October 28, 2021

To: **Representative, Emilie Kornheiser**
                Senator, Ruth Hardy

From: **Tammy Kolbe, University of Vermont**
                Bruce Baker, Rutgers University
                Drew Atchison & Jesse Levin, American Institutes for Research

RE: **Response to Questions Posed by the Task Force on Pupil Weighting (dated October 22, 2021)**

Thank you for your thoughtful questions regarding the data, methods, and findings from our Study of Pupil Weights in Vermont's Education Funding Formula. Our response is structured in two parts. First, we review the implications of the proposed changes in assumptions for how weights would be applied in the equalized pupil calculation. Second, we respond to your questions, point-by-point. (See Attachment A)

Implications of Changes in Assumptions

Your letter describes three revised assumptions for the equalized pupil calculation that are under consideration by the Task Force:

1. Calculating equalized pupils using additive, rather than multiplicative, pupil weights for economically disadvantaged students and for school enrollment.

2. Using eligibility for Free- and Reduced-Price Lunch (FRPL) as a proxy measure for student disadvantage, rather than the existing measure that uses a count of families receiving nutrition benefits.

3. Replacing the recommended pupil weight for English language learners (ELL) with a targeted categorical aid program and remove the associated weight for ELL students from the equalized pupil calculation.

Changing the equalized pupil calculation to incorporate additive weights and using the count of students eligible for FRPL as a proxy measure for student disadvantage require the weights presented in Table 4.9 of our report to be recalculated.

Recognizing the time constraints faced by the Task Force, as a courtesy, we re-estimated the weights derived from the district- and school-level cost function models to reflect these new assumptions. The revised weights are presented in Table 1 (appended to this memo).

It is important to note, however, that the assumptions used to recalculate weights derived from district- and school-level cost function models reflect different assumption for how student economic disadvantage is measured. Specifically:

1. The weights derived from the cost function models that use school-level data for analysis reflect the proposed change to using FRPL as a proxy measure for student disadvantage.

2. The weights derived from the cost function models that use district-level data for analysis assume the existing approach to poverty measurement (see Table 1, Footnote 3). Recalculating weights using district-level data will require the cost function models to be re-run using district-level information on FRLP eligibility, a task that requires additional time and resources to complete.

   However, to be clear, <u>without re-estimating the district-level cost function models, the weights presented in Report Table 4.8 or Table 1 of this memo should not be applied to any other measure of student economic disadvantage other than what is currently defined in statute–</u> i.e., weights derived from the district-level models cannot be applied to FRPL counts without re-estimating the district-level cost function models.

Replacing the ELL weight with a categorical grant program does not impact the weight estimates presented in Report Table 4.9 or Table 1 (in this memo). Implementing a categorical grant program for ELL students will, however, impact the education spending amounts used in the equalized pupil calculation.

Updated Recommendations

We have no objections to incorporating additive weights in the equalized pupil calculation, nor using FRPL as a measure of student economic disadvantage. Based on these policy assumptions, we recommend the updated weights derived from the school-level model, as presented as Model 4 in Table 1 (below).

Additionally, it is important to note that there are efficiencies in operating a formula that adjusts for differences in the cost of educating ELL students using weights incorporated in the equalized pupil calculation. A categorical funding program for ELL students could be a viable policy alternative <u>if the funding available through this program is equivalent to the cost offset that would be generated by the weight</u> identified in Model 4 (Table 1). This would require the General Assembly to calculate, each fiscal year, a new funding amount for the program.

Table 1: Revised Weights Derived from Models Using District- and School-level Data

		Weights Derived from Models Using District-level Data[1]		Weights Derived from Models Using School-level Data[1]	
		Model 1[2]	Model 2[3]	Model 3[2]	Model 4[4]
Student Needs	Poverty Rate (AOE)	0.61	0.57	2.97	
	Free- or Reduced-Price Lunch (FRPL) Rate				1.03
	% ELL	0.09	0.05	1.58	2.49
Grade Range	% Middle Grades Enrollment	1.20	0.17	1.23	0.36
	% Secondary Grades Enrollment	1.47	0.45	1.20	0.39
Context					
Enrollment	<100 Students	0.21	0.19	0.26	0.21
	101–250			0.12	0.07
Population Density	<36 Persons per Square Mile	0.12	0.11	0.23	0.15
	36 to <55	0.06	0.06	0.17	0.12
	55 to <100	0.07	0.17	0.11	0.07

[1] Both the district- and school-level weights presented in this table were derived from models controlling for the share of students in a district/school with mild and severe disabilities. These weights are appropriate to be paired with the state's existing categorical grant program for special education. Weights from models that do not control for the share of students with disabilities in a district/school are not presented and are available upon request.

[2] Models 1 & 3 Assumptions: Weights reflect assumptions in the equalized pupil calculation currently in statute, specifically: (1) Grade range weights were set to a base value of 1.00 representing elementary grade enrollment; (2) grade range weights and poverty weights are multiplicative, meaning that the poverty weight is applied to the grade range weighted enrollment; (3) all other weights are additive; (4) enrollment weights for the district model apply to district size, and enrollment weights for the school model apply to school size; and (5) the poverty ratio is calculated according to current statute (16 VSA §4001(8)) – i.e., with the number of economically-deprived persons defined as the count of children who reside within a family unit receiving nutrition benefits, and any other persons who do not reside with a family unit receiving nutrition benefits for whom English is not the primary language. Models 1 & 3 weights are unchanged from the weights reported in Tables 4.8 & 4.9 in the Study of Pupil Weighting in Vermont (i.e., models controlling for SWD).

[3] Model 2 Assumptions: Weights reflect revised assumptions, specifically: (1) all weights are now additive and (2) grade range weights are no longer set to a base value of 1.00 for elementary grade enrollment. The poverty ratio is calculated according to current statute (16 VSA §4001(8)) – i.e., with the number of economically-deprived persons defined as the count of children who reside within a family unit receiving nutrition benefits, and any other persons who do not reside with a family unit receiving nutrition benefits for whom English is not the primary language. Enrollment weights for the district model apply to district size.

[4] Model 4 Assumptions: Weights reflect revised assumptions, specifically: (1) all weights are now additive and (2) grade range weights are no longer set to a base value of 1.00 for elementary grade enrollment; and (3) the extent of economic disadvantage in a school is measured as the count of FRPL-eligible students. Enrollment weights for the school model apply to school size.

Attachment A

Response to Questions

1. *Since you have testified that the pupil weights estimated for selected cost factors are dependent on the model from which they are derived, including both the underlying data and the cost factors included in the estimation, what changes would the Task Force need to make to the pupil weights recommended in your report to account for these variations?*

   Your letter describes three revised assumptions for the equalized pupil calculation that are under consideration by the Task Force:

   1. Calculating equalized pupils using additive, rather than multiplicative, pupil weights for economically disadvantaged students and for school enrollment.

   2. Using eligibility for Free- and Reduced-Price Lunch (FRPL) as a proxy measure for student disadvantage, rather than the existing measure that uses a count of families receiving nutrition benefits.

4. Replacing the recommended pupil weight for English language learners (ELL) with a targeted categorical aid program and remove the associated weight for ELL students from the equalized pupil calculation.

   Changing the equalized pupil calculation to incorporate additive weights and using the count of students eligible for FRPL as a proxy measure for student disadvantage require the weights presented in Table 4.9 of our report to be recalculated.

   Recognizing the time constraints faced by the Task Force, as a courtesy, we recalculated the weights derived from the district- and school-level cost function models to reflect these new assumptions. The revised weights are presented in Table 1 (appended to this memo).

   It is important to note, however, that the assumptions used to recalculate weights derived from district- and school-level models reflect different assumptions for how student economic disadvantage is measured. Specifically:

   1. The weights derived from the cost function models that use school-level data for analysis reflect the proposed change to using FRPL as a proxy measure for student disadvantage.

   2. The weights derived from the cost function models that use district-level data for analysis assume the existing approach to poverty measurement (see Table 1, Footnote 3). Recalculating weights using district-level data will require the cost function models to be re-run using district-level information on FRPL eligibility, a task that requires additional time and resources to complete.

      Why do the district-level cost function models need to be re-estimated if the poverty measure is changed to FRPL?

FRPL was not considered as a need variable when running our initial district-level models. Instead, the AOE poverty rate (which is calculated per existing statute) and the SAIPE poverty rate were used in these estimations. As noted in Table 4.6 in our report, the AOE poverty measure proved both to be the best measure of student economic disadvantage at the district level as well as consistent with existing policy.

By contrast, the underlying school-level cost model uses FRPL as a proxy for student economic disadvantage. (FRPL was used in the school-level model since: (1) the AOE poverty measure was unavailable at the school-level; and (2) our risk analysis showed it to be the strongest predictor of student risk, based on student economic disadvantage). We performed the conversion from school-level FRPL to the AOE poverty measure and applied the latter to the weight estimation model. In doing so, we did sensitivity checks to ensure that this conversion was in line with the original cost model predictions.

With additional time and resources, we can attempt to re-estimate a district-level cost function model using FRPL as a proxy for student economic disadvantage. That said, based on our earlier estimations, it is not clear that a re-estimation using the district-level data would yield consistent, statistically significant, and logical results. This is one of the key reasons we did not recommend weights based on the district-level cost model for policymaking.

That said, to be clear, <u>without re-estimating the district-level cost function models, neither the weights derived from the district-level model presented in the report (Table 4.9) nor the weights presented in Table 1 of this memo can be applied to a poverty measure other than what is currently defined in statute</u> – i.e., weights derived from the district-level models cannot be applied to FRPL counts without re-estimating the district-level cost function models.

Replacing the ELL weight with a categorical grant program does not impact the weight estimates presented in Table 4.9 of the report or Table 1 presented in this memo. Implementing a categorical grant program for ELL students will, however, impact the education spending amounts used in the equalized pupil calculation.

3. ***Can the estimated cost associated with students in poverty in Table A.1. be applied to the number of students eligible for FRPL program or to the number of students enrolled in SNAP nutrition benefits (the measure used in our current equalized pupil calculation)? If the application varies, do the estimated costs vary as well?***

No. As noted above, the dollar costs derived from the district-level cost function model (Table A.1) use the existing AOE poverty measure. As a result, the results are not compatible with alternative poverty measures, including FRPL. With additional time and resources, we can try to re-estimate the cost function models using district-level data and FRPL eligibility as the poverty measure, if this is a step the Task Force would like to take.

Would you let us know if these cost estimates should be changed to be consistent with the report findings and if so, how?

The dollar estimates from the cost function model presented in Table A.1 should not be used in policy (e.g., a categorical grant program where the number of FRPL-eligible students is multiplied by $5,531).

The dollar value for any single cost factor (e.g., poverty) does not account for all the other costs controlled for in the model. If you would like to derive a dollar value that could be used in policy, the models will need to be re-estimated with just those factors that will be accounted for in policy. Put another way, all the coefficients reported in Table A.1 are contingent on controlling for the other factors included in the model. The model reported in Table A.1 was used to identify relevant cost factors, controlling for a wide range of measures of district and school context. As a result, one cannot pick and choose some coefficients and not others from what is presented in Table A.1. – i.e., if you choose one of the estimates, for that estimate to appropriately reflect the additional costs, you must account for all the other estimates (coefficients) presented in Table A.1 in policy (e.g., Herfindahl Index).

In addition, based on the results of the models reported in Tables A.1-A.3, we estimated simplified models for the purpose of developing weights for policy. The simplified models included just those cost factors that were identified as relevant for weighting. Tables A.5 and A.9 present the model weight calculations along with the base spending amount.

With additional time and resources, it is possible derive dollar estimates for the list of specific cost factors identified in your letter (i.e., poverty, high school, middle school, population density 1, population density 2 and 3) derived from the district data. We are happy to establish a contract with JFO to complete this additional work if this is a step the Task Force would like to take.

It is also worth noting that the dollar amounts derived from such an estimation would need to be adjusted annually to account for differences inflation/cost over time.

4. *Would you explain why there is such a large difference between the pupil weights derived from the district- and school-level models? How can such divergent results both be explained in common language to legislators, advocates, and the general public?*

The district- and school-level models are derived from different data sources and use different assumptions. That said, with the exceptions of the weights estimated for poverty and ELL, the weights are generally comparable between district- and school-level models. The rationale for why the models provide different values for poverty and ELL is different for each cost factor, specifically:

- **ELL Student Weights**
  As we discuss in the report, we have concerns regarding the ability to estimate cost differentials for ELL students in Vermont using district-level data. Except for a few districts in certain geographic areas of the state, ELL students make up a very small share of most Vermont school district enrollments. This, coupled with the comparatively

smaller number of school district observations (compared to the larger number of school-level observations) available for analysis, makes it challenging to develop cost estimates for ELL students using district-level data. In fact, the coefficient for ELL students is not statistically significant in the district-level cost function model (see Report, Table A.1). For this reason, we do not have confidence that the weight derived for ELL students using district-level data is an accurate representation of the differences in the cost of educating ELL students in Vermont.

However, when we compare the weight derived for ELL students from the Vermont school-level model (Report, Table 4.8) to the one derived from the regional model (Report, Table 4.9) the weights are similar (1.58 vs. 1.27, respectively). Additionally, the coefficient for the percentage of ELL students is statistically significant in the school-level cost function model (see Report, Table A.2). Together, these factors give us confidence that the ELL weight derived from the school-level model best reflects the difference in the cost of educating ELL students in Vermont.

It is noteworthy, that the ELL re-estimated weight for the school-level model (Table 1, above) increases to 2.49. This is likely due to the change in poverty measure. The prior weight was based on a weighting estimation that used the existing AOE poverty measure, which accounts for ELL students in its count of economically disadvantaged students. The revised measure used in the re-estimated weights – i.e., FRPL eligibility – no longer includes ELL students in the measure, and as a result a portion of the cost differential for ELL students that was initially captured by the AOE poverty measure is now entirely represented by the re-estimated ELL weight.

- *Poverty*
  As noted in the report, the district- and school-level cost estimation models use different measures for economic disadvantage than does the regional model (Tables A.1-A.3). The different poverty measures are more or less stringent with respect to identifying economically disadvantaged students (e.g., the existing AOE measure identifies fewer students than does FRPL eligibility), and as a result the cost function estimates are not readily comparable between the district- and school-level models

  That said, it is noteworthy that the re-estimated weight for poverty using Vermont school-level data is similar – although smaller in magnitude - to the weight estimated using the regional model (1.03 vs. 1.24, respectively).[1] Both the revised school level model and the regional model use FRPL in the cost function and weight estimation, which allow a direct comparison between models.

Additionally, based on the question, we feel it is important to reiterate that we used a defined process to come to a preferred cost estimation model and translation of that model into weights that can be used in policy.

The process started with a careful vetting of the various student need measures in terms of how strongly associated they were with the outcome measures of interest (i.e., risk modeling). This was followed by estimating alternative cost models using the best measures of risk and

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[1] The regional poverty weight (1.24) can be found in Report, Table 4.9.

constructing models that assess – accurately and precisely – the connection between spending levels and outcome measures, controlling for risk measures. We then used the cost predications from these carefully curated models to construct a weighted formula that emulated the cost predictions. To construct this weighting system we needed to, in some instances, switch between measures of poverty and determine the right statistical adjustment for doing so, such that the weighted formula would accurately predict costs.

Given this process, as we note in our memo (above), <u>we are confident that the weights derived from the cost models that rely on school-level data provide the most accurate estimate for differences in costs for specified factors.</u>

Table 1 updates the school-level weights provided in the report (Table 4.8). The revised weights were re-estimated assuming that all cost factors are additive in the equalized pupil calculation and that statute is modified to use FRPL eligibility as the measure of student economic disadvantage.

5. ***Assuming we apply the special education census grant to Average Daily Membership unweighted by the number of equalized pupils or the number of poverty-weighted pupil, as called for in Act 173, should we use the pupil weights that control for students with disabilities or the pupil weights that do not control for students with disabilities?***

The weights derived from cost function models that control for the share of students with disabilities in a district or school should be used if the policy decision is to maintain the existing special education categorical funding program. For simplification, Table 1 (above) does not include the weights generated from models that did not control for the percentage of students with disabilities in a district or school.