THE LEARNING ASSISTANCE PROGRAM:
Options to Revise the State Funding Formula

Technical Appendix

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Washington State Institute for Public Policy

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WASHINGTON STATE INSTITUTE FOR PUBLIC POLICY

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INTRODUCTION

The 2001 Legislature directed the Washington State Institute for Public Policy (Institute) to:

> "… *examine options for revising the state funding formula for the learning assistance program to enhance accountability for school performance in meeting education reform goals*."[1]

Because state LAP and federal Title I programs have operated in tandem for a number of years, we examine both programs in this study. We also describe how LAP and Title I funds are used and attempt to identify whether statewide data shows a relationship between LAP, Title I, and student performance (as measured by test scores).

These technical appendices show results from various statistical analyses conducted using statewide data from the following sources:

- LAP and Title I Year-End Reports for 1995-96 through 1999–2000, which include district-reported enrollments, staffing, and allocation of funds to school buildings.
- Data files for all districts and school buildings containing headcount and full-time equivalent (FTE) student enrollment, student enrollment in federal Free and Reduced Lunch (FRL) programs, and test score results (Iowa Test of Basic Skills [ITBS] and WASL) for 1995–96 through 1999–2000.
- Individual student test score results for a cohort of students: 2000 ITBS Grade 3 and 2001 WASL Grade 4.

[1] ESSB 6153, Section 608, Chapter 7, Laws of 2001 2nd Special Session (2001-03 Biennial Appropriations Act).

I. REGRESSION ANALYSIS OF LAP AND TITLE I BUILDING ALLOCATIONS

The Institute conducted a multivariate, stepwise regression analysis using a number of factors that might predict a building's combined LAP and Title I allocation and therefore reveal how districts prioritize resources for remediation. The analysis examined allocations to elementary schools, since more than 70 percent of allocated resources go to elementary schools. Data came from district LAP and Title I Year-End reports submitted to the Office of the Superintendent of Public Instruction (OSPI) for 1999–2000, which include information on allocations to buildings and other possible variables.

Sixteen districts not receiving both LAP and Title I funds were excluded from the analysis, as were 177 districts with fewer than three elementary schools because of the difficulty in identifying a pattern among so few schools. Together, these excluded districts enrolled only 7 percent of elementary school students in the state.

The question of inquiry was:

What factors predict the amount of an elementary school's LAP or Title I allocation?

The results of the regression analysis for 804 elementary schools receiving LAP and Title I funds for 1999–2000 (after the exclusions described above) are shown in Exhibit 1. Only results with statistical significance of $p<.05$ are shown. Building poverty is the strongest predictor of a building's allocation. The parameter estimate illustrates both the relative size and direction of a factor's effect. For example, for every additional percent of poverty in a building, the LAP or Title I allocation increases by $1,721.

Exhibit 1
Factors Explaining Elementary LAP and Title I Allocations
Adjusted R^2: .725

Factor	Explanatory Power (Partial R^2)	Statistical Significance (p value)	Effect Size/Direction (Parameter Estimate)
Building Percent Poverty	.540	<0.001	+1,721
Total Building Enrollment	.102	<0.001	+202
Amount of District LAP and Title I Allocation	.024	<0.001	+0.01
Building Poverty Rank in District	.056	<0.001	+3,816
Percent Students in Lowest Quartile (3rd grade test)	.003	<0.05	+560

Separate analyses were also conducted based on the pattern of allocation the district followed in providing LAP and Title I funds to elementary schools:

Do the factors explaining the total LAP or Title I allocation vary depending on the pattern of allocation used by the district?

The short answer to this question is "yes," although poverty remains the strongest predictor of the size of a building's overall allocation in all but one case (where all buildings receive both LAP and Title I). Exhibit 2 shows the results of this analysis.

Exhibit 2
Factors Explaining Elementary LAP and Title I Allocations, Based on Allocation Pattern

Factor	Explanatory Power (Partial R^2)			
	LAP Fills in After Title I	**LAP to All Buildings**	**Both LAP and Title I to All Buildings**	**LAP and Title I to Highest Poverty**
Building Percent Poverty	.567*	.625*	.294*	.631*
Total Building Enrollment	.166*	.027*	.361*	.087*
Amount of District LAP and Title I Allocation	.073*	.040*	ns	ns
Building Poverty Rank in District	.059*	.091*	ns	.039*
Percent Students in Lowest Quartile (3rd grade test)	.006**	ns	ns	ns
Number of Elementary Schools in District	ns	ns	ns	.009***
Adjusted R^2	**.871**	**.783**	**.655**	**.766**

Statistical Significance (p value): * <0.001
** <0.01
*** <0.05

II. Analysis Using Cohort of 3rd and 4th Grade Students: Change in Washington Percentile Rank

The Institute matched test score data to create a cohort of students who took the 3rd grade standardized test in 2000 and the 4th grade WASL in 2001. Reading and math scores were analyzed separately (rather than using a combined score). The question of inquiry:

If a student was identified as receiving LAP or Title I services in 3rd grade, did this affect the 4th grade test score?

To answer this question, we took the following steps:

1) Because other analyses suggested problems with the LAP or Title I participant identifier on state tests, we used test score data only from students in the following buildings:

    - Building did not operate a schoolwide program for LAP or Title I in 1999–2000.
    - On the 3rd grade standardized test, the building identified more than 1 percent but fewer than 50 percent of tested students as receiving LAP or Title I services.

    After these limitations were accounted for, reading scores for 37,528 students and math scores for 37,768 students remained.

2) To compare standardized test and WASL scores, we converted each student's test score into a percentile rank relative to other Washington students who took each test.

3) We then compared students' Washington percentile rank on the 3rd grade test with their Washington percentile rank on the 4th grade WASL. We did one analysis using all students in the cohort, using an average for each 3rd grade quartile. Then, to compare LAP/Title I participants and non-participants, we used only students who ranked in the lowest Washington quartile in 3rd grade. In this quartile, there were more than 2,700 students identified as LAP or Title I, and more than 4,500 students who were not.

Exhibit 3 shows the results of the analysis for all students in the cohort. Students who were low-scoring in 3rd grade made greater improvements in their ranking on the 4th grade WASL relative to other students. Declines in how originally high-scoring students ranked relative to others are not terribly surprising, in part because on average, their scores had little room for dramatic improvement.

Exhibit 3
Average Change in Washington Percentile Rank (Percentile Points) from 3rd Grade (2000) to 4th Grade (2001)

Performance on 3rd Grade Test	Average Change in Washington Percentile Rank on 4th Grade WASL	
	Reading	Math
Lowest WA Quartile (<25th percentile)	+11.9	+10.5
Second WA Quartile (25th–50th percentile)	+ 7.3	+5.5
Third WA Quartile (50th–75th percentile)	-0.8	-0.7
Fourth WA Quartile (75th–100th percentile)	-9.1	-0.8

Exhibit 4 shows the comparison only for students in the lowest Washington quartile in 3rd grade. In theory, we would expect to see greater gains as a result of LAP and Title I participation. Instead, however, we found slightly lower gains for the LAP and Title I students.

Exhibit 4
Average Change in Washington Percentile Rank for Low-Scoring Students: LAP and Title I Participants Versus Non-Participants

	Average Change in Washington Percentile Rank on 4th Grade WASL	
	Reading	Math
LAP or Title I Participant	+10.8	+9.5
Non-Participant	+12.6	+11.0
Difference (Participant versus Non-Participant)	(1.8)	(1.5)

The analysis described above compared the average change in Washington percentile rank between 3rd and 4th grade for groups of students. It did not attempt to control for such factors as building poverty, LAP or Title I allocations in a school, etc. When we conducted a stepwise, multivariate regression analysis with data to control for these factors, we found almost no change in the results. That is, even after controlling for other possible factors, LAP and Title I participants who scored in the lowest Washington quartile in 3rd grade improved their percentile ranking by 4th grade, but not by as much as non-participating students who also had low 3rd grade scores.

III. REGRESSION ANALYSIS USING BUILDING-LEVEL TEST SCORES

The Institute also conducted an analysis using average test scores at the building level in an attempt to identify whether LAP and Title I were factors in predicting how a 3rd grade student would perform on the 4th grade WASL the following year. Average 3rd and 4th grade test scores were examined for 2000 and 2001 in elementary schools that had received LAP or Title I allocations in 1999–2000. The question of inquiry:

Did the amount of a building's LAP and Title I allocation influence students' test scores between 3rd and 4th grade?

Because earlier analyses suggested that building poverty was the strongest predictor for the size of a building's LAP and Title I allocation, this analysis was conducted using "dollars per FRL-eligible student" to control for overall building enrollment (which might naturally affect the size of the allocation). There was no weighting in the analysis by building enrollment.

Test scores for 1,038 buildings are included in the analysis. The results of the stepwise regression analysis explaining a building's 4th grade WASL scores in reading are shown in Exhibit 5. The results for math are in Exhibit 6. Only results with statistical significance of $p<.05$ are shown. The LAP and Title allocation was a statistically significant, but small, predictor of 4th grade WASL scores, but the effect was negative. After students' 3rd grade scores were accounted for, the more money a building received from LAP and Title I, the lower its average 4th grade WASL scores.

Again, the parameter estimate provides an indication of the size and direction of a factor's effect. For example, every additional dollar from LAP and Title I was associated with a decline of -.0005 points on a building's average 4th grade WASL scores, after other factors had been taken into account.[2] Because variables such as building poverty and LAP and Title I allocations are highly correlated, however, the parameter estimate can be a difficult statistic to interpret. If building poverty were removed from the regression equation, the statistic for LAP and Title I allocation would change. The direction (positive or negative) would remain the same.

[2] WASL scores are measured as the students' scale scores, which range from 316 to 481 points for reading and 214 to 563 points for math on the 4th grade WASL.

Exhibit 5

Factors Explaining 4th Grade Reading Scores by Building
Adjusted R^2: .681

Factor	Explanatory Power (Partial R^2)	Statistical Significance (p value)	Effect Size/Direction (Parameter Estimate)
Students' 3rd Grade Test Scores	.657	<0.001	+0.03
Building Percent Poverty	.018	<0.001	-0.05
Number of Schools in District	.002	<0.01	-0.02
District in Rural County	.003	<0.01	-1.21
LAP and Title I Allocation per FRL Student	.001	<0.05	-0.005

Exhibit 6

Factors Explaining 4th Grade Math Scores by Building
Adjusted R^2: .648

Factor	Explanatory Power (Partial R^2)	Statistical Significance (p value)	Effect Size/Direction (Parameter Estimate)
Students' 3rd Grade Test Scores	.597	<0.001	+0.953
Building Percent Poverty	.042	<0.001	-0.172
District in Western Washington	.003	<0.01	-2.353
Percent Bilingual Students	.003	<0.01	-0.084
LAP and Title I Allocation Per FRL Student	.002	<0.05	-0.001
District in Rural County	.001	<0.05	-1.325

IV. POVERTY, TEST SCORES, AND LAP FUNDING

Relationship Between Poverty and Test Scores

The association between student poverty and student achievement is well-documented.[3] However, the strength of the relationship between poverty and test scores depends on which indicators are used in the analysis. Presumably, policymakers want to drive funding out to school districts using factors most closely associated with their objectives (improved test scores). Therefore, the Institute conducted a series of analyses to determine which set of indicators produced the "best predictive fit" between poverty and low test scores. The following combinations of factors were tested (see Exhibit 7):

- Level of Data Collection: District, Building
- Student Grade Level: All Grades, Elementary, High
- Test Scores: Standardized Tests (students in the lowest quartile), WASL (students in Level 1)
- Poverty Indicator: FRL, Census

- **Level of Data Collection:** Except for elementary schools, poverty is a better predictor of a district's test scores than of a building's test scores. This is because using averages in a predictive model eliminates outliers that might not fit the model and results in a stronger statistical relationship. District level data is an average of building data.

- **Student Grade Level:** There is a closer relationship between poverty indicators and elementary test scores than for test scores at other grade levels or district-wide. There is speculation that students in higher grades are less likely to participate in school lunch programs or may be reluctant to report eligibility for an economic support program.

- **Test Scores:** Interestingly, less of the variation in WASL scores is explained by poverty factors. Student poverty predicts WASL scores, but other factors have relatively stronger influence on the WASL than on standardized tests. WASL scores are less predictable.

- **Poverty Indicator:** Even though Title I relies on Census data and estimates of students living in families below the federal poverty line, this indicator is not as strong a predictor of student test scores as eligibility for Free and Reduced Lunch.

- **Other:** Very small districts are often outliers: removing districts with fewer than ten tested students significantly improves the statistical relationship. Results shown below reflect removal of districts (or buildings) with fewer than 10 tested students. It is also possible to improve the statistic by weighting each district according to number of students, but results from very large districts overwhelm the analysis and potentially

[3] U.S. Department of Education, *Promising Results, Continuing Challenges: The Final Report of the National Assessment of Title I* (Washington, D.C., 1999), 7.

overstate the relationship between poverty and student achievement. Results shown below are unweighted.

Exhibit 7
How Strongly Do Indicators of Poverty Predict Test Scores?

Level of Data Collection	Poverty Indicator	Student Grade Level	Test Scores	Percent of Variation in Test Scores Explained by Poverty (R^2)
Building	FRL	Elementary	Standardized	51%
			WASL	47%
		All	Standardized	38%
			WASL	22%
District	FRL	Elementary	Standardized	37%
			WASL	29%
		All	Standardized	48%
			WASL	34%
	Census	Elementary	Standardized	25%
			WASL	26%
		All	Standardized	34%
			WASL	30%

Poverty as a Funding Driver for LAP

We also compared the attributes of FRL and Census estimates (used by Title I to allocate money to districts) as possible funding drivers for LAP (see Exhibit 8).

Data on FRL-eligible students is collected annually at both building and district levels, has a close relationship to student achievement (as described above), is relatively stable from year to year,[4] and is simple to calculate and understand. Some disadvantages to relying on FRL include suspicion that older students are less likely to participate in school lunch programs and/or sign up for an economic assistance program. There is also suspicion that

[4] From year to year, approximately 60 percent of districts experience less than 3 percent variation (up or down) in the percentage of students eligible for Free and Reduced Lunch. If a three-year rolling average is used, 80 percent of districts experience this minimal variation from year to year.

some school districts make a concerted effort to enroll students in the program and others may not. Not all districts report FRL information.[5]

Title I relies on Census estimates for allocating funds to districts. The Census estimates are updated every two years using a combination of factors, so it is more objective than voluntary participation in school lunch programs. In part because they are updated less frequently, the Census estimates provide a more stable funding driver. However, there is a five-year lag between data collection and the updated estimate, and information is not available at the building level. Analysis by the Institute suggests the Census indicator is not as strong a predictor of student achievement as the FRL indicator, and for some districts, there are large and unexplained discrepancies between the two poverty indicators.[6]

Exhibit 8
Comparison of Poverty Indicators

Attributes	Free and Reduced Lunch	Census Estimates
Collected at District Level	Yes	Yes
Collected at Building Level	Yes	No
Stable	Yes, particularly using a 3-year average	Yes, because only updated every 2 years
Up-to-Date	Yes (collected annually)	No (5-year lag in information)
Statistically Related to Student Achievement	Yes	Yes, but less so than FRL
Reliable	• Based on voluntary enrollment. • Probable under-report for older students. • Some districts provide no data.	• Based on objective estimate by experts. • Incorporates multiple factors. • Unexplained discrepancies in certain districts.

[5] Twelve districts reported no poverty information to OSPI between 1996 and 2000. The number of districts which do not report varies from year to year and can be as high as 20.

[6] Because eligibility criteria are different, we would expect to find a larger proportion of FRL-eligible students than meet the definition of poverty according to the Census. However, the Institute found at least 30 districts where the difference between the two indicators was larger than expected (more than 40 percent). Most of these districts had large Hispanic or Native American student populations, suggesting that Census data may not be as accurate an indicator of poverty in those communities.