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Report to

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Beginning in 2005-06, Maine implemented a new school funding formula entitled Essential Programs and Services (EPS). Maine's EPS formula is fashioned after what is called nationally an adequacy funding model. Instead of determining the cost of K-12 education based on past expenditures, adequacy-based models are designed to determine the cost of providing K-12 education to a pre-determined level. Adequacy funding models are designed to insure there are adequate funds in a K-12 school funding formula to insure all students have equity of education opportunities.

To insure this equity of opportunity most school funding experts believe a funding formula must include measures to insure both horizontal and vertical equity. Horizontal equity is premised on the fundamental precept that equals should be treated equally. In practice this means that children who are similar in background and previous achievement should have equal funding support (i.e., equivalent per pupil expenditures).

Vertical equity means un-equals should be treated unequally. Not all children are alike. For example, some have special education needs, some have limited English proficiency, and some come from higher poverty environments, all of which require additional funds to support them as they strive to achieve common academic standards and performance.

Prior to implementation of EPS, Maine's funding formula had little in terms of prescribed levels of adjustment to insure vertical equity. But beginning in 2005-06, three vertical equity adjustments were put into place (special needs, LEP, and Disadvantaged Youth), and provisions were included in the law for three year reviews of these adjustments. The Disadvantaged Youth adjustment was first reviewed in Fall 2008. This report describes the results from the second regularly scheduled review in 2010-2011.

At present the Disadvantaged Youth vertical equity adjustment in the EPS formula is in the form of a weight per pupil operating expenditure adjustment. According to Gold, Smith and Lawton (1995):

> Weighting procedures, in effect, adjust the pupil count to provide a better reflection of a school district's educational need…Weights are assigned in

> relation to the costs of educating the "regular" school pupil. The "regular" pupil is given a weight of one (1.0). Other pupil populations are given weights relative to the "regular" pupil weight of 1.0 to reflect the additional cost of educating these pupils. For example, if a particular category of student has a weight of 1.5, that implies that it costs 1.5 times as much to educate that student as it does the "regular" student (p.25).

The current weight adjustment is 15%. That is to say, policy makers concluded that beginning in FY2006 school districts should receive a 15% adjustment in their per pupil operating expenditure allocation for each pupil in the district who was eligible for free or reduced lunches (a standard measure of poverty). In establishing this 15% adjustment, policy makers had very little guidance from the national literature or any empirical evidence. Like many state policy makers across the country who have supported a so-called poverty adjustment, Maine's leaders had to set the adjustment without any clear evidence of what level adjustment was needed to insure vertical equity. And like many other state policy makers across the country, Maine leaders were forced to set the adjustment based on theoretical, policy, and political considerations.

The central question, given the goal of the EPS formula to increase student equity, becomes "Is the 15% adjustment the appropriate amount?" In-other-words, is the 15 % adjustment what it takes to help disadvantaged youth achieve Maine's state learning standards, the Learning Results. If it is, then one should find for those school districts that spend an additional 15% for each of their disadvantaged youth, that their disadvantaged youth are meeting state proficiency standards. Conversely, for those school districts spending less than the additional 15% for each of their disadvantaged youth, fewer of their disadvantaged youth would be meeting the state standards.

But first, before attempting to answer the central question about the adequacy of the 15%, it is important to explore the relationship between poverty and performance. Today there is a considerable body of literature linking student poverty and student achievement. But the strength of the link appears to be dependent upon several factors, such as ethnicity, density of poverty, geographic setting, (e. g; urban vs rural), and school level.

What is the case for Maine? Are poverty and performance related? Is the link strong? To answer these questions, the relationship between poverty (defined as qualifying for free or reduced lunch) and performance on Maine statewide standardized tests (MEA & MSHA) was

examined. The relationship was explored by calculating correlations between these two variables.

A statistical correlation is a number which represents the relationship between two or more phenomena. The number may range between ±1.00. A correlation of + 1.00 means that as one variable increases, the other variable also increases. This is labeled a perfect positive correlation. A perfect negative correlation (-1.00) means that as one variable increases the other variable decreases. The plus (+) or minus (-) sign accompanying a correlation does not denote the value of the correlation; just the direction of the relationship. Correlations near zero (0.00) represent no correlation between the variables. In-other-words, as one variable increases, the other variable may sometimes increase, sometimes decreases, or does not change.

One common way to interpret a correlation is to determine its predictive power; to determine how often you may predict one variable from another and be correct. To determine its predictive power, a correlation is converted as follows: the correlation is squared and then multiplied by 100. So, for example, if the correlation is .90, then the predictive power is 81% (.90 x .90) x 100)). This means if you know the first variable, and you know that the correlation between the first variable and a second variable is .90, then you may predict one from the other and expect to be correct 81% of the time.

Table 1 reports the correlations between the percent qualifying for free or reduced lunch and MEA/MHSA performance, using school level data for FY2009. As shown in the table, there

Table 1: Correlation between Poverty and Achievement*

	Percent Free or Reduced Lunch	4th Grade MEA Performance	8th Grade MEA Performance	11th Grade MEA Performance
Percent Free or Reduced Lunch	1.00			
4th Grade MEA Performance	-.448	1.00		
8th Grade MEA Performance	-.563	.280	1.00	
11th Grade MHSA Performance	-.788	-.226	.351	1.00

* All correlations are significant at the 0.01 level

are moderate to substantial negative correlations (-.448 to -.788) between the percent of students in a school who qualify for free or reduced lunches and the school level performance of students. The negative sign denotes the direction of the relationships. In this case, as the percent of poverty increases, school level performance decreases. However, the relationship is not as strong as one might expect, particularly in the lower grades. In the case of 4th grade, if one attempted to predict MEA performance from the percent of pupils qualifying for free or reduced lunch, one would only be correct approximately 20 percent of the time ((-.448 x -.448) x 100 = 20%). And even at the 11th grade where the correlation is higher, the prediction would be correct approximately 62 percent of the time ((-.788 x -.788) x 100 = 62.1%).

Why are these correlations not higher? One explanation may be that there is, in fact, only a moderate relationship between poverty levels and achievement in Maine schools. However, before settling on this explanation, another potentially important phenomenon needs to be explored. Is there is a curvilinear relationship rather than a linear relationship between poverty and achievement. It could be that performance accelerates in its decline as the density of poverty increases. In-other-words, as the amount of poverty increases in a school (e.g., from 20% of pupils qualifying for free or reduced lunches to 60%), school level performance on the MEA/MHSAs falls off considerably more. And if this is the case, the standard linear correlation formula is not equipped to measure this phenomenon.

Figure 1 depicts what it would look like if there was an accelerated decline in performance with greater density of poverty in schools. The vertical axis on the left denotes achievement and the horizontal axis represents percentages of free and reduced lunch qualified pupils in a school. As depicted in the figure, as the rates of poverty accelerated the decline in achievement accelerates. Applying the standard linear correlation formula to this phenomena would result in a correlation which underestimates the relationship (i.e., the correlation coefficient would be smaller); in essence by masking the real relationship.

Figure 1:
Relationship Between Poverty Levels in Schools and Performance

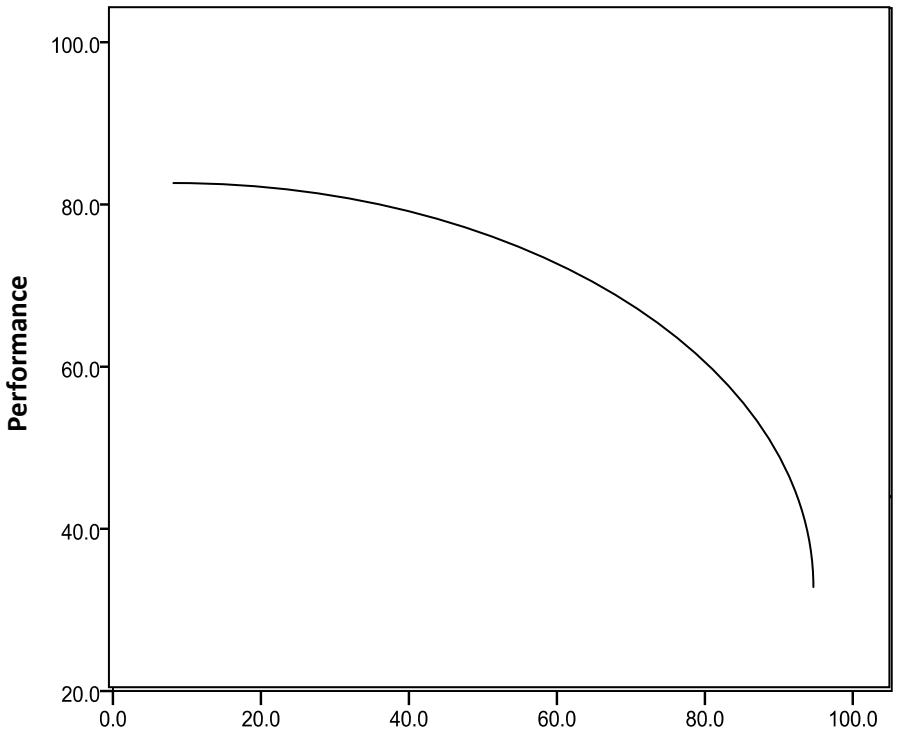
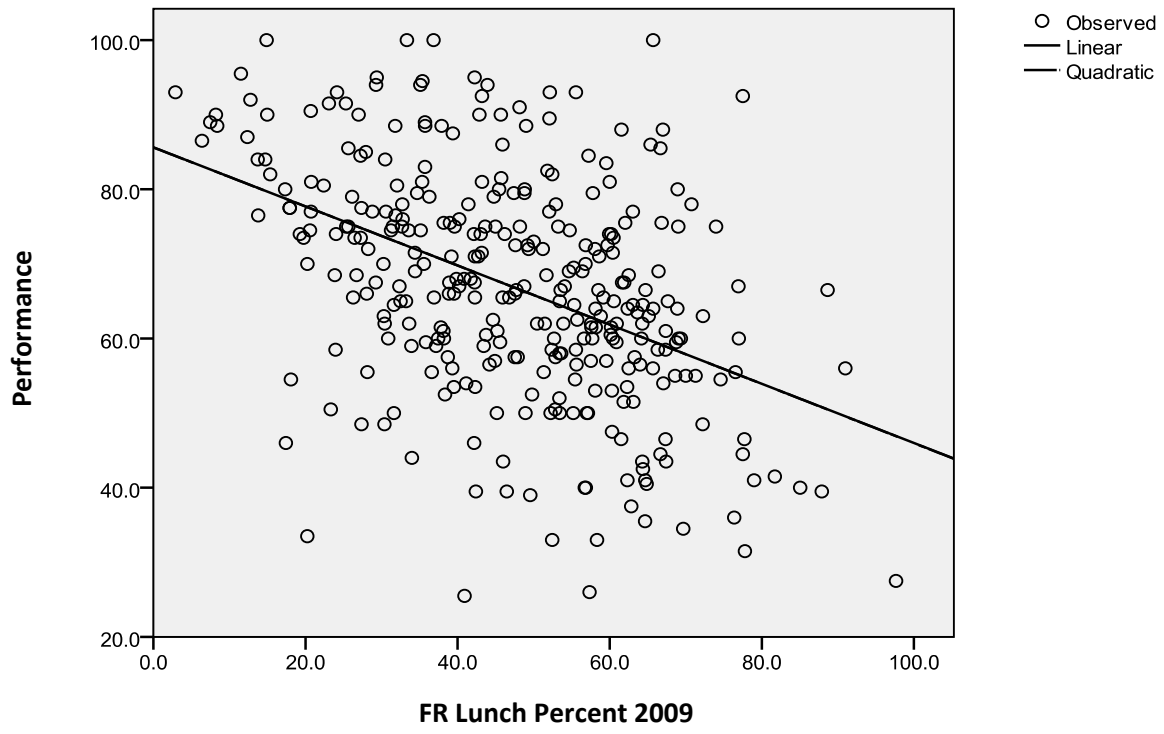


Figure 2 on the next page is a graph of the actual relationships found between poverty levels and student performance. The results are very similar for the 8th and 11th grade. Each circle in the figure represents a school, and a school's position on the graph denotes the intersection of its poverty level and student performance. As shown in Figure 2, there does not appear to be a curvilinear relationship between the percent of poverty in a school and student performance on the 4th grade MEA. Similar profiles for 8th grade and 11th grade appear in Appendix A. There is a relationship between the two variables, just not a curvilinear one. Additionally, what the figure reveals is that other factors besides poverty levels alone are related to performance. If poverty alone were the most important factor, then the circles should be clustered along the straight line. To the extent that they are not clustered along the line suggests that other factors are related to school level performance.

Thus, the analysis indicates there is a relationship between poverty levels and student performance in Maine schools, that it is moderate to substantial, and other factors besides

poverty impact achievement. One of those factors could be per pupil expenditures. In fact, the Disadvantaged Youth weight in the EPS formula is specifically designed to mitigate the effects of poverty. It is designed to provide additional resources to support the learning of disadvantaged pupils. To return to the central question then, is the 15% adjustment the appropriate amount to help disadvantaged pupils achieve Maine's Learning Results?

Figure 2:
Relationship Between 4th Grade MEA and Poverty Level



As in the case of the first review of this EPS component, a cost function approach was used in answering this central question. A *cost function* approach involves using statistics to estimate an educational cost function, where school spending is modeled as a function of the characteristics of students, schools, communities, and education outcomes. The results of the analysis can be used to estimate the average amount of school spending per Disadvantaged and non- Disadvantaged Youth for a given set of school and community characteristics and level of proficiency. The pupil weight is calculated from the difference between these amounts.

Table 2 presents what the cost function analysis should yield as results if the present 15% adjustment exists in practice as well as in policy. To determine these expenditure levels, an analysis was done of the relationships between actual MEA performance and expenditures.

Table 2: Projected Per-Pupil Expenditure Assuming Match Between Policy and Practice at 15% Additional (2008-2009)

Additional Spending for F/R Lunch Eligible Students:	Per Pupil Expenditures		
	K-8	9-12	K-12
A. Per-Pupil Expenditure for non-Free/Reduced Lunch Qualified Pupil	$6,818.26	$7,454.05	$7,030.19
B. Additional 15% Per-Pupil Expenditure for Free/Reduced Lunch Qualified Pupil	$1,022.74	$1,118.11	$1,054.53
C. Projected Per-Pupil Expenditure for Free/Reduced Lunch Qualified Pupil	$7,841.00	$8,572.16	$8,084.72

In 2008-09 the State average proficiency level on a composite MEA performance scale was 66% for grades K-8 (and 43% for grades 9-12). Because we know the statewide expenditures and the number of economically disadvantaged students, we can determine by algebra what the expenditures and per non-economically-disadvantaged student would need to be, assuming 15% more were to be spent on the economically disadvantaged students. The analysis revealed that lower poverty school districts would have average expenditures of $6,818 per pupil for their K-8 students and $7,454 for 9-12 pupils. Row B in Table 2 reports the 15% dollar amount based on these expenditure amounts, and Row C reports what one would expect to find in terms of funding levels in higher poverty school districts. In-other-words, if school districts were spending an additional 15% for each disadvantaged youth in their districts, then per pupil expenditures for these pupils would be $7,841 for K-8 grade pupils, and $8,572 for 9-12 grade students.

Table 3 on the next page reports the actual 2008-09 spending levels for non-F/R lunch pupils and F/R lunch pupils. The same standard of proficiency was used as in Table 1. That is, average per pupil expenditures were compared assuming lower and higher poverty school districts achieving the 66% and 43% proficiency levels. As may be seen in the table, higher poverty school districts are actually only spending 1% **more** than lower poverty schools to achieve the same K-8 levels of performance, 18% **less** to achieve 9-12 levels of performance, for an overall K-12 additional weight equivalent to minus 6%. In essence, the empirical evidence indicates high poverty school districts that are achieving the same levels of student performance

as found in lower poverty school districts, are spending 6% less rather than the 15% more as established by current policy.

Table 3: Actual Additional Spending for F/R Lunch Eligible Students for State Average Performance

	K-8	9-12	K-12
Spending for non-F/R Lunch Student to achieve State Average proficiency level	$7,863.04	$9,741.68	$8,489.26
Spending for F/R Lunch Student to achieve State Average proficiency level	$7,953.44	$8,014.68	$7,973.86
Difference in Per-Pupil Spending	$90.40	-$1,727.00	-$515.40
Additional Pupil Weight for F/R Lunch Student	**0.01**	**-0.18**	**-0.06**

Why the difference between policy and practice? And why does the evidence seem to be counter-intuitive? That is to say, higher poverty schools appear to be actually spending less to achieve the same results as higher poverty schools. Why is this the case?

Several phenomena may provide at least some partial insight into these findings. First, the relationship between school funding levels and poverty may be more complex than just free and reduced lunch eligibility. Table 4 reports the correlations between some district factors and per pupil expenditures.

Table 4: Correlations Between Expenditures and Selected Characteristics 2008-2009

	Correlation	
	K-8	9-12
Per-Pupil Valuation	.728**	.473**
SAU Attending Enrollment	-.307**	-.516**
Free and Reduced Lunch Percentage	-.252**	-.047
MEA/MSHA Percent Meeting or Exceeding Proficiency	.244**	-.031

**. Correlation is significant at the 0.01 level.

The correlation coefficients in the table indicate there's little if any correlation between the percent of free and reduced lunch eligible pupils in school districts and per pupil expenditures (i.e., K-8 = -.252 and 9-12 = -.047). And the correlations between district size and expenditures are only low to moderate (e.g., -.307 and -.516) and negative. However, the correlations between per pupil valuations and per pupil expenditures are moderate to high

(e.g.,.473 and .728) and positive. Thus, the empirical evidence indicates per pupil expenditures in Maine school districts are more related to property valuation than poverty or school district size.

A second phenomenon which is important to note is that the expenditures used in this analysis are not only those devoted to achieving the Learning Results. Some school districts chose to spend more on resources which are above and beyond what a district needs to spend to achieve the Learning Results. For example, for a broader curriculum, or more AP courses, or more on extra-curricular programs. Thus, while at first blush it may appear that lower poverty school districts are spending more to achieve the same results as higher poverty schools, lower poverty districts may be spending more because they are supporting more than achievement of the Learning Results.

Third, without knowing what specific resources school districts are spending on helping their disadvantaged pupils achieve proficiency in the state learning standards, it is impossible to discern clearly the relationships between per pupil expenditures, poverty levels, and student performance in higher and lower poverty school districts. To understand these relationships, and then to provide a more definitive answer to the central question of the appropriateness of the 15% weight, evidence of more specific expenditures school districts incur in supporting their disadvantaged pupils achieve the Learning Results is needed.

Given the evidence described above, and the identification of several factors which may assist in interpreting the evidence, two recommendations are made for the continuation of the Disadvantaged Youth adjustment in Maine's EPS funding formula. These are:

1. The current weight should be retained until more accurate information becomes available.
2. The 15% weight should be converted to be a targeted EPS component.

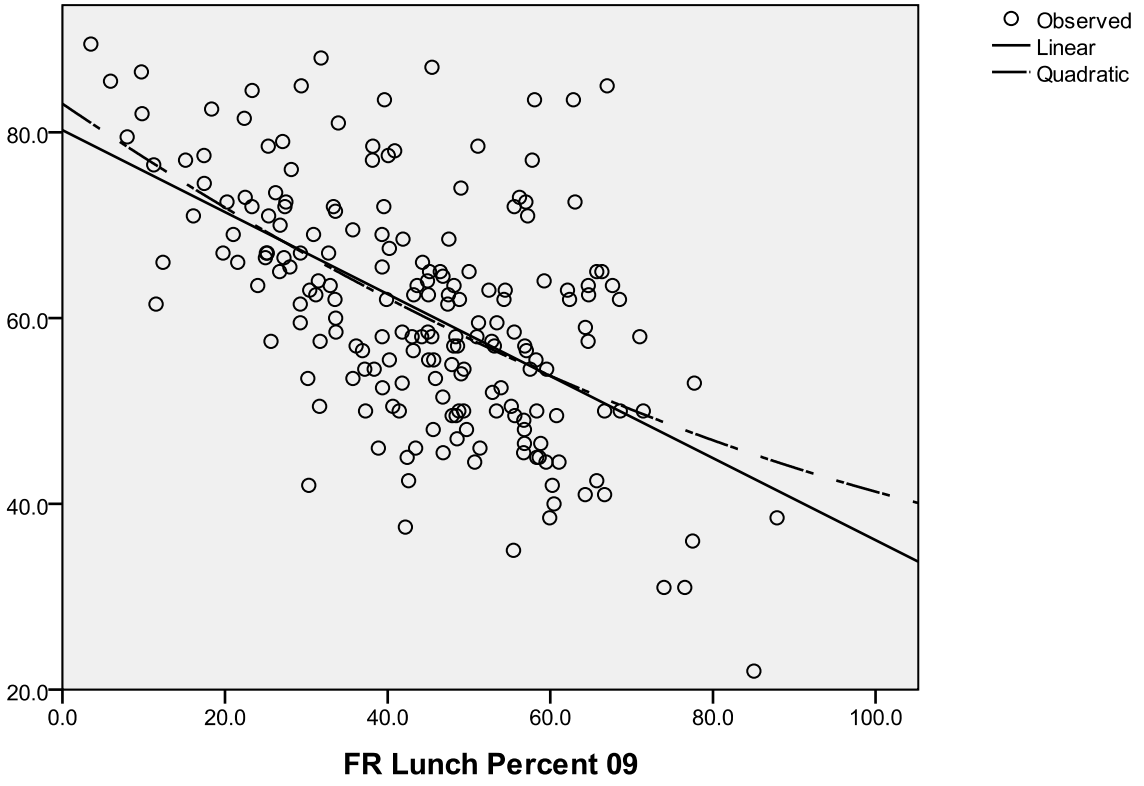
Maintaining the current weight, and converting it into targeted funds, will insure that the original policy is practiced in Maine's school districts, and over time provide the evidence to determine if the 15% weight is sufficient to insure achievement of high standards by all Maine pupils.

References

Gold, S. D., Smith D. M., & Lawton, S. B. (1995). Public school finance programs of the United States and Canada 1993-94: Volume 1. Albany, NY: State University of New York, American Education Finance Association, and The Center of the Study of the States. The Nelson A. Rockefeller Institute of Government

APPENDIX A

Relationship Between 8th Grade MEA and Poverty Level



Relationship Between 11th Grade MHSA and Poverty Level