The 2009-10 Review of the Transportation Cost Component in the Essential Programs and Services School Funding Model

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Background

Beginning 2005-06, Maine implemented a new school funding formula entitled the Essential Programs and Services (EPS). This cost-based EPS model is based on two fundamental premises. First, there must be adequate resources in each of Maine's school administrative units and schools to achieve desired outcomes. Second, there must be equity in the distribution of these adequate resources among Maine's school administrative units. Equity means similar school administrative units should be treated similarly in the school funding formula, and dissimilar school administrative units should be treated dissimilarly.

In the case of pupil transportation, and prior to 2005-06, Maine used an expenditure-reimbursement model for funding transportation costs. School administrative units annually submitted their transportation expenditure to the State, and the school administrative units were reimbursed for a portion of these expenditures based on an ability-to-pay formula.

An analysis of historical data revealed wide variations in reported transportation expenditures, even among Maine school administrative units with apparently similar cost-relevant characteristics (e.g., similar numbers of pupils, similar numbers of miles of road, similar numbers of miles traveled by school buses, etc). It was hypothesized that the differences in reported expenditures may be due to a combination of *controllable* (discretionary) and *uncontrollable* (non-discretionary) *cost drivers;* that is, cost factors *within the control of school administrative units* and cost factors *beyond school administrative unit control*. Controllable factors and the expenditures associated with them reflect local decisions, and consequently, in theory, the cost of these factors may be considered the responsibility of the local school administrative unit. However, uncontrollable factors should be the joint responsibility of the State and school administrative units, and thus accounted for in the EPS funding formula. Accordingly, an analysis was undertaken of the relationship between key uncontrollable cost drivers and transportation expenditures. A variety of potential uncontrollable cost drivers were examined initially, but only two consistently surfaced from this analysis. The two key drivers were: (1) the number of resident pupils; and (2) the number of miles of road (class 1 – 5 roads). Using a statistical analysis procedure called multiple regression, the two uncontrollable cost drivers were found to be highly correlated with 2000-2001 and 2001-02 expenditures, and consequently highly predictive of transportation costs. The correlation between the two variables, the number of resident pupils and miles of road, and transportation expenditures was 0.91 (a perfect relationship is 1.00). Thus, Pupil Density (i.e., the number of pupils per mile of road) is very predictive of transportation costs. This makes sense intuitively, because students in sparsely populated rural SAUs generally live farther from school—and hence cost much more per pupil to transport—than pupils in densely populated urban SAUs. Figure 1 displays visually the relationship between actual and predicted costs.

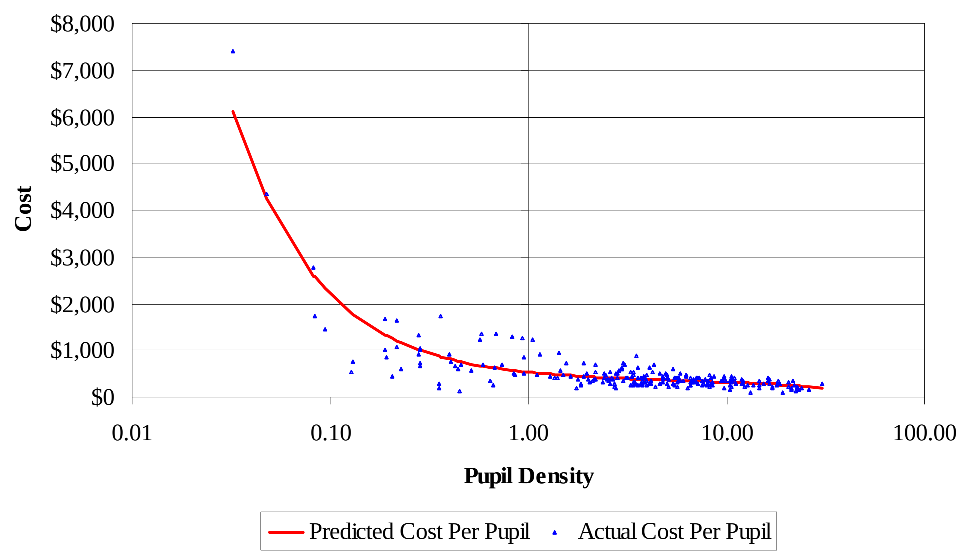

Figure 1: 2000-2001 Actual and Predicted Tranportation Operating Costs

Based on this analysis, a pupil density model, along with some adjustments was incorporated into the EPS funding formula. Thus, beginning in 2005-06, SAU transportation cost allocations in the EPS formula were determined based on a pupil density index (i.e., number of resident pupils and number of class 1-5 road miles within

SAU), and adjustments for:

1. Out-of-district special education transportation
2. Vocation education transportation
3. Transportation of homeless pupils
4. Ferry costs
5. Island SAU costs

In approving the transportation component of EPS, the Joint Committee on Education and Cultural Affairs of the Maine State Legislature formally requested a further analysis of the transportation component of EPS. This additional analysis was to assess the impact of other transportation factors. One analysis involved further examination of different models. Accordingly, a second series of analyses were undertaken to calculate the empirical relationship between various other models and SAU transportation expenditures. These relationships, defined by correlations, are reported in Table 1. A correlation of 1.00 would in this case represent a complete correspondence between the model and expenditures, and as may be seen from the table, the pupil density model remained the strongest model (r=.928). The Odometer Miles Model also was strong (r=.903), so a third model combining the two strongest models was calculated. This combined model (models 1 and 3) also yields a strong correspondence (r=.905) between the model and SAU expenditures.

Table 1

Model	Description	Correlation
1. Odometer Miles Model	The gross cost per pupil conveyed for each SAU is predicted by the odometer miles traveled per pupil conveyed by each SAU.	.903
2. Cost Per Mile Traveled	The gross cost per odometer mile traveled for each SAU is predicted by the odometer miles traveled per pupil conveyed by the SAU.	.704
3. Pupil Density Model	The net cost per resident pupil for each SAU is predicted by the pupil density per mile of class 1 through class 5 road in the SAU.	.928
4. Combined Pupil Density and Odometer Miles Models	The average of the Pupil Density Model and the Odometer Miles Model.	.905

A second analysis involved an examination of other factors school personnel thought might affect transportation costs. Based on the discussions with the ad hoc advisory group of superintendents and business managers, the analysis focused on the components of school transportation systems the group hypothesized might need to be included in the EPS component because of their unique or uncontrollable features. These were: (1) mileage traveled returning from dead-end roads, the edge of districts, and other towns; (2) midday, late, and summer school buses; (3) driver compensation; and (4) fuel costs. If, as hypothesized, these features may be related to the variance between transportation expenditures and EPS cost allocations, then statistically significant moderate to high correlations should be found between the features and the expenditure-allocation variance. Table 2, reports the correlations found in this analyses. As may be seen from the table, only one feature (bus driver compensation) correlated with transportation expenditure-allocation variance. All other correlations were not statistically significant, nor of any significant size.

Table 2: Correlations Between Transportation Expenditures and Transportation System Features

Transportation System Feature	Correlation to Expenditure-Allocation Variance
1. Percent of miles retraveled returning down dead-end roads.	-.026
2. Percent of miles retraveled returning from edge of district.	-.114
3. Percent of miles retraveled going to another town.	-.064
4. Percent of regular run miles on midday buses.	.049
5. Percent of regular run miles on late buses.	0.11
6. Percent of regular run miles on summer school buses.	-.072
7. Total hourly bus driver compensation.	.221*
8. Gas price per gallon.	-.050
9. Diesel price per gallon.	.038

* statistically significant <.05

Based on these series of analyses, the current EPS transportation component of EPS is calculated as follows:

1. The Density model or Combined Density and Odometer Model is applied to each SAU, depending on whichever model is more beneficial to the SAU relative to the most recent transportation expenditures.
2. An SAU's transportation allocation is adjusted for unique circumstances. These are:
    a. out-of-district special education costs
    b. vocation education transportation
    c. transportation of homeless pupils
    d. ferry boat costs
    e. island transportation costs
3. An SAU's transportation allocation as calculated in (1) has an upper limit of 5% above predicted cost or a lower limit of 10% below expenditures, whichever is applicable.

In accordance with state status this model was reviewed in 2009-10. More specifically an analysis was undertaken to determine if the models (Density and Odometer) used in the present calculations are still appropriate. The correlations between transportation allocations using these models and actual 2008-09 expenditures were calculated, and these correlations appear in Table 3. These results indicate that while the individual models are weaker predictors of actual expenditures than in previous analyses,

Table 3

Model	Description	Correlation
1. Odometer Miles Model	The gross cost per pupil conveyed for each SAU is predicted by the odometer miles traveled per pupil conveyed by each SAU.	.686
2. Pupil Density Model	The net cost per resident pupil for each SAU is predicted by the pupil density per mile of class 1 through class 5 road in the SAU.	.750
3. Combined Pupil Density and Odometer Miles Models	The average of the Pupil Density Model and the Odometer Miles Model.	.996

the combined model is even a stronger predictor then the previous analysis. Thus, no changes are recommended at this time in the current EPS transportation component. However, a further analysis may be needed once sufficient numbers of SAUs/RSUs have implemented the state supported transportation routing software, and once additional RSUs/AOS's are established.