges from zero to 1.0, with 1.0 representing perfectly equitable statewide funding. An index of at least 0.95 is considered desirable.

- When the districts below the state median spend far less than the state median, the McLoone Index approaches zero and indicates large inequities.
- When districts below the state median make per pupil expenditures near the state median, the McLoone Index approaches one and indicates greater funding equity.

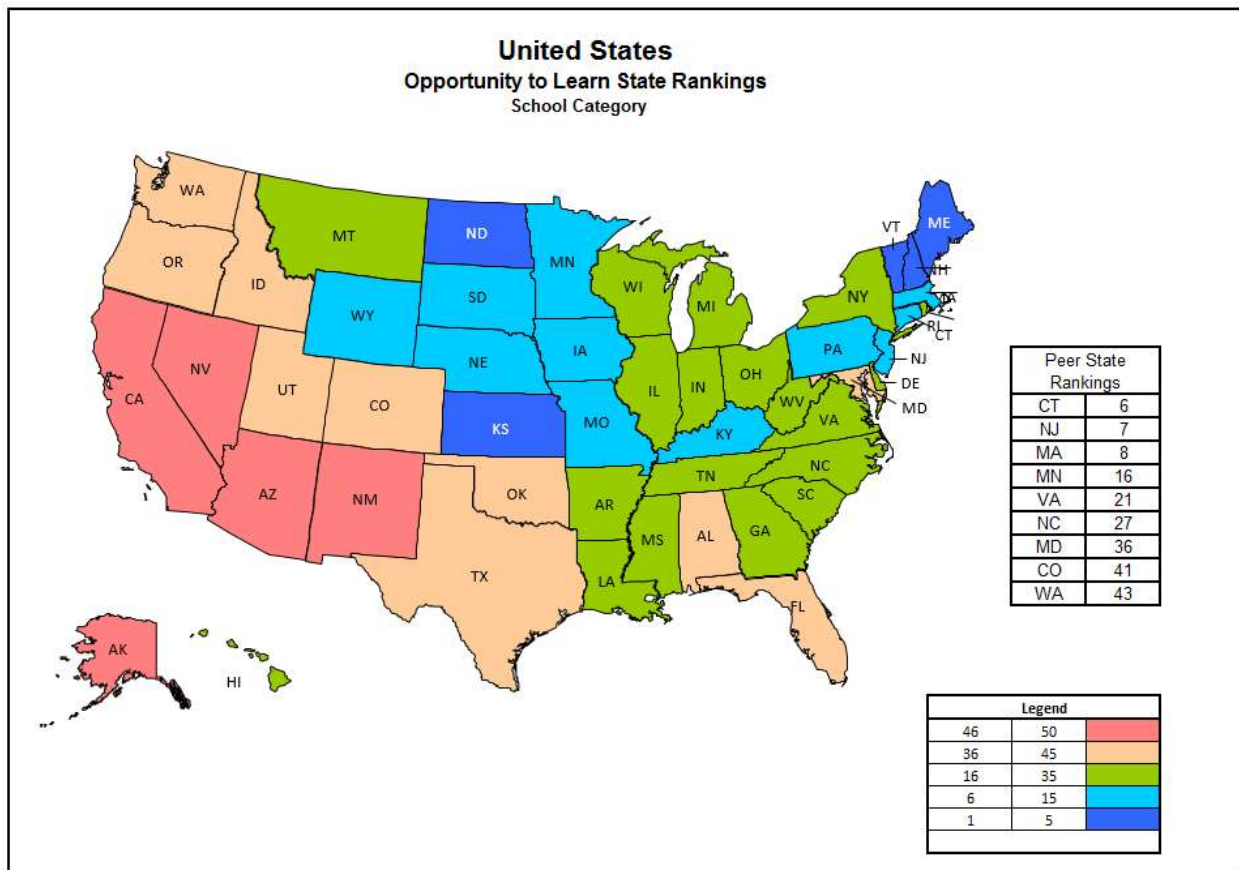
There are negligible correlations between the McLoone Index and each of the educational outcome measures, meaning that there is little systematic relationship between equitable spending at the state level and educational outcomes.

School

The School category is meant to capture the impact of certain school conditions and design on the Education Outcomes. Two measures provide insight to the average level of staffing at schools within a state, another measure captures the average diversity of the schools, and the final measure examines the degree to which unexcused absences, tardiness, and the skipping of classes impact student outcomes. The premise here is that better staffed schools can put policies in place to increase student engagement and a more positive school environment will support greater educational opportunities.

The combination of measures showed a strong and negative correlation ($R = -0.731$) with the Education Outcomes, which supports the underlying premise. The highest performers on this measure are in the New England states and the Midwest. The lowest performers are in the South, Southwest, and the West. Washington ranked 43rd out of the 50 states and ranked at the bottom of the nine peer states (Figure 6). For the combination of School measures representing school staffing, school demographics, and student engagement, Washington is well below average when compared nationally and performed the lowest of the peer states.

Figure 6: Shows the relative ranking of the 50 states on the School indicator.



The School measures are framed differently than some of the other measures in that positive standard scores tend to be more indicative of lower performance; hence the strong and negative correlation coefficient. For example:

- The standard scores (Table 7) of more than one standard deviation for the student to teacher ratio and the student to aide ratio means the average student to teacher/aide ratios in Washington are substantially higher than the national averages.
- The percentage of teachers who perceive unexcused absences as a problem for their students is also higher than the national average, which also is a negative correlate to student outcomes

On this indicator, a negative standard score is desired as lower values are correlated with higher student performance. The positive standard score (Summary of Measures, Table 7) for Washington means Washington's contribution from Schools in the model (student to teacher/aide ratios and unexcused absence problems) works against higher educational performance.

Table 7: Shows the standard scores for the measures used for the School category.

School Category	Standard Score	Interpretation of Standard Score
Student to teacher ratio	1.17014	Substantially higher than the national average.
Student to teacher aide or paraprofessional ratio	1.66346	
Percent of students who are Hispanic, Black, Pacific islander or Native American	-0.30645	Marginally lower than the national average.
Percent of teachers who believe tardiness and class skipping are a problem at their school	0.29277	Marginally higher than the national average.
Summary of Measures*	0.70498	

*Note: For this indicator, a negative standard scores are desired as negative scores are indicative of more favorable outcomes; lower student to teacher/aide ratios and fewer negative impacts from unexcused absences.

Are the student to teacher ratio and the student to aide ratio measuring the same thing? The correlation coefficient ($R = 0.605$) was moderate to strong and positive for the average student to teacher and student to aide (or paraprofessional) ratios. Because the correlation was not excessively high, both measures were retained in the category. However, if another measure were to be identified for the category, the student to aide ratio might be discarded or could be averaged with the student to teacher ratio.

Are the student to teacher and student to aide ratios a proxy for the per pupil expenditures? The correlation coefficients were moderate to strong and negative for the average per pupil expenditures and student to teacher ratio ($R = -0.627$) and for the student to aide ratio ($R = -0.630$). Because the correlations are not excessively strong, per pupil expenditures do not appear to be capturing the same variance as the student to teacher and student to aide ratios. However, it is clear that lower per pupil spending is associated with greater student to teacher ratios.

Is the average school diversity a proxy for neighborhood poverty and safety? The correlation coefficients were examined for the average percent of targeted subgroups at a school, the percent of children not living in a high poverty neighborhood, and the percent of children living in a safe neighborhood. There is a strong negative correlation ($R = -0.777$) between the percent of targeted subgroups at schools and percent of children living in safe communities. The combination of the three measures is likely capturing elements of poverty, as many students of color reside in relatively high poverty and unsafe neighborhoods. Given the concerns here, some consideration will be given to changing this broad category in a yet-to-be determined manner.

Action

No Board action is anticipated.

Please contact Andrew Parr at andrew.parr@k12.wa.us if you have questions regarding this memo.

Appendix A

Technical Information

The preliminary OTL Index combines 16 indicators in four broad categories into a single metric to quantify the relative opportunity for educational success in each state. The OTL combines four additional indicators into a single Educational category that serves as an overall Education Outcomes measure. This first iteration of an OTL Index is meant to be straightforward and simple by design, as evidenced by the small number of measures and categories that are equally weighted.

The methodology allows the user the opportunity to compute correlation coefficients individually and collectively for the input and output measures. Correlation coefficients (Pearson R) were computed for all measures used in this OTL Index version and it is important to note that not all measures meet the statistical significance test (Table A1), but this would be expected. However, when the individual measures are aggregated to the broad categories or indicators, appreciable correlation coefficients are reported and that is the goal for this type of work.

The OTL Index:

- Places an equal number of measures in each category so that no one measure carries more weight than another
- Transforms each measure to a standardized score so that the comparison of each measure to other measures is made possible and, measures can be combined and averaged.
- The generation of standard scores did not include a step to eliminate the impact of outliers, which means that some biasing might be possible. However, any biasing would be diminished through the averaging of multiple measures.

This methodology simply compares the results of any given measure to all of the 50 states without consideration of whether the performance is adequate in any manner. For example, South Carolina has the highest percentage of eligible children in kindergarten (83.0 percent) and the national average is approximately 77 percent. So, South Carolina achieves the highest standard score (1.965) for this measure but most would agree that 100 percent kindergarten enrollment would be more desirable. In this manner, less than that which is desired might be misconstrued as the 'best.' So, this work should be viewed as comparative or normative-based, not criterion-based as some other research work.

Multiple Regression

Multivariate linear regression was conducted to determine the strength of the statistical model. The analysis regressed Educational Outcomes on the Family & Health, Community, School, and Educational (K-12) Expenditure categories. The analysis produced a significant ANOVA result ($F = 18.904$, $p < 0.001$) and two of the indicators (Family and Health and School) were significant predictors. Approximately 59.4 percent of the variance found in the dependent variable was accounted for in the model.

The regression model predicted an Educational outcome score of -0.39926, which is a little lower than the 50-state average. Washington's performance (residual) was 0.16405 standard deviation units higher than the predicted score. One could readily interpret these analyses as follows:

- Washington's performance on the individual OTL opportunity indicators is mostly below the national average and very low rated when considered in combination.
- The low OTL opportunity measures would lead one to anticipate that Washington's performance on the education outcomes should also be very low.

- But Washington’s performance on the education outcomes is a little lower than the national average, meaning that Washington students are performing better than predicted.

Table A1: Shows the correlation coefficient (Pearson *R*) between each of the opportunity (input) measures and the educational outcome measures

Indicator Category	Label	Measure	Correlation to Educational Outcomes
Family & Health (FH) CM = 0.559** EX = 0.381** SC = -0.628** ED = 0.695**	FH 1	Percent of children whose parents had predictive concerns about their development 2011-12	ED 1 = -0.374** ED 2 = -0.134 ED 3 = -0.321* ED 4 = 0.012
	FH 2	Percent of children who are in excellent or very good health 2011-12	ED 1 = 0.541** ED 2 = 0.392** ED 3 = 0.462** ED 4 = 0.312*
	FH 3	Percent of children with health insurance	ED 1 = 0.226 ED 2 = 0.395** ED 3 = 0.394** ED 4 = 0.677**
	FH 4	Birth rate not to teen mothers 2013	ED 1 = 0.717** ED 2 = 0.242 ED 3 = 0.605** ED 4 = 0.732**
Community (CM) FM = 0.559** EX = 0.271 SC = -0.525** ED = 0.498**	CM 1	Percent of 3 and 4 year olds attending preschool 2012-14	ED 1 = 0.302* ED 2 = 0.251 ED 3 = 0.284* ED 4 = 0.668**
	CM 2	Percent of eligible children in kindergarten 2012-14	ED 1 = -0.290* ED 2 = -0.318* ED 3 = -0.467** ED 4 = -0.169
	CM 3	Percent of children not living in high poverty areas 2009-13	ED 1 = 0.597** ED 2 = 0.347* ED 3 = 0.520** ED 4 = 0.268
	CM 4	Percent of children who live in safe communities 2011-12	ED 1 = 0.455** ED 2 = 0.344* ED 3 = 0.416** ED 4 = 0.013
Expenditures for Schools (EX) FM = 0.381** CM = 0.271 SC = -0.484**	EX 1	Regionally adjusted per pupil expenditures in 2013	ED 1 = 0.321* ED 2 = 0.217 ED 3 = 0.402** ED 4 = 0.379**
	EX 2	McLoone Index 2013, a measure of equitable funding. Actual spending as a percent of the amount needed to bring all students to the median spending level.	ED 1 = -0.265 ED 2 = -0.212 ED 3 = -0.237

ED = 0.400**			ED 4 = -0.207
	EX 3	Percent of district funds derived locally 2013-14	ED 1 = 0.304* ED 2 = 0.245 ED 3 = 0.189 ED 4 = 0.363**
	EX 4	Percent of taxable resources spent on education 2013	ED 1 = 0.215 ED 2 = 0.234 ED 3 = 0.258 ED 4 = 0.328*
School FM = -0.628** CM = -0.525** EX = -0.484** ED = -0.731**	SC 1	Student to teacher ratio	ED 1 = -0.230 ED 2 = -0.484** ED 3 = -0.357* ED 4 = -0.337**
	SC 2	Student to teacher aide or paraprofessional ratio	ED 1 = -0.498** ED 2 = -0.332* ED 3 = -0.491** ED 4 = -0.428**
	SC 3	Percent of students who are Hispanic, Black, Pacific islander or Native American	ED 1 = -0.579** ED 2 = -0.469** ED 3 = -0.557** ED 4 = -0.265
	SC 4	Percent of teachers who believe tardiness and class skipping are a problem at their school	ED 1 = -0.336* ED 2 = -0.535** ED 3 = -0.364** ED 4 = -0.528**
Education (ED) FM = 0.695** CM = 0.498** EX = 0.400** SC = -0.731**	ED 1	Percent of children scoring at or above proficient on the NAEP Reading and Math (combined) in 2015	FM = 0.517** CM = 0.538** EX = 0.296* SC = -0.575**
	ED 2	Adjusted Cohort Graduation Rate in 2014	FM = 0.417** CM = 0.315* EX = 0.252 SC = -0.637**
	ED 3	Percent of teens 16-19 who are attending school or working	FM = 0.531** CM = 0.381** EX = 0.317* SC = -0.619**
	ED 4	Percent of young adults 18-24 who are enrolled in or completed college 2013	FM = 0.807** CM = 0.394** EX = 0.443** SC = -0.559**

**Note: Correlation is significant at the 0.01 level (2-tailed).

*Note: Correlation is significant at the 0.05 level (2-tailed).