

Utah Education Funding Study

Re-examining Funding Adjustments to Account for Scale of Operations

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Project Overview

In early 2021, WestEd completed the Utah Education Funding Study. Through this project, the study team evaluated Utah’s current K–12 funding system to determine the extent to which funding formulas met their intended purposes, particularly with respect to ensuring “reasonably equal educational opportunities for all children” (Utah Code Annotated § 53F-2-103). The study consisted of two primary phases.

Phase 1 examined the alignment between Utah’s vision for students and the Minimum School Program as defined by statute, as well as the extent to which the current Minimum School Program meets the principle of reasonably equal opportunities for all students (Willis, Silverstein, et al., 2019). Phase 2 examined costs and resource allocation through a variety of methods, with an emphasis on equal educational opportunity (Jacobson et al., 2021). The study team’s methods in this second phase included conducting quantitative analyses of student and fiscal data and examining successful school sites through a case-study process.

One of the recommendations made as a result of this second phase of the study pertained to the association between district enrollment and educational costs. Specifically, the study team recommended that the state adjust funding to provide additional funds for the state’s smallest districts. This recommendation was based upon the study’s cost function analysis findings and was presented as an alternative to the current Necessarily Existent Small Schools (NESS) program.

The analysis and findings presented in this memo grew out of discussions following the completion of the original study. These discussions led to a call for additional analyses that considered alternative approaches to adjusting education funding in Utah to account for the effect that scale of operations has on district and school operating costs. Specifically, this additional work, led by WestEd in collaboration with the Utah State Board of Education (USBE), included the following goals:

- **Goal #1:** Support the USBE to understand and review the technical methods used in the Utah Education Funding Study’s cost function analysis.
- **Goal #2:** Conduct an additional analysis of the Utah Education Funding Study’s findings, including exploring approaches to applying the cost function analysis results with respect to district size, school size, and school remoteness to inform state funding policy.

The collaborative work described in this memo took place from August 2022 to March 2023.

This memo outlines the study team’s analysis of these topics, including an alternative adjustment that incorporates school remoteness into the original study recommendation; a summary of the impact this alternative would have on district funding weights and total funding for this purpose; and a review of the policy implications of choosing this new approach over other available options, including the original study recommendation or the current NESS program.

As a result of this work, the team identified four key findings:

Finding 1: School remoteness in Utah, as measured in this analysis, follows a few geographic patterns, with the most remote schools located in the southeast region of the state.

Finding 2: A new funding adjustment incorporating school remoteness as an additional cost factor represents a valid alternative to the recommendation in the original study.

Finding 3: The new proposed adjustment would increase funding weights for most districts compared to the recommendation in the original study.

Finding 4: Based upon the FY 2021/22 basic funding amount, the new proposed adjustment would provide about \$5.5 million more funding than the recommendation in the original study.

Background

Before summarizing the results of this additional project work, this section summarizes aspects of the original study that relate to the new analyses conducted by the study team.

The second phase of the original Utah Funding Study included an analysis of the drivers of education resource needs in Utah, and how they affect total per-pupil costs in schools and districts across the state.

The original study included a broad focus on overall per-pupil costs, taking into account district enrollment and school remoteness, as well as student populations served, regional economic conditions, spending efficiency, and other local factors. Importantly, the study estimated the association that each cost factor has with spending, holding constant student outcomes. In other words, it estimated how the “expected” cost of reaching the same set of outcomes changes from school to school. (Section 2 of the [Utah Education Funding Study: Phase 2 Report](#) provides additional information about this analysis.)

Through this analysis, the original study found that district size and school remoteness both had a significant association with costs:

- District size was negatively associated with per-pupil spending, suggesting that per-pupil costs decrease as district enrollment increases. This phenomenon is broadly referred to as “economies of scale,” and describes the improvement in spending efficiency as a school district, private business, or organization grows larger.¹
- School remoteness, measured as the distance to the center of the nearest metropolitan or micropolitan area, had a positive relationship with per-pupil costs. In other words, schools that are more remote tended to be associated with higher per-pupil costs.

Drawing on the first of these findings with respect to district size, the original study recommended that the cost function analysis results be translated into funding weights representing additional per-student Weighted Pupil Units (WPU) that, in line with the results, declines as districts get larger.²

Despite reporting findings regarding school remoteness, the original study did not recommend its inclusion in a funding adjustment accounting for the effect that scale of operations has on district and school operating costs. The simplicity of a funding weight relying on a single, district-level cost factor, as opposed to the complex set of factors determining NESS funding, was part of the motivation for this recommendation. This decision from the original study is discussed further in the Policy Implications section of this memo.

¹ To provide an illustrative example of economies of scale within education finance, when a district grows from 10 to 60 students, it may need to hire a new teacher or build a new classroom, significantly increasing per-pupil costs. Conversely, when a district with 10,000 students enrolls 50 more students, the effect on per-pupil costs may be negligible because the same cost is divided over more students.

² Note that in this memo, “funding weight” is analogous to additional per-student WPU in that it represents a per-pupil percentage increase in funding such that a funding weight of 0.50 would bring up per-pupil funding 50% above the base funding amount.

Key Findings

The new analysis yielded four main findings:

Finding 1: School remoteness in Utah, as measured in this analysis, follows a few geographic patterns, with the most remote schools located in the southeast region of the state.

Finding 2: A new funding adjustment incorporating school remoteness as an additional cost factor represents a valid alternative to the recommendation in the original study.

Finding 3: The new proposed adjustment would increase funding weights for most districts compared to the recommendation in the original study.

Finding 4: Based upon the FY 2021/22 basic funding amount, the new proposed adjustment would provide about \$5.5 million more funding than the recommendation in the original study.

Each of these findings are discussed in more detail in the following subsections.

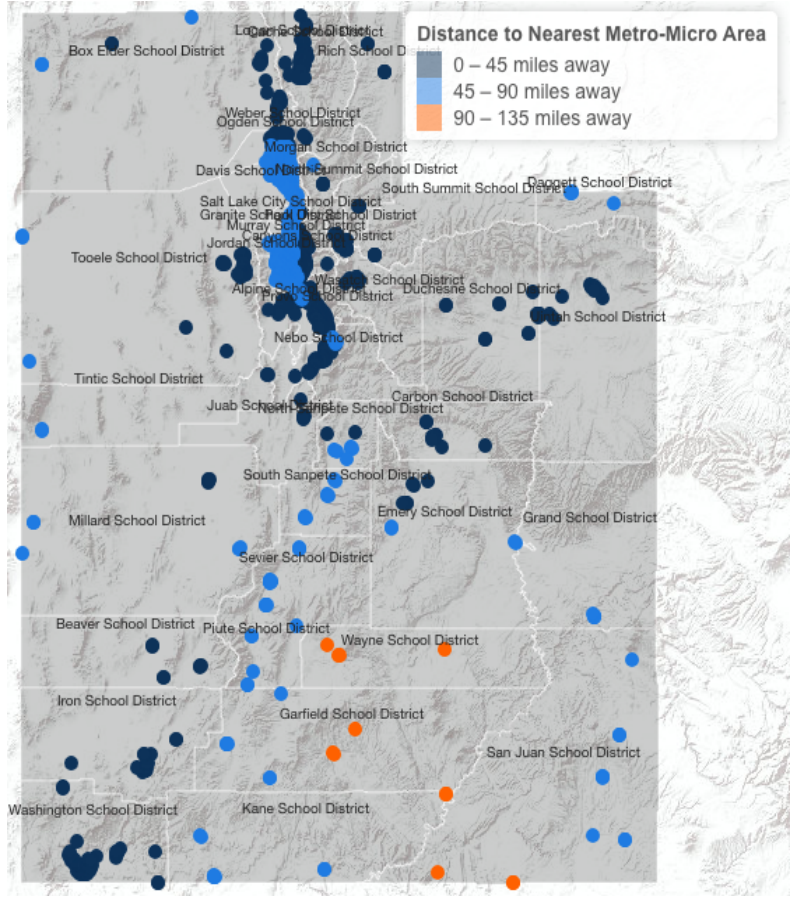
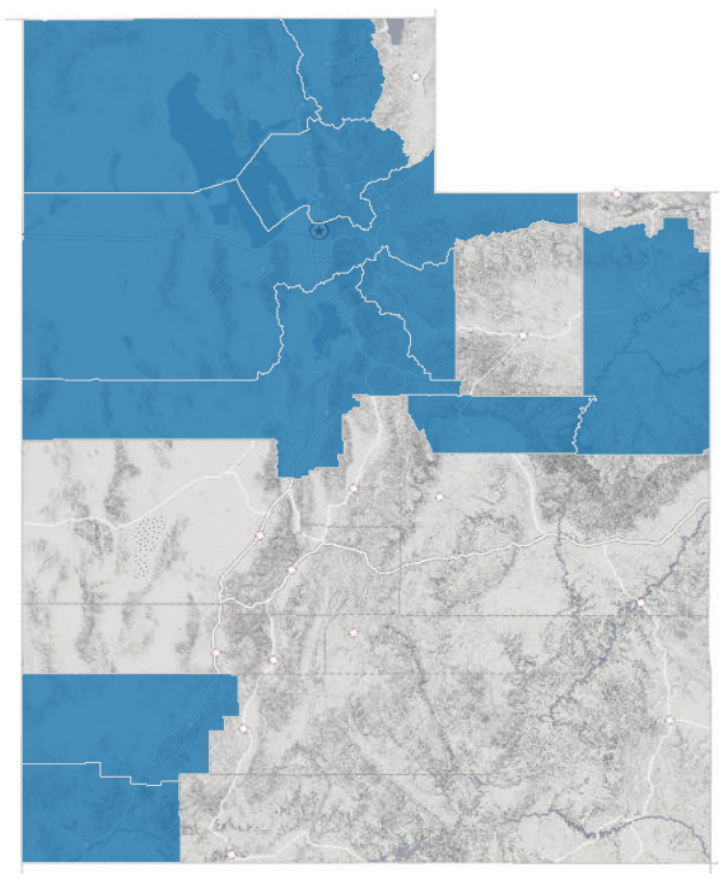
Finding 1: School remoteness in Utah, as measured in this analysis, follows a few geographic patterns, with the most remote schools located in the southeast region of the state.

As noted, the cost function analysis findings in the original study established that school remoteness likely has an association with costs. In fact, school remoteness has been included in similar cost function analyses—e.g., see Taylor et al. (2018) and Willis, Krausen, et al., (2019)—and is typically intended to account for the differences in the cost of nonlabor resources in geographically isolated settings. However, remoteness may also moderate the association between district size and cost—that is, districts that are more remote may have greater costs than their size alone would suggest. For example, even districts of a medium size may have trouble economizing when faced with delivering resources to very remote schools. Subsequent sections of this memo discuss the possibility of incorporating school remoteness into a funding adjustment for scale of operations. First, however, it is important to understand how school remoteness was defined in the original study, and how remoteness varies across the state.

There are many possible ways to define remoteness or geographic isolation (discussed further in the Policy Implications section). In the original study, and for the purposes of this memo, a school’s remoteness is defined as its distance to the *geographic center* of the nearest metropolitan or micropolitan area. This specific measure is aligned with similar prior cost function analysis studies (Taylor et al., 2018; Willis, Krausen, et al., 2019). However, other possible approaches may be worthy of consideration. These are discussed in the Additional Areas for Investigation section of this report.

To illustrate the variation in school remoteness, Figure 1 displays the metropolitan and micropolitan areas in the state (shaded in blue) in Map #1 and the remoteness of any given school in the state in Map #2.

Figure 1: Metropolitan/Micropolitan Areas in Utah and Distance to the Nearest Metropolitan or Micropolitan Area
Map #1 **Map #2**



Source. Utah Geospatial Research Center’s Utah Metro Micro Statistical Area map; National Center for Education Statistics Common Core of Data and United States Census Bureau

Description. Map #1 displays the boundaries of metropolitan or micropolitan areas in Utah; it does not include metropolitan or micropolitan areas in bordering states. Map #2 displays school district boundaries and identifies school locations shaded to reflect their distance from the center of the nearest metropolitan or micropolitan area.

As illustrated in Map #2, school remoteness in Utah varies, ranging from 2 miles to 131 miles. On average, most schools are just over 40 miles away from the center of the nearest metropolitan or micropolitan area. Districts in the southeast portion of the state, such as Wayne and Garfield, have a larger number of remote schools than other regions, many of which are more than 90 miles from the nearest metropolitan or micropolitan area. This makes sense since, as seen in Map #1, metropolitan and micropolitan areas are mostly clustered in the northwest and southwest corners of the state.

Conversely, schools in districts located within a metropolitan or micropolitan area such as Washington or Uintah are relatively closer to that area's geographic center and thus, under the given measure, are relatively less remote.

Finding 2: A new funding adjustment incorporating school remoteness as an additional cost factor represents a valid alternative to the recommendation in the original study.

Through discussions with the USBE and a review of the original study analysis, the study team identified the incorporation of the original study's school remoteness findings into a funding adjustment for scale as the primary focus for this project's additional analysis. The study team also tested alternatives to the original study recommendation that district weights be reduced gradually after the 25th percentile of district enrollment statewide.

Incorporating School Remoteness

The inclusion of school remoteness in an adjustment to account for scale is motivated by its theoretical moderating effect on the relationship between district size and costs. Specifically, districts of moderate size are arguably unable to take advantage of their scale when allocating resources to very remote schools within their borders. Staff cannot feasibly be freely exchanged between the remote schools and their peer schools elsewhere in these districts; thus, each school functions like a very small, somewhat self-contained program.

For example, optimizing staff-to-student ratios is one way larger districts can bring down per-pupil costs. A larger district has a large enough program for staff to be adjusted across multiple schools to minimize or even avoid an increase in total costs resulting from fluctuations in the student population bringing down its per-pupil costs. However, when a small number of students are served in a geographically remote school it is often infeasible or impractical to fine tune the staff serving those students, and instead the district must maintain a constant level of staffing to serve those students even when their numbers are very small or even shrinking. This

puts upward pressure on per-pupil costs. It is with this issue in mind that the study team considered the incorporation of school remoteness.

It should also be noted that through the NESS program, the state has long recognized that geographic remoteness necessitates providing greater funding for schools in the most remote areas of the state. Thus, the incorporation of remoteness into a funding adjustment to account for scale is also more in line with current policy in this area.

To bring school remoteness into a new funding adjustment, the study team extended the results of the original study's cost function analysis. Specifically, the findings in the original study with respect to school remoteness were combined with the findings with respect to district size, to construct new district funding weights. Thus, the new weights represent additional funding to address additional costs stemming from district size *and* the remoteness of the schools within a district's boundaries.³

Re-examining the 25th Percentile Thresholds

In addition to incorporating school remoteness into new funding weights, the study team also considered the original study's recommendation to reduce the cost function analysis funding weights as districts grow in size. This original recommendation was motivated by a recognition that while the cost function analysis results imply at least *some* additional per-pupil funding for even relatively large districts with few remote schools, budget constraints and practicality call for the limited funding available for this purpose to be targeted to the *smallest* districts with the most remote schools.

With this in mind, the original study called for the full cost function analysis weights to be decreased gradually as districts grow in size and to be reduced to zero for the largest districts in the state. Specifically, the 25th percentile of district enrollment statewide—1,694 in FY 2018/19—was chosen as the threshold after which weights would be reduced because it is a visually clear point at which the reduction in per-pupil costs for each additional student predicted by the cost function analysis begins to level off. This signified to the study team the point at which the need for additional funding becomes less severe because per-student cost is not as responsive to changes in enrollment at this point. Likewise, 10 times the 25th percentile was chosen as the threshold at which districts are sufficiently large to be beyond the scope and purpose of the additional funding.⁴

While the study team views these recommended thresholds as reasonable, they are a matter of judgment and open to reconsideration. With this in mind, the study team took a closer look

³ Additional details on how the study team constructed these new weights is included in the Methods Appendix.

⁴ Additional details on this recommendation in the original report is included in the Methods Appendix.

and, after examining several alternatives, concluded that the original recommendation is a strong approach to achieving the goal of targeting resources to the smallest districts.

Specifically, the team considered the rate at which additional costs are predicted to decline as district enrollment increases at different enrollments to determine if the 25th percentile was a reasonable threshold. As reported in the original study, additional costs are highest for the smallest districts, and each additional student *reduces* these additional costs. In fact, at small sizes the additional costs go down significantly as district enrollment grows. Table 1 illustrates this trend. For example, districts at the 5th percentile of enrollment see a decrease of about 0.115 in the funding weight for each additional 20 students. The same increase in districts at the 10th percentile see only a 0.034 funding weight decrease, a difference of 0.08 per-student WPU, or 8% of the base funding amount (i.e., the difference between 0.115 and 0.034).

However, as illustrated in Table 1, these differences are smaller at larger sizes, and even much larger changes in enrollment yield much more modest differences. For example, districts at the 25th percentile see a predicted decline in the funding weight of 0.003 compared to a decline of 0.001 at the 30th percentile enrollment, a difference of only 0.002 per-student WPU or 0.2% of the base funding amount. And while the differences are even less when comparing larger districts, such as the 35th and the 40th percentiles and the 45th and 50th percentiles, the pace of the decline is more modest (see Table 1).

Table 1: Responsiveness of Funding Weights to Changes in Enrollment, by Enrollment Percentile

Percentile	FY 2018/19 enrollment	Decrease in funding weights for every 20 additional students
5th Percentile	273	0.11563
10th Percentile	507	0.03426
15th Percentile	1,044	0.00853
20th Percentile	1,520	0.00414
25th Percentile	1,694	0.00336
30th Percentile	2,471	0.00161
35th Percentile	2,876	0.00120
40th Percentile	3,178	0.00098
45th Percentile	3,484	0.00082
50th Percentile	4,780	0.00044

Source. WestEd analyses, 2023

As illustrated in Table 1, the association between district size and cost is increasingly less significant as enrollment increases, and after the 25th percentile predicted changes in the funding, weights start to flatten out as noted in the original study.

With respect to the point at which district funding is reduced to zero, the original study identified a threshold of 10 times the 25th percentile, or 16,940 students or more in FY 2018/19. Districts of this size were roughly those in the top 25% in terms of size. At this scale the funding weights, *after the weight reduction is applied*, are no more than 0.015 and as low as 0.0004, or between 1.5% and .04% of the base funding amount. As with the first threshold, the

study team considered alternatives but concluded that the original study recommendation is reasonable.

In this case, it is important to consider that given the large size of these districts, any additional funding per pupil will translate to a relatively large amount of total funding. For example, in FY 2018/19, a weight of 0.015 for a district of around 17,000 students was only about \$51 per pupil but well over \$800,000 in total funds. Even a very small weight of 0.0004 translates into close to \$1 million in total funds for the largest districts in the state. Meeting the state's goal for this type of program—to provide additional support for small districts with remote schools—is at odds with providing this level of funding to the largest districts in the state. In short, this second threshold can have a very large impact on overall funding provided by the state.

The choice of 10 times the 25th percentile was intentionally anchored to the original threshold for the sake of coherence and selected with face validity in mind, but reflects no more sophisticated analysis than that. Though the study team would strongly advocate for a policy excluding funding from the largest districts in the state for the reasons noted, it should be acknowledged that many thresholds at the higher end of the district enrollment range may be reasonable. Nonetheless, while this threshold could reasonably be set at lower or higher district enrollment, the study team sees no compelling reason that a different threshold would improve upon the original study recommendation.

For both chosen thresholds, though no change was proposed here, it is important to consider that changes in either of these thresholds would likely have meaningful implications on the level of funding to districts and overall. With this in mind, state policymakers should consider modeling the impact of different thresholds and consider what other criteria may be relevant when determining which threshold is the most effective and equitable.

Finding 3: The new proposed adjustment would increase funding weights for most districts compared to the recommendation in the original study.

Through the analysis described in Finding 2, the study team identified a new proposed funding adjustment to account for the effect of scale of operations on district and school operating costs that (1) incorporates school remoteness, and (2) maintains the reduction in funding weights after the 25th percentile of district enrollment statewide.

The new adjustment translates into a new set of district funding weights through a process analogous to the process used in the original study.⁵ These new weights can be brought up to

⁵ Additional details on how the study team constructed these new weights is included in the Methods Appendix.

date with more current data from the most recent fiscal year (i.e., FY 2021/22) and compared to the original study recommendation and the NESS program.

First, in order to make comparisons between the recommended weights and NESS funding, NESS “weights” were derived based upon the funding amounts provided to districts receiving NESS funding. Specifically, the study team first divided each district’s total NESS funding in FY 2021/22 by its enrollment. Then, this amount was divided by the basic funding amount value in that year to calculate the NESS weight for each district, which has the same interpretation as the new proposed weights and the weights recommended in the original study.

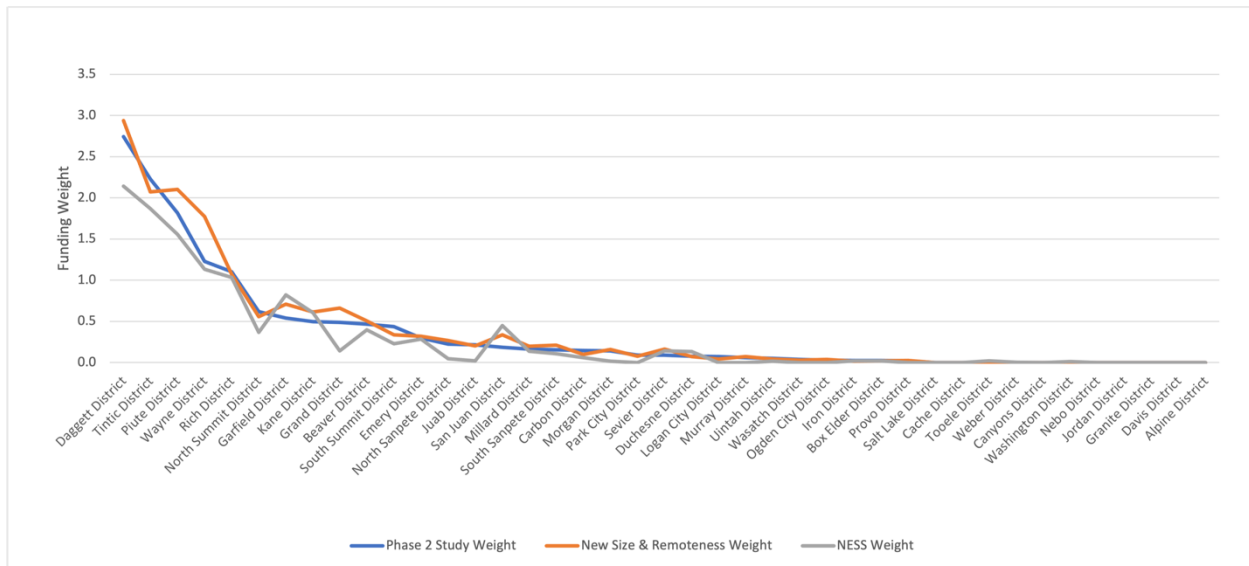
As presented in Figure 2, across all three scenarios, the smaller districts tend to have the highest per-pupil funding weights under the new adjustment compared to the original study or the NESS program. Additionally, the new weights would provide significantly more funding to districts with the most remote schools, such as Garfield, Wayne, and San Juan.

For instance, relative to the original recommended weights, Sevier and San Juan School Districts stand to gain the most in total additional funding under the new adjustment, in large part because schools in these districts are an average of 77 and 85 miles away, respectively, from the nearest metropolitan or micropolitan areas. In contrast, districts with relatively fewer remote schools such as South Summit and Logan, with schools 16 and 11 miles from the nearest metropolitan or micropolitan areas, would see a reduction in additional funding compared to the original weights.

By design, the new weights imply little or no additional funding to the large districts, whose schools are generally not very remote, especially since the new weights include the original study recommendation to draw down weights as districts get larger in size and reduce funding to zero for the largest districts.

Figure 2 displays the weights under each of the three scenarios, which each take a distinct approach to accounting for the effect of scale on costs.

Figure 2: Funding Weights From the Original Study, New Size and Remoteness Weights, and NESS Weights by School District in FY 2021/22



Note. New and original weights are based upon FY 2021/22 district enrollment, though the original study included the weights based upon FY 2018/19 district enrollment.
Source. Authors’ calculations are based on data provided by USBE and an extension of the cost function analysis.

Overall, both weights were highly correlated with the NESS weights. Districts with the largest NESS weights were also those that were largest under both the new and original proposed weights. Moreover, the correlation with the NESS weights was slightly higher for the new weights compared to the original weights, though both were highly correlated.⁶

Finding 4: Based upon the FY 2021/22 basic funding amount, the new proposed adjustment would provide about \$5.5 million more funding than the recommendation in the original study.

Given that the weights presented in Figure 2 are based on distinct approaches to accounting for the effect of scale on costs, they have different implications on funding. The new weights that incorporate school remoteness would require the largest amount of overall statewide funding, and about \$5.5 million more than the weights recommended in the original study. Both would provide more funding than the current NESS program in FY 2021/22.

Table 2 displays the total estimated funding derived from the original and new weights discussed in this memo, alongside total funding for NESS in FY 2021/22. These estimated totals

⁶ Specifically, the original weights had an r statistic of 0.9754 compared to an r statistic of 0.9756 for the new weights.

are based on applying the FY 2021/22 base funding amount of \$3,809 to the weights presented in Figure 2 and then multiplying this amount by the FY 2021/22 district enrollment to calculate the total estimated district funding. Finally, the district totals are summed to calculate a statewide total funding estimate.

Table 2: Estimated Total Funding Amounts Implied by Proposed Cost Function Analysis Weights and Compared to Necessarily Existent Small Schools in FY 2021/22

Funding Weight	Statewide Total Funding Implied by Weight (in millions)
NESS	\$44.00
Original Phase 2 Study Weights	\$55.47
Proposed School Remoteness Weights	\$60.99

Source. Authors' calculations are based on data provided by USBE and an extension of the cost function analysis. Note. Values are approximate.

Policy Implications

The proposed incorporation of school remoteness into a funding adjustment to address the effect of scale of operations on costs offers policymakers an alternative option to meeting the needs of districts facing higher costs due to the small size of their overall program or smaller programs at remote schools within their district. Thus far this memo has described how the study team identified this alternative and its impact on funding.

First, a weight that includes more cost factors—in this case the addition of school remoteness—may result in a funding policy that is less easily understood by local school business administrators and other local leaders such as school principals. With the goal of promoting understanding and buy-in in mind, an adjustment with fewer cost factors may be preferable to a more complex adjustment that incorporates multiple cost factors.

Second, although the NESS program includes provisions that take into account school size, the analysis team does not recommend including school size in a funding adjustment accounting for scale. As a result, there is a more fundamental difference between both the new adjustment and the adjustment recommended in the original study compared to the existing NESS program

that should be considered. These two topics are discussed in more detail in the following sections.

Adding additional cost factors makes the funding formula more complex.

A common tension in translating education finance research into actionable policy changes is the tendency for the research to recommend a complex set of considerations and calculations for a given funding program. However, policymakers may rightly prefer a simpler approach as it is often more easily understood.

In the original Utah Funding Study recommendations, the study team sought to maximize ease of understanding in translating the complex findings that resulted from the cost function analysis into new funding policies. With this in mind, the study did not include school remoteness in the final adjustment for scale. The new proposed adjustment *does* include school remoteness as a cost factor. This adds to the complexity of the policy and may make it less easily understood by practitioners and local school business administrators.

This additional complexity is in part because the adjustment would include variables measured at different levels—remoteness is measured at the school level, while district enrollment is measured at the district level. Also, though the cost function analysis overall is at the school level, the state will most likely direct additional funding to the district level and allow districts to decide how to invest it. Thus, the new proposed adjustment that incorporates school remoteness requires generating funding weights at the school level and aggregating these to the district level. This process may be more difficult to replicate compared to the original study funding weights, though it is still arguably more straightforward than the current NESS allocation process. This may also make it more difficult for local practitioners to understand the process that produces their specific funding amount year over year.

In contrast, the original recommended adjustment (which did not include school remoteness) required only applying a district's enrollment to a single equation to reproduce the funding weights.

As policymakers consider the proposed alternative adjustment for scale, it is important to keep in mind the potential trade-off of adopting a more complex approach.

School remoteness should be prioritized over school size when accounting for the effect of scale on costs.

Part of the scope of this additional project was to consider how variation in school size may support a funding adjustment for the effect of scale on per-pupil costs. After considering the potential inclusion of school size as an additional cost factor in an alternate funding adjustment,

the study team has concluded this would not be appropriate. This is primarily because, in the view of the team, the inclusion of school remoteness in the proposed alternate weight is a stronger approach to accounting for how school context within a district affects the district's ability to take advantage of economies of scale overall.

Specifically, as noted previously, the isolation of a school within a district impacts the extent to which that district is able to adjust the allocation of resources across schools to achieve greater efficiency. A district with isolated schools cannot freely exchange staff between the isolated settings and other schools in the district to, for example, optimize staff-to-student ratios as the number of students served fluctuates. The distance alone makes this kind of transfer of personnel resources unreasonable. Likewise, the marginal use of districtwide resources, either personnel or tangible goods, is constrained by this distance. A district cannot, for example, efficiently share itinerant staff between the isolated school and schools in more densely populated areas within the district. These remote settings will also likely be small, but their isolation is more central than their size to the resulting cost implications related to scale.

Conversely, the size of small schools that are not isolated may, over time, be adjusted to increase in size according to the district attendance/feeder patterns or school consolidation. The exchange of students between schools that are relatively close together and serving the same grades is generally within a district's, and its community's, control.

To be clear, this is not to suggest that in all cases districts should redefine school feeder patterns or consolidate campuses to achieve cost efficiencies. The study team's analysis focused on scale of operations and how the state can adjust for circumstances in which the effects of scale on costs are inherent to the school and district setting. There may be other considerations that extend beyond the scope of this analysis that motivate continuing to operate small schools at a higher per-pupil cost for which the state may choose to provide funding.

For example, consider that the current NESS regulations (Utah State Board of Education, 2021) acknowledge that consolidation or changes to attendance feeder patterns to improve efficiency may not be optimal if they result in "undesirable social, cultural, or economic changes in the community" (see R277-445-3(A)(6)). Adjustments in funding intended to account for these sorts of community-specific factors are beyond the scope of the original cost study model. Thus, an attempt to account for them based on this study's findings would not be appropriate.

Additional Areas for Investigation

The analyses in this memo reflect natural extensions of the original study cost function analysis that was developed through a partnership between WestEd and USBE.⁷ There is potential for additional investigation, specifically regarding alternative measures of remoteness. The measure of remoteness currently used is distance in miles to the geographic center of the nearest metropolitan or micropolitan area. This measure has been used in similar analyses (Taylor et al., 2018; Willis, Krausen, et al., 2019). Due to the size and shape of the census-designated metropolitan and micropolitan areas, this measure is sometimes less suitable to describe the remoteness of schools *within a district context*. This is because the center of the metropolitan or micropolitan area may be far from the district's population center. Other measures focused on addressing this issue could be explored in future work.

Future work could include, for example, an alternative to measuring distance “as the crow flies” that could capture the difficulty or time associated with traveling to an isolated location, such as typical driving time. Future work could also explore the use of measures more applicable to each district's context, such as remoteness *within* a district rather than relative to a metropolitan or micropolitan area. This approach might include, for example, distance from the nearest school serving the same grade levels within a district.

These additional possibilities have not been tested by the study team. Future analysis might consider how these measures both are or are not suitable for a cost function analysis, as well as whether they better capture the important cost factors in the Utah context specifically.

Conclusion

This report outlines the study team's exploration of the pros and cons of a funding weight to account for scale that uses district size and school remoteness. From a quantitative perspective, the study team believes that a funding weight that includes both district-size and school-remoteness measures and is based on the Phase 2 cost function analysis is valid and better meets USBE goals currently targeted by NESS. However, even if this change is taken up, policymakers will need to make some decisions around implementing a replacement for NESS. Most notably, the state will need to decide if and how to establish thresholds for reducing

⁷ Dr. Lori Taylor also provided invaluable guidance during the drafting of this memo in partnership with WestEd and USBE.

funding weights as districts grow in size, and whether to incorporate additional qualitative cost factors that are ill-suited to a cost function analysis.

Ultimately, if the new proposed weights including school remoteness as a cost factor were to replace the NESS funding stream, the state would provide an additional \$17 million more to districts than it provided under NESS in FY 2021/22. Not only would the proposed weights increase the total funding amount statewide, but they would also target the funds toward the smallest districts with the most remote schools when compared to NESS.

Methods Appendix

Cost Function Analysis

The current analysis is an extension of the cost function analysis in the original study—therefore a review of the relevant sections of the Phase 2 report describing that method may be helpful.⁸ In short, a cost function analysis is a regression-based approach to predicting the association that various cost factors have with minimum “expected” costs, holding student outcomes and other factors constant. Of particular relevance to the current analysis is the fact that the original cost function model included as cost factors district enrollment and school remoteness, measured as the distance, in miles “as the crow flies,” to the center of the nearest metropolitan or micropolitan area.

It should also be emphasized that the cost function model presented in the original study was not changed as part of the current analysis. Rather its results were used differently to offer an alternative approach to adjusting funding to account for the relationship between scale of operations and costs.

Creating Funding Weights

Also relevant to the current analysis is the process used to translate these findings into funding adjustments, sometimes referred to as funding weights. In brief, to create the district-level weight for the new funding adjustment including both district enrollment and school remoteness, the study team generated school-specific predictions of minimum cost using the cost function analysis model and based only on variation in district enrollment and school remoteness and compared these to the minimum of these predictions across all schools in the sample. The school weight is then calculated as the percentage that a given school’s prediction is above the minimum prediction across all schools. For example, a school spending 20 percent above the minimum prediction would have a weight of 0.20. The study team then averaged the resulting school-level weights by district to create an average district-level weight.⁹

⁸ Detailed explanations of the cost function analysis and the study team’s application of this method to USBE’s research questions are available in Part 1, Section 2: Cost Function Analysis, and in the Technical Appendix B of the Phase 2 report.

⁹ This district-level weight is a weighted average using school enrollment as the weight to account for the fact that certain schools serve larger numbers of students and thus should be more heavily weighed than smaller schools.

Targeting Funds Based on District Size

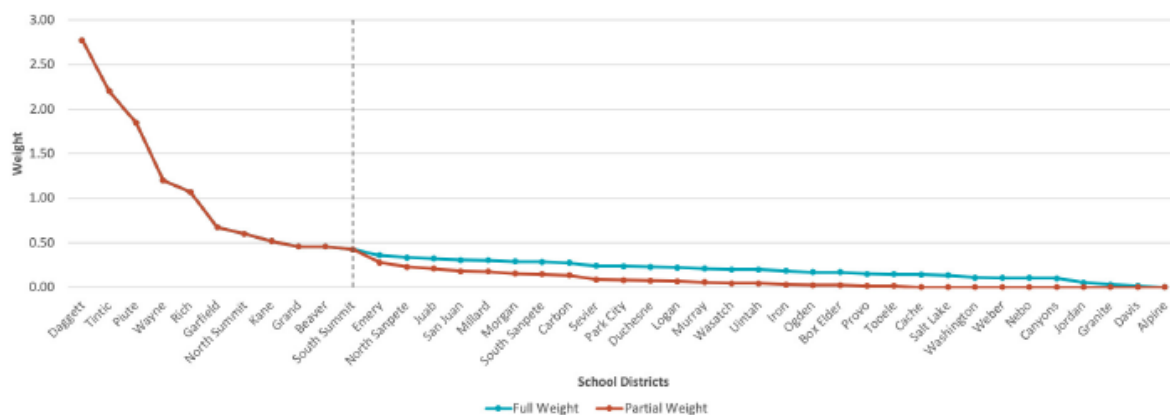
Finally, as recommended in the Phase 2 report, the new funding adjustment includes an additional step of targeting funding to the smallest districts by gradually reducing funding to districts with enrollment above the 25th percentile to below the amount predicted in the cost function model.

Specifically, the recommended weights for these districts are reduced from the full weight derived from the cost function analysis in proportion with how much larger its enrollment is than the 25th percentile of enrollment, and is reduced to zero for districts with enrollment greater than or equal to 10 times the 25th percentile enrollment.

For example, the 25th percentile of enrollment in Utah was 1,694 in FY 2018/19. Under the alternative adjustment, districts with more than 1,694 students enrolled in FY 2018/19 would receive only a portion of the weight predicted by the model based on how far their enrollment exceeds the 25th percentile. Further, the largest districts—those with enrollments of 10 times the 25th percentile value—would receive no adjustment at all (for additional detail, see page 91 of the Phase 2 report).

The 25th percentile was chosen in the original study because beyond this point the predicted additional costs appear to “level off” as enrollment increases. This “leveling off” can be seen in Figure 3 which compares the full weights to the reduced (or partial) weights, identifying with a dotted line the point at which this reduction starts (i.e., the 25th percentile).

Figure 3: Original Cost Function Analysis Weights With Respect to Scale, Including Full and Partial Weights, by School District in FY 2018/19



Source. Authors’ calculations are based on the data used for the cost function analysis (described in Technical Appendix B of the Phase 2 report) and additional FY 2018/19 data from the USBE.

Note. Originally published in the Phase 2 report as Exhibit 46.

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