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Executive Summary

Per-pupil expenditure (PPE) is a cloudy lens for education finance analysis. It reduces complex school systems—shaped by community wealth, student needs, facility age, governance choices, and historical commitments—into a single number that tempts expedient comparisons. Examined on its own, PPE tells us little about education quality, district efficiency, or resource adequacy.

Yet PPE can't be wished away. It's embedded in state reporting and media coverage. It's a customary metric for officials and taxpayers making sense of school spending. Ignoring it looks evasive. The question isn't whether to use PPE, but how to use it responsibly—with appropriate context to prevent misleading conclusions about revenue and expense while surfacing patterns that support decisions.

This report takes that approach: examining PPE across Western Massachusetts not to rank districts like racehorses, but as a starting point for more grounded deliberation about education funding.

The report is organized from broad regional patterns down to district-level details. You could read straight through to build understanding from high-level trends to fine detail. Or you could follow this quick-start guidance to answer two specific questions: How do my school district finances compare to other districts in Western MA with similar enrollment? How does the growth rate of my district finances compare?

Quick-start guide:

1. Review the **Cohort comparison: Western MA enrollment cohorts and districts of interest** on the next page.
2. Refer to **Section 1: Western MA traditional district trends—Scatterplot of enrollment vs. per-pupil expenditure with quartile boundaries (2024)** to see how all districts are grouped into cohorts using 2024 enrollment numbers.
3. Locate your district in **Section 3: Specific districts compared to cohorts** to see details of district expense categories, enrollment, Chapter 70 aid, and required net school spending (NSS) and actual NSS compared to cohort benchmarks.

Refer to the appendices for information about data sources and calculations.

As of October 24, 2025, this is a draft report that is still under review and has not been discussed by committee. Please send questions and comments to Leverett and Amherst-Pelham Regional School Committee member Tim Shores at shorest@arps.org.

Executive Summary (continued)

Cohort comparison: Western MA enrollment cohorts and districts of interest

| Cohort/District | 2009 \$/pupil | Shading vs baseline: $ \Delta\$/\text{pupil} \geq 5.0\%$, $ \Delta\text{CAGR} \geq 1.0\text{pp}$ | | | Above baseline |
|-------------------------------------|---------------|---|-------|-------|----------------|
| | | | | | Baseline |
| | | CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | Below baseline |
| Western MA (all, excl. Springfield) | \$12,234 | +4.0% | +4.6% | +6.0% | \$22,065 |
| Western MA Tiny (0-200 FTE) | \$14,738 | +4.2% | +4.4% | +6.0% | \$27,504 |
| Western MA Small (201-800 FTE) | \$12,523 | +4.6% | +5.1% | +6.7% | \$24,622 |
| Western MA Medium (801-1600 FTE) | \$13,032 | +4.1% | +4.7% | +6.1% | \$23,785 |
| Western MA Large (1601-10K FTE) | \$11,775 | +3.9% | +4.5% | +5.9% | \$20,841 |
| Outliers (Springfield) | \$14,608 | +4.1% | +5.7% | +9.4% | \$26,615 |

Table 1

District comparison: Medium enrollment cohort (801-1600 FTE)

| Cohort/District | 2009 \$/pupil | Table 2 | | | |
|----------------------------------|---------------|----------|----------|---------|---------------|
| | | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
| Western MA Medium (801-1600 FTE) | \$13,032 | +4.1% | +4.7% | +6.1% | \$23,785 |
| Amherst-Pelham Regional | \$16,211 | +3.8% | +3.8% | +4.8% | \$28,233 |
| Amherst | \$16,029 | +4.6% | +4.7% | +5.7% | \$31,267 |

District comparison: Tiny enrollment cohort (0-200 FTE)

| Cohort/District | 2009 \$/pupil | Table 3 | | | |
|-----------------------------|---------------|----------|----------|---------|---------------|
| | | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
| Western MA Tiny (0-200 FTE) | \$14,738 | +4.2% | +4.4% | +6.0% | \$27,504 |
| Leverett | \$15,156 | +2.5% | +0.5% | +2.0% | \$21,910 |
| Pelham | \$14,733 | +3.0% | +3.3% | +5.9% | \$23,040 |
| Shutesbury | \$14,011 | +4.4% | +5.3% | +5.0% | \$26,908 |

Table 1 compares PPE and cost growth of Western MA school district cohorts with the benchmark of all Western MA districts. **Tables 2 and 3** benchmark districts against their cohort averages.

Cohorts are organized by enrollment size. Grouping districts by enrollment size enables more meaningful cost comparisons—districts of similar size face similar challenges with administration, staffing, facilities, and program requirements. Detailed information about cohorts follow in **sections 1 and 2**. Detailed comparisons of individual districts to cohorts follow in **sections 2 and 3**.

Enrollment size is just one factor. Districts in the same cohort can differ significantly in wealth, demographics, geography, facility age, and governance, all of which shape costs and outcomes. Per-pupil expenditure (PPE) figures can obscure these differences, which is why this report examines PPE through detailed revenue and expenditure subcategories over time, not just top-line comparisons. Therefore, this breakdown alone won't tell the complete story of education funding and outcomes in each district and cannot support useful claims about which districts are 'efficient' or 'wasteful.' That requires local knowledge and deliberation of community priorities, student needs, and historical context. Instead, this breakdown can reveal patterns and anomalies that support and invite well-grounded investigation of education costs across a large region.

Executive Summary (continued)

Per-pupil expenditure and recent growth overview: 2019 PPE (lighter) to 2024 PPE (darker segment)

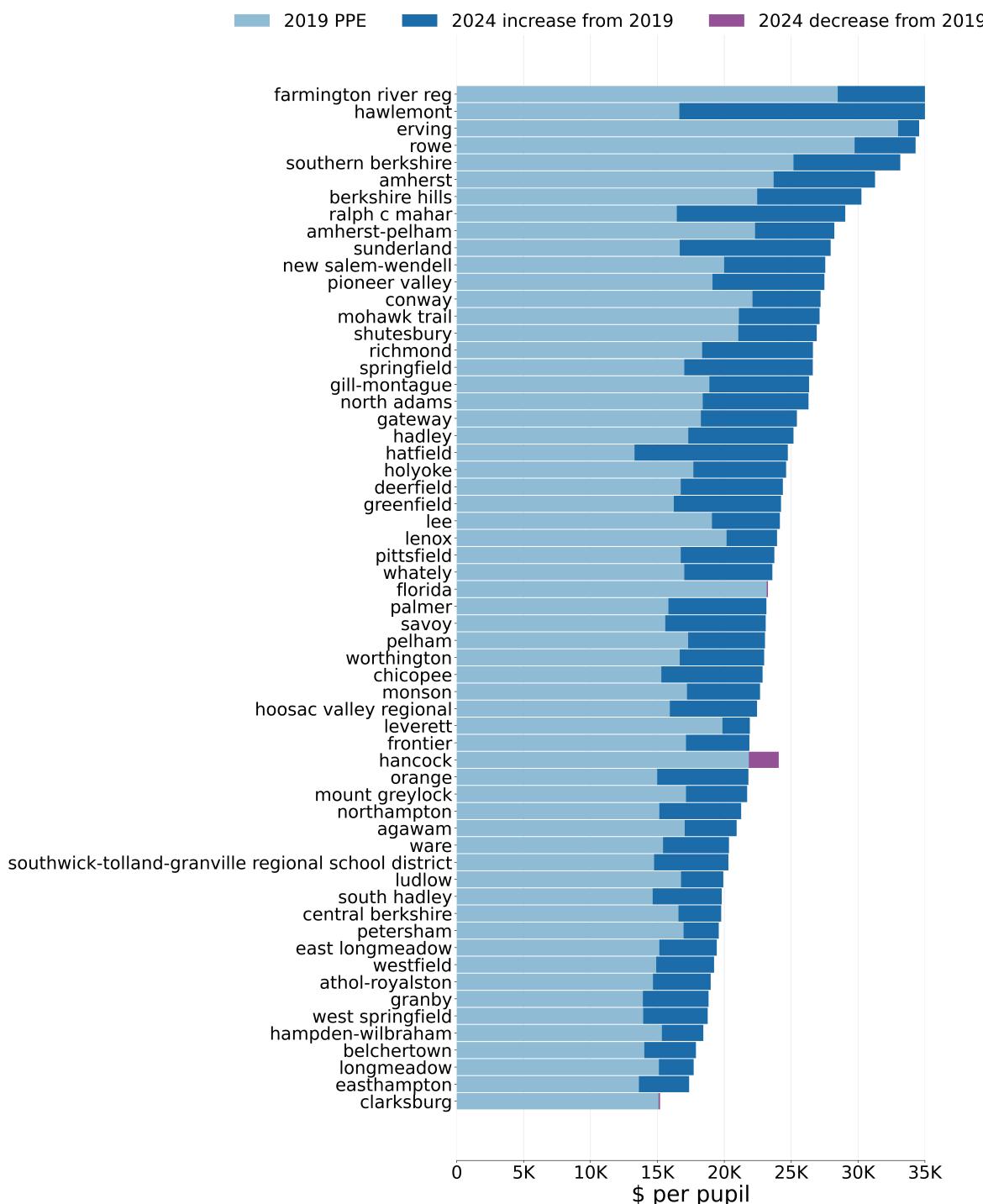


Figure 1

Each bar represents a district's per-pupil expenditures (PPE) in 2024, with growth from 2019 shown by a darker color. Districts are sorted by 2024 spending. While the spread is visible, this alone is nearly meaningless: we don't know if the difference between \$15K and \$30K per student reflects education quality, cost-of-living adjustments, special education demand, economies of scale, administrative decisions, ballot box decisions, or legacy cost structures.

Note: The following districts are omitted from this analysis: Chesterfield-Goshen (missing expenditure data), Hampshire (missing expenditure data), Southampton (missing expenditure data), Warwick (no enrollment data), Westhampton (missing expenditure data), Williamsburg (missing expenditure data).

Executive Summary (continued)

Statistical Associations

Statistical Analysis: Associations Between Enrollment Cohorts, Enrollment Growth, and Per-Pupil Expenditures

This section examines statistical associations between district characteristics (enrollment cohort, enrollment growth rate) and per-pupil expenditure patterns (2024 amounts and 2009-2024 growth rates). These analyses help identify whether certain district characteristics are systematically associated with spending levels or growth rates.

Summary of Findings:

Analysis of Western Massachusetts traditional districts (2009-2024) reveals weak to moderate statistical associations between enrollment characteristics and per-pupil expenditures. Enrollment cohort (district size) shows a modest association with 2024 spending levels but minimal association with spending growth rates. Enrollment growth rate shows weak associations with both current spending and spending growth. Combined models explain only a small portion of variation in district spending patterns, confirming that enrollment characteristics alone cannot predict per-pupil expenditures.

Detailed Statistical Results:

1. Enrollment Cohort and 2024 Per-Pupil Expenditure ANOVA test examining whether different enrollment cohorts (Tiny, Small, Medium, Large) have systematically different per-pupil expenditures in 2024. Results show a statistically significant but modest association ($F = 3.85$, $p = 0.014$, $\eta^2 = 0.216$), indicating that enrollment cohort explains approximately 22% of the variation in 2024 PPE. Effect size interpretation: small to medium effect, suggesting cohort membership has some predictive value but substantial variation exists within cohorts.

2. Enrollment Cohort and Per-Pupil Expenditure Growth (2009-2024) ANOVA test examining whether different enrollment cohorts experienced different growth rates in per-pupil expenditures from 2009 to 2024. Results show no significant association ($F = 0.61$, $p = 0.611$, $\eta^2 = 0.036$), indicating that enrollment cohort does not predict PPE growth patterns. Effect size interpretation: negligible effect.

3. Enrollment Growth Rate and 2024 Per-Pupil Expenditure Linear regression examining whether districts with higher enrollment growth rates (2009-2024) have higher 2024 per-pupil expenditures. Results show a weak positive association ($r = 0.226$, $R^2 = 0.051$, $p = 0.160$), which is not statistically significant at $\alpha = 0.05$. The model explains only 5.1% of PPE variation. Slope interpretation: for every 1% increase in enrollment growth, 2024 PPE increases by approximately \$33.50, but this relationship is not reliable given the weak correlation.

4. Enrollment Growth Rate and Per-Pupil Expenditure Growth (2009-2024) Linear regression examining whether districts with higher enrollment growth experienced higher PPE growth rates. Results show a weak negative association ($r = -0.175$, $R^2 = 0.031$, $p = 0.283$), which is not statistically significant. The model explains only 3.1% of PPE growth variation. Slope interpretation: enrollment growth does not predict PPE growth patterns.

5. Combined Model: Cohort + Enrollment Growth → 2024 Per-Pupil Expenditure ANCOVA combining both predictors (enrollment cohort and enrollment growth rate) to predict 2024 PPE. Results show modest explanatory power ($R^2 = 0.232$, Adjusted $R^2 = 0.155$, $F = 3.02$, $p = 0.023$). The combined model is statistically significant but explains only 23% of PPE variation, with the adjusted R^2 suggesting that adding enrollment growth provides minimal improvement over cohort alone.

6. Combined Model: Cohort + Enrollment Growth → PPE Growth (2009-2024) ANCOVA combining both predictors to predict PPE growth rates from 2009-2024. Results show no significant explanatory power ($R^2 = 0.069$, Adjusted $R^2 = -0.027$, $F = 0.74$, $p = 0.569$). The negative adjusted R^2 indicates that the model performs worse than simply using the mean PPE growth rate. Effect size interpretation: enrollment characteristics do not predict spending growth patterns.

Interpretation Notes: These analyses examine statistical associations, not causal relationships. Significant associations indicate that certain district characteristics tend to occur together with certain spending patterns, but do not prove that one causes the other. Many other factors (wealth, demographics, facility age, governance, etc.) also influence per-pupil expenditures.

Section 1 — Western MA traditional public school district trends

Section 1 examines per-pupil expenditure (PPE) trends across all Western Massachusetts traditional school districts, organized by enrollment-based cohorts.

This section provides a regional overview before diving into cohort-specific details (Section 2) and individual district comparisons (Section 3).

Contents:

Year-over-Year (YoY) growth rates: Shows the rate of PPE change from 2009-2024 for Amherst-Pelham, Amherst, Leverett, Pelham, Shutesbury, and their cohorts.

5-year and 15-year CAGR by district and cohort: Shows how compound annual growth rate (CAGR) smooths out the volatility of YoY rates of change, making it easier to understand and compare change in PPE over time.

Distribution of 2024 enrollment and proposed cohort grouping: Shows a histogram of Western MA districts by enrollment with cohorts determined by statistics visualized by the histogram.

Scatterplot analysis: Shows the relationship between district enrollment and PPE for 2024, with a table of cohort members.

All districts are grouped into enrollment cohorts based on 2024 in-district FTE using IQR (Interquartile Range) analysis. This grouping enables meaningful peer comparisons while acknowledging that enrollment size is just one factor influencing costs. Districts in the same cohort can differ significantly in wealth, demographics, geography, facility age, and governance—all of which shape costs and outcomes.

Section 1 — Western MA traditional public school district trends

Year-over-Year (YoY) growth rates by district and cohort

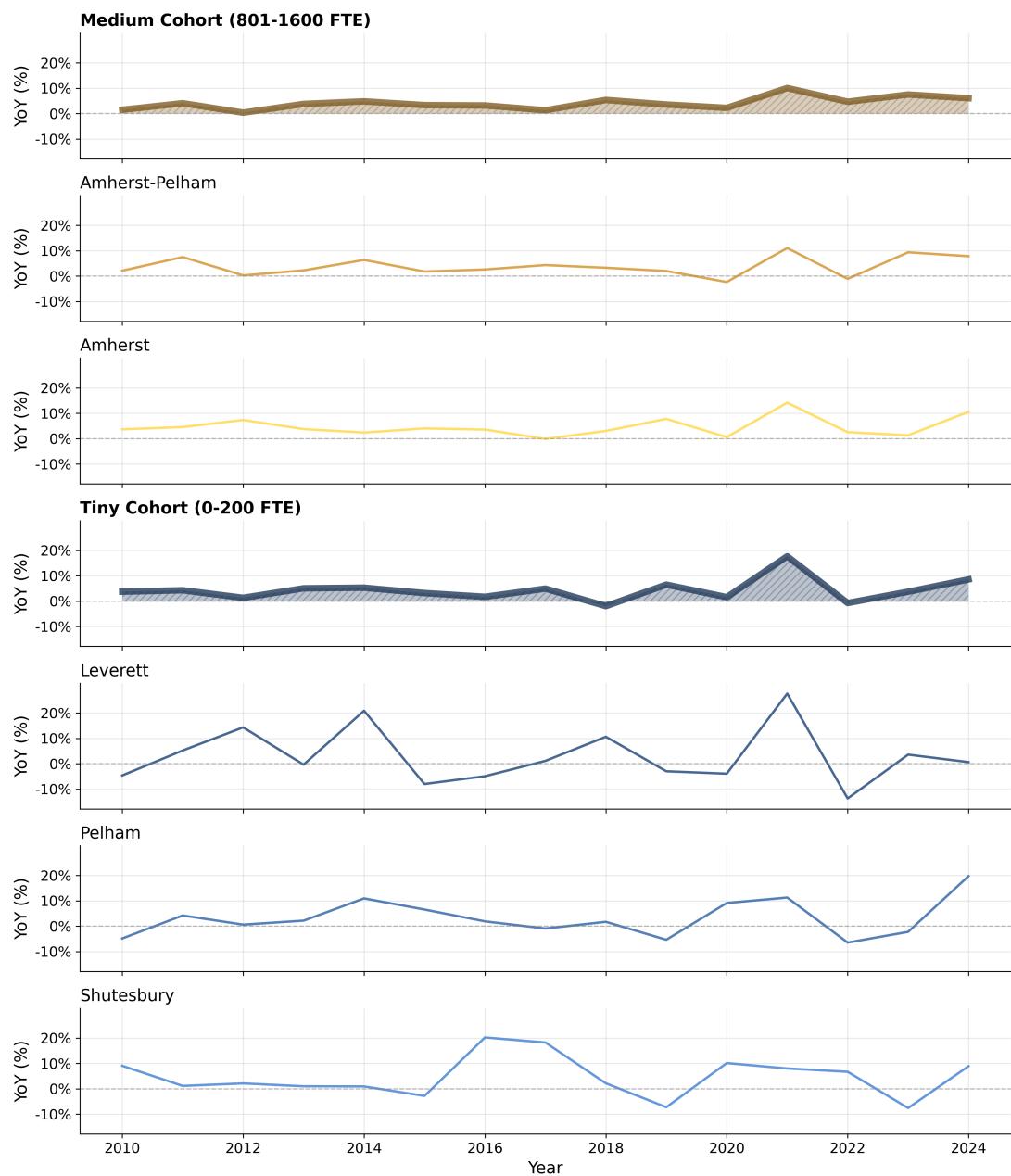


Figure 2

These plots show year-over-year (YoY) growth rates in per-pupil expenditure (PPE) for districts of interest and their enrollment cohorts. The districts are organized into enrollment cohorts based on student population size. The thicker lines represent cohort aggregates, while thinner lines show individual districts within each cohort. The determination of these cohorts is explained in detail in Appendix A. While patterns can be observed in these plots, it is difficult to discern a clear, consistent signal across all districts and cohorts over the 2009-2024 period.

Section 1 — Western MA traditional public school district trends

5-year and 15-year CAGR by district and cohort

The Compound Annual Growth Rate (CAGR) provides a clearer picture of growth trends by smoothing out year-to-year volatility. By comparing 5-year periods (2009-2014, 2014-2019, 2019-2024), we can observe how growth rates have evolved over time. The visualization below uses color shading to group districts by their enrollment cohorts, with diagonal white lines marking cohort aggregates for easy identification. For a longer-term perspective, we can also examine the 15-year CAGR from 2009 to 2024, shown in the second chart, which captures the overall growth trajectory across the entire period.

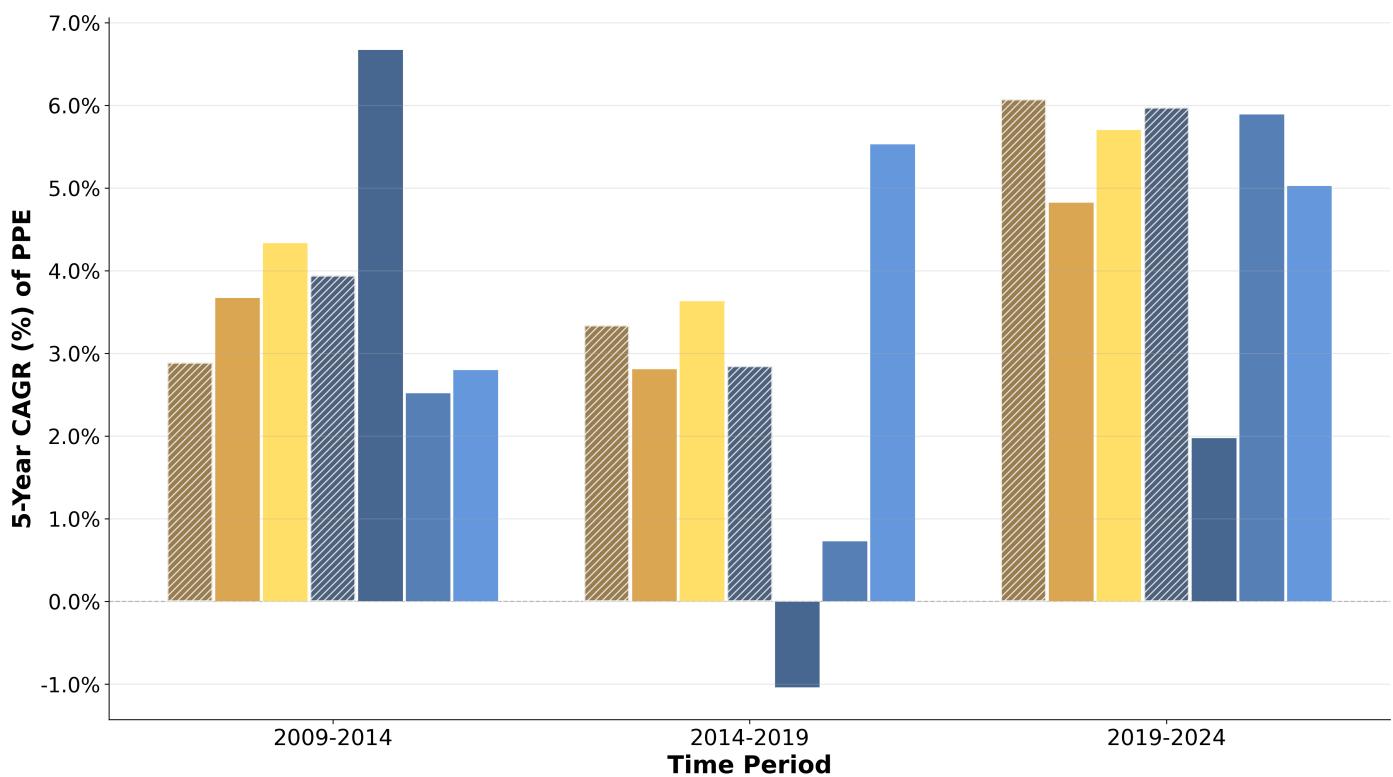


Figure 3

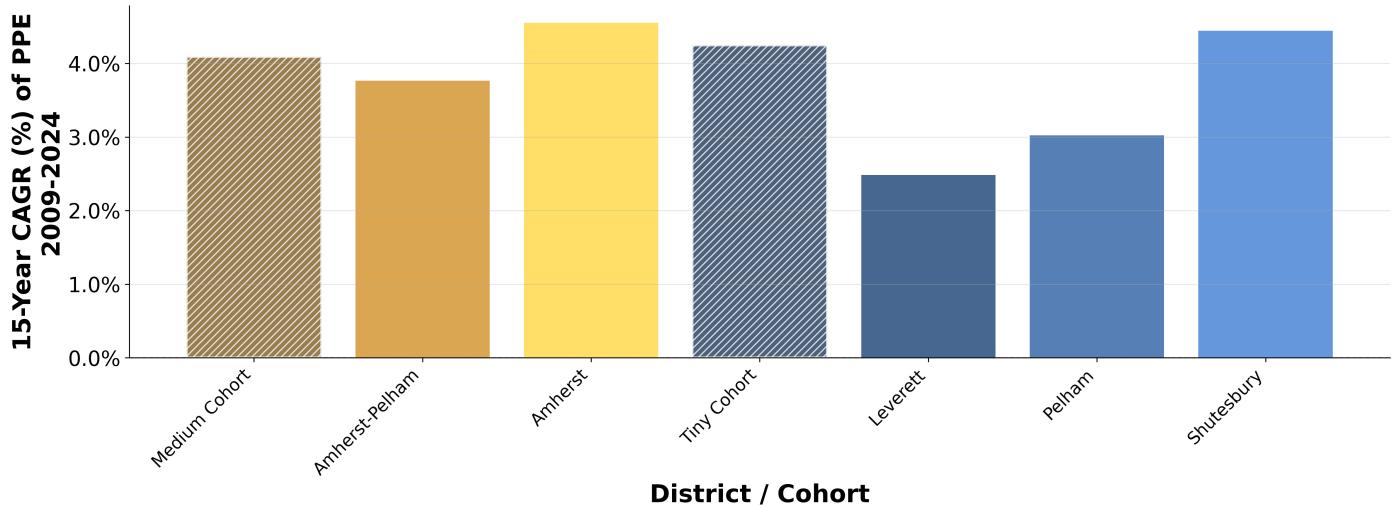


Figure 4

Section 1 — Western MA traditional public school district trends

Distribution of 2024 enrollment and proposed cohort grouping

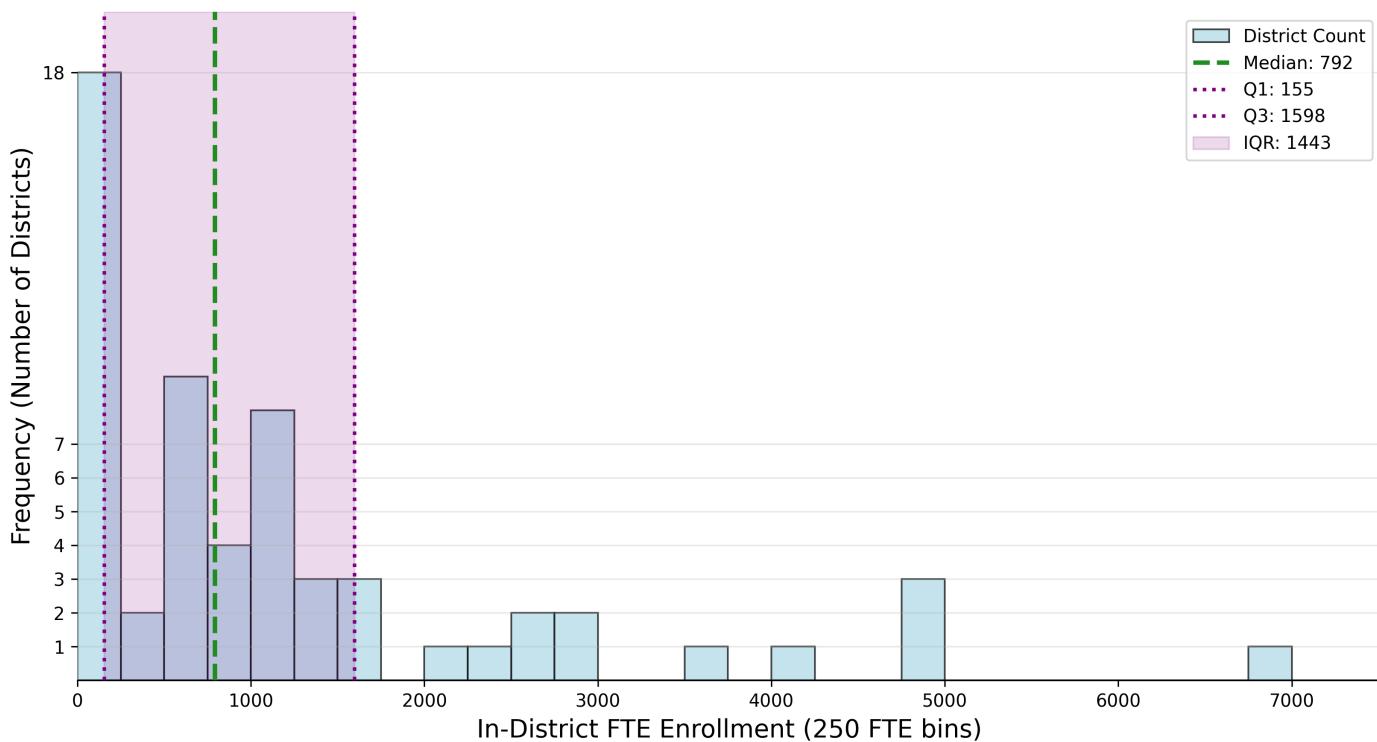


Figure 5

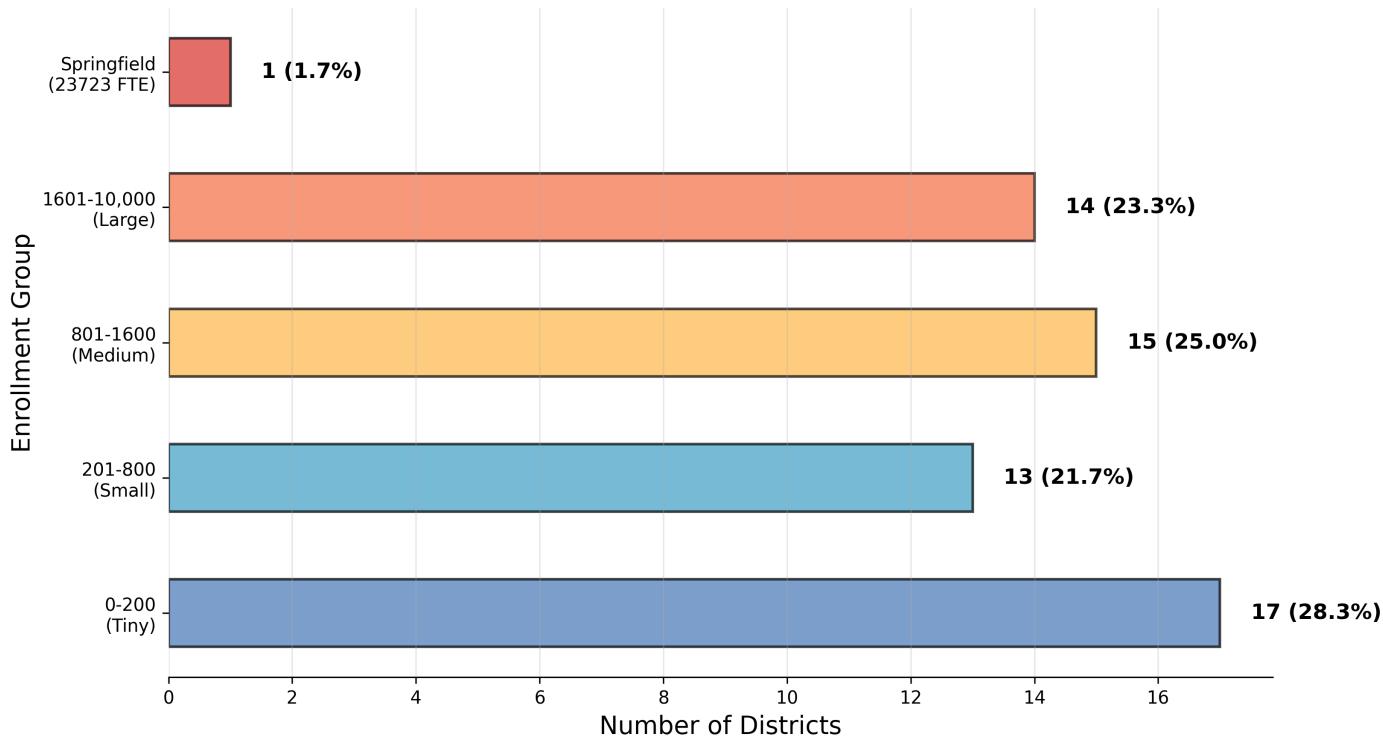


Figure 6

The histogram (top) shows right-skewed distribution of districts by 2024 enrollment using 250 FTE bins, with a long right tail and sparse districts at higher enrollments. Based on IQR analysis, districts are grouped into five enrollment-based cohorts (bottom): Tiny Cohort (0-200 FTE), Small Cohort (201-800 FTE), Medium Cohort (801-1600 FTE), and Large Cohort (1601-10000 FTE). Springfield (>10,000 FTE) is excluded as a statistical outlier. As noted earlier, these cohorts group districts by scale, not sameness. This breakdown alone won't tell the complete story of education funding and outcomes in each district. That requires local knowledge and deliberation.

Section 1 — Western MA traditional public school district trends

Scatterplot of enrollment vs. per-pupil expenditure with quartile boundaries (2024)

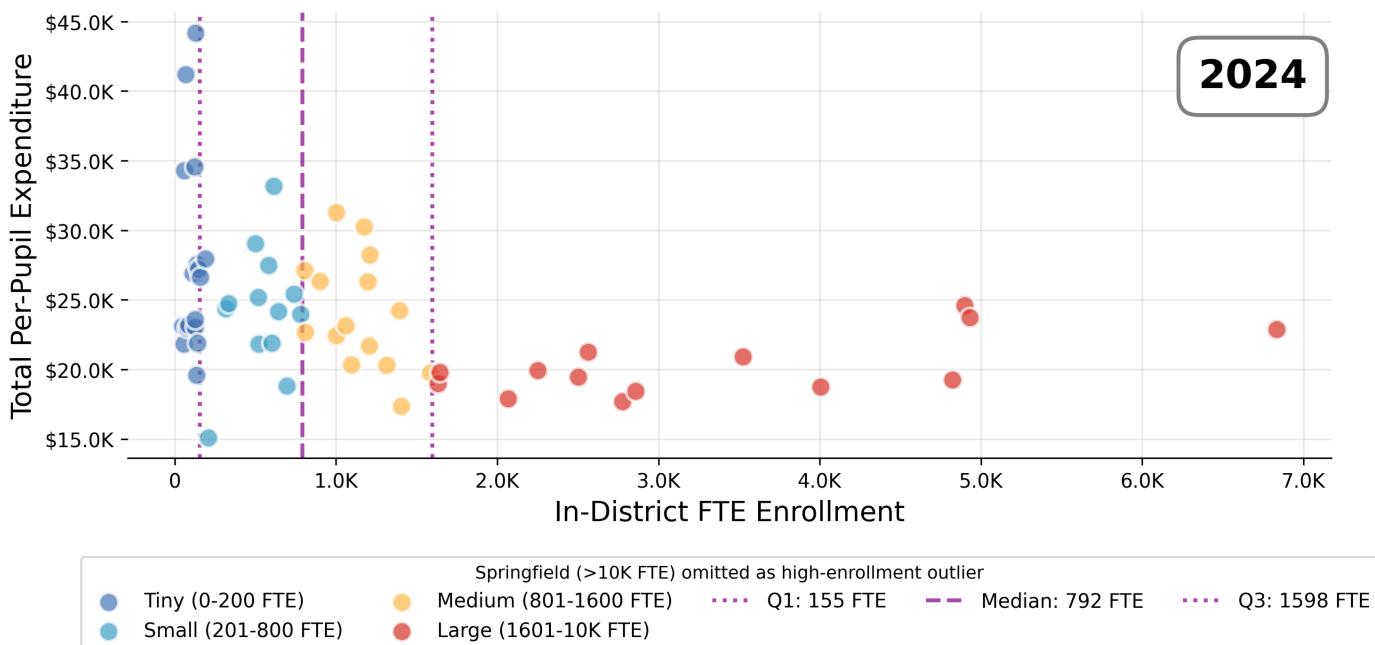


Figure 7

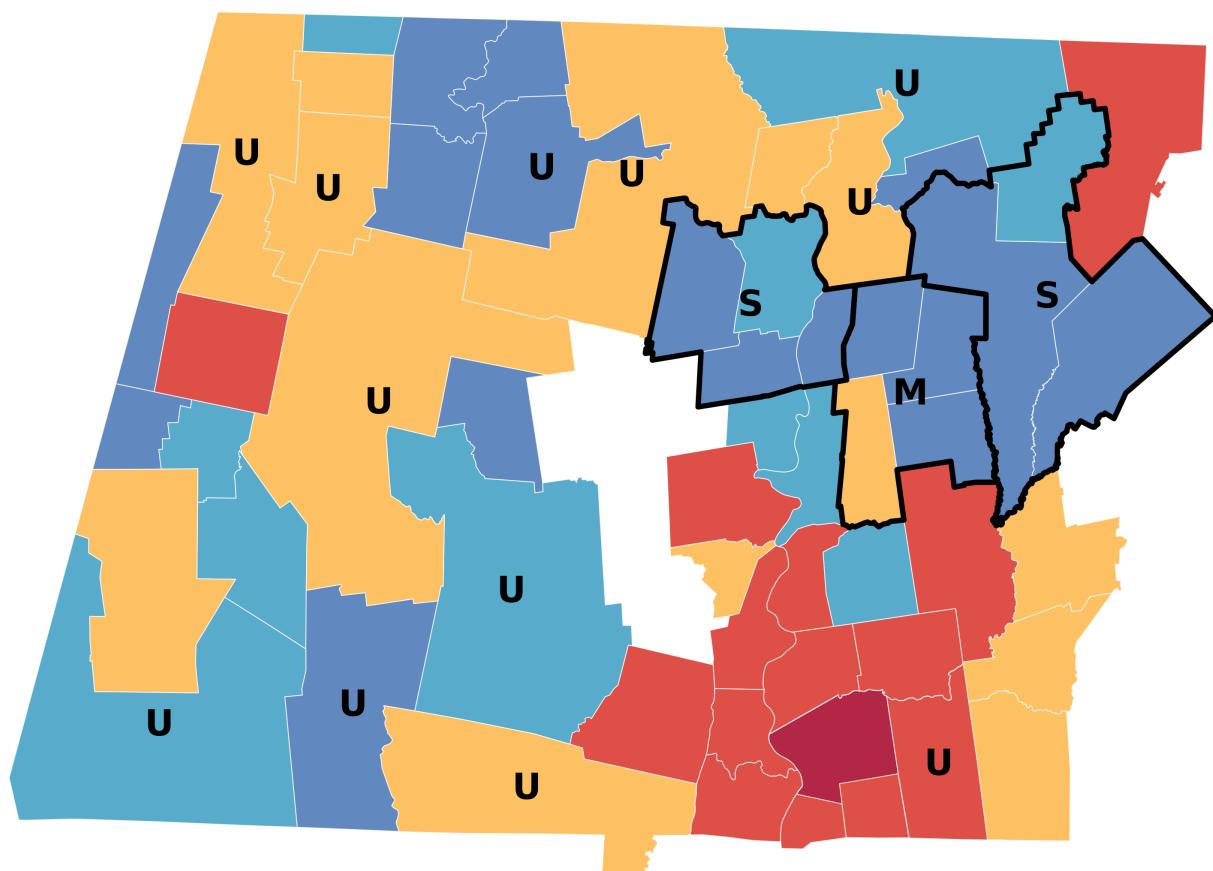
Table 4

| District | 2024 FTE | 2024 PPE ▼ |
|----------------------|----------|------------|
| Hawlemont | 108 | \$41,189 |
| Rowe | 86 | \$34,297 |
| New Salem-Wendell | 148 | \$27,553 |
| Conway | 155 | \$27,200 |
| Shutesbury | 129 | \$26,908 |
| Whately | 136 | \$23,593 |
| Florida | 94 | \$23,175 |
| Savoy | 62 | \$23,099 |
| Pelham | 136 | \$23,040 |
| Worthington | 140 | \$22,985 |
| Leverett | 145 | \$21,910 |
| Hancock | 106 | \$21,836 |
| Petersham | 141 | \$19,591 |
| Farmington River Reg | 254 | \$44,178 |
| Erving | 208 | \$34,566 |
| Southern Berkshire | 758 | \$33,162 |
| Ralph C Mahar | 622 | \$29,040 |
| Sunderland | 209 | \$27,953 |
| Pioneer Valley | 664 | \$27,490 |
| Richmond | 210 | \$26,631 |
| Hadley | 624 | \$25,173 |
| Hatfield | 412 | \$24,752 |
| Deerfield | 355 | \$24,382 |
| Lee | 746 | \$24,155 |
| Frontier | 656 | \$21,881 |
| Orange | 593 | \$21,809 |
| Granby | 781 | \$18,824 |
| Clarksburg | 262 | \$15,078 |
| Amherst | 1,135 | \$31,267 |
| Berkshire Hills | 1,291 | \$30,257 |

| District | 2024 FTE | 2024 PPE ▼ |
|--|----------|------------|
| Amherst-Pelham | 1,356 | \$28,233 |
| Mohawk Trail | 951 | \$27,124 |
| Gill-Montague | 1,127 | \$26,345 |
| North Adams | 1,447 | \$26,300 |
| Gateway | 847 | \$25,430 |
| Lenox | 814 | \$23,944 |
| Palmer | 1,234 | \$23,154 |
| Monson | 910 | \$22,675 |
| Hoosac Valley Regional | 1,240 | \$22,450 |
| Mount Greylock | 1,269 | \$21,705 |
| Ware | 1,310 | \$20,348 |
| Southwick-Tolland-Granville Regional School District | 1,432 | \$20,311 |
| Holyoke | 6,165 | \$24,619 |
| Greenfield | 1,869 | \$24,237 |
| Pittsfield | 5,806 | \$23,739 |
| Chicopee | 7,530 | \$22,866 |
| Northampton | 2,846 | \$21,267 |
| Agawam | 3,691 | \$20,920 |
| Ludlow | 2,377 | \$19,928 |
| South Hadley | 1,950 | \$19,810 |
| Central Berkshire | 1,787 | \$19,773 |
| East Longmeadow | 2,600 | \$19,444 |
| Westfield | 5,162 | \$19,236 |
| Athol-Royalston | 1,887 | \$18,981 |
| West Springfield | 4,245 | \$18,760 |
| Hampden-Wilbraham | 2,950 | \$18,436 |
| Belchertown | 2,265 | \$17,887 |
| Longmeadow | 2,826 | \$17,710 |
| Easthampton | 1,712 | \$17,371 |
| Springfield | 29,468 | \$26,615 |

Section 1 — Western MA traditional public school district trends

Geographic map showing district locations and enrollment cohorts (2024)



Enrollment Cohorts - 2024

- | | |
|--|---|
| Tiny (0-200 FTE): 17 district(s) | Secondary regional (black border) Cohort: T, S, M, L, XL |
| Small (201-800 FTE): 13 district(s) | U = Unified regional district (PK-12) |
| Medium (801-1600 FTE): 15 district(s) | |
| Large (1601-10K FTE): 14 district(s) | |
| Outliers (Springfield >10K FTE): 1 district(s) | |

Figure 8

This map situates the districts within their geographic context in Western Massachusetts. Districts are shaded according to their enrollment cohort: Tiny (blue), Small (light blue), Medium (yellow), Large (orange). Elementary and PK-12 districts that are associated with a single town appear as solid filled areas. PK-12 unified regional districts (marked with 'U') span across multiple towns. Secondary regional districts are bounded by a thick black border with a cohort letter indicator (T = Tiny, S = Small, M = Medium, L = Large) showing the enrollment cohort of the secondary regional district. Note a secondary regional district's underlying member districts may belong to different enrollment cohorts.

Section 2 — Western MA cohort details

Tiny (0-200 FTE) — PPE vs Enrollment — Weighted average per district.

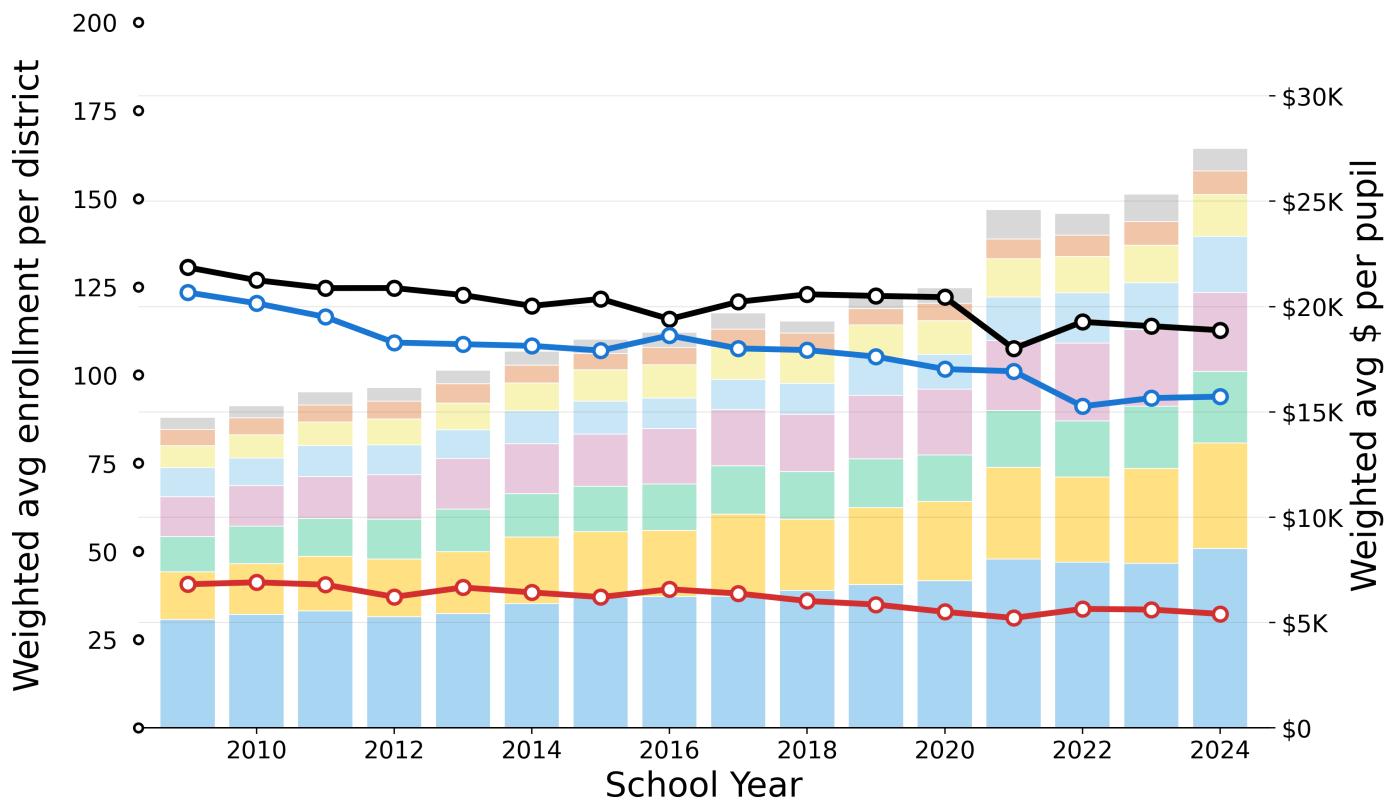


Figure 9

Table 5

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$577 | +4.1% | +4.7% | +9.4% | \$1,057 |
| Administration | \$770 | +2.6% | +2.8% | +7.9% | \$1,126 |
| Instructional Leadership | \$1,042 | +4.4% | +4.2% | +5.2% | \$1,991 |
| Operations and Maintenance | \$1,374 | +4.5% | +5.5% | +7.9% | \$2,652 |
| Other Teaching Services | \$1,899 | +4.7% | +4.7% | +4.6% | \$3,757 |
| Pupil Services | \$1,669 | +4.9% | +5.2% | +8.0% | \$3,406 |
| Insurance, Retirement and Other | \$2,258 | +5.5% | +4.8% | +6.5% | \$5,009 |
| Teachers | \$5,148 | +3.4% | +3.7% | +4.6% | \$8,507 |
| Total | \$14,738 | +4.2% | +4.4% | +6.0% | \$27,504 |

Table 6

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|------|----------|----------|---------|------|
| In-District FTE Pupils | 131 | -1.0% | -0.6% | -1.6% | 113 |
| Foundation Enrollment | 123 | -1.8% | -1.4% | -2.3% | 94 |
| Out-of-District FTE Pupils | 41 | -1.5% | -1.7% | -1.6% | 32 |

Shading vs baseline: $|\Delta \$/\text{pupil}| \geq 5.0\%$, $|\Delta \text{Enrollment}| \geq 5.0\%$, $|\Delta \text{CAGR}| \geq 1.0\text{pp}$

Above Western MA baseline

CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$

Below Western MA baseline

Section 2 — Western MA cohort details

Tiny (0-200 FTE) — Chapter 70 Aid and Net School Spending (NSS).

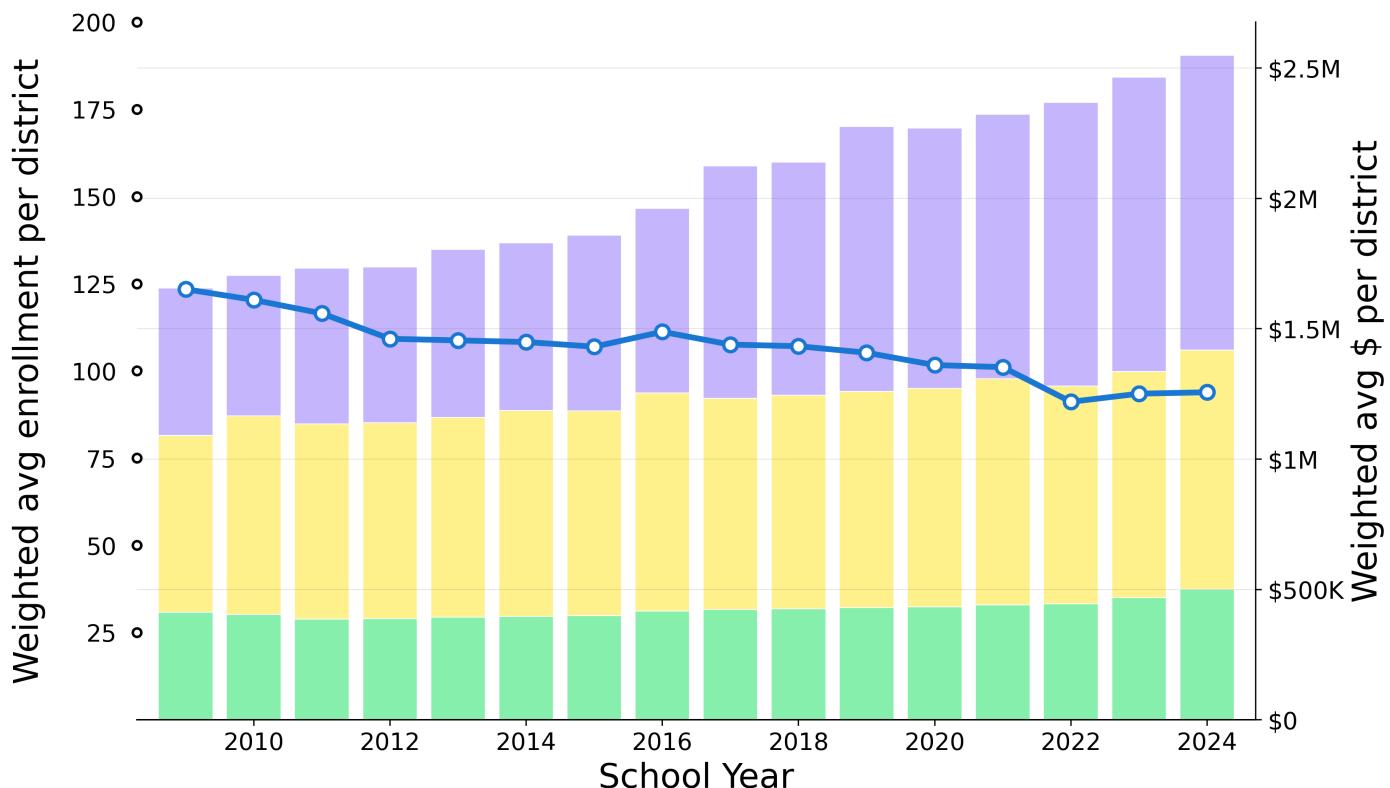


Figure 10

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|-------------|-------------|-------------|------------|-------------|
| Actual NSS (minus Req NSS) | \$565,230 | 4.74% | 5.83% | 2.20% | \$1,131,796 |
| Req NSS (minus Ch70) | \$679,670 | 2.02% | 1.51% | 2.02% | \$917,491 |
| Ch70 Aid | \$412,033 | 1.30% | 2.34% | 3.07% | \$500,393 |
| Total (Actual NSS) | \$1,656,933 | 2.92% | 3.38% | 2.30% | \$2,549,680 |

Table 7

| Table 8 | | | | | |
|---|------|----------|----------|---------|---------------------------|
| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
| Foundation Enrollment | 123 | -1.8% | -1.4% | -2.3% | 94 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above Western MA baseline |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below Western MA baseline |

Table 8

Tiny (0-200 FTE) includes 17 members:

Districts (15): Conway, Erving, Florida, Hancock, Hawlemont, Leverett, Pelham, Petersham, Richmond, Rowe, Savoy, Shutesbury, Sunderland, Whately, Worthington.

Unified regions (2): Farmington River Reg, New Salem-Wendell.

Section 2 — Western MA cohort details

Small (201-800 FTE) — PPE vs Enrollment — Weighted average per district.

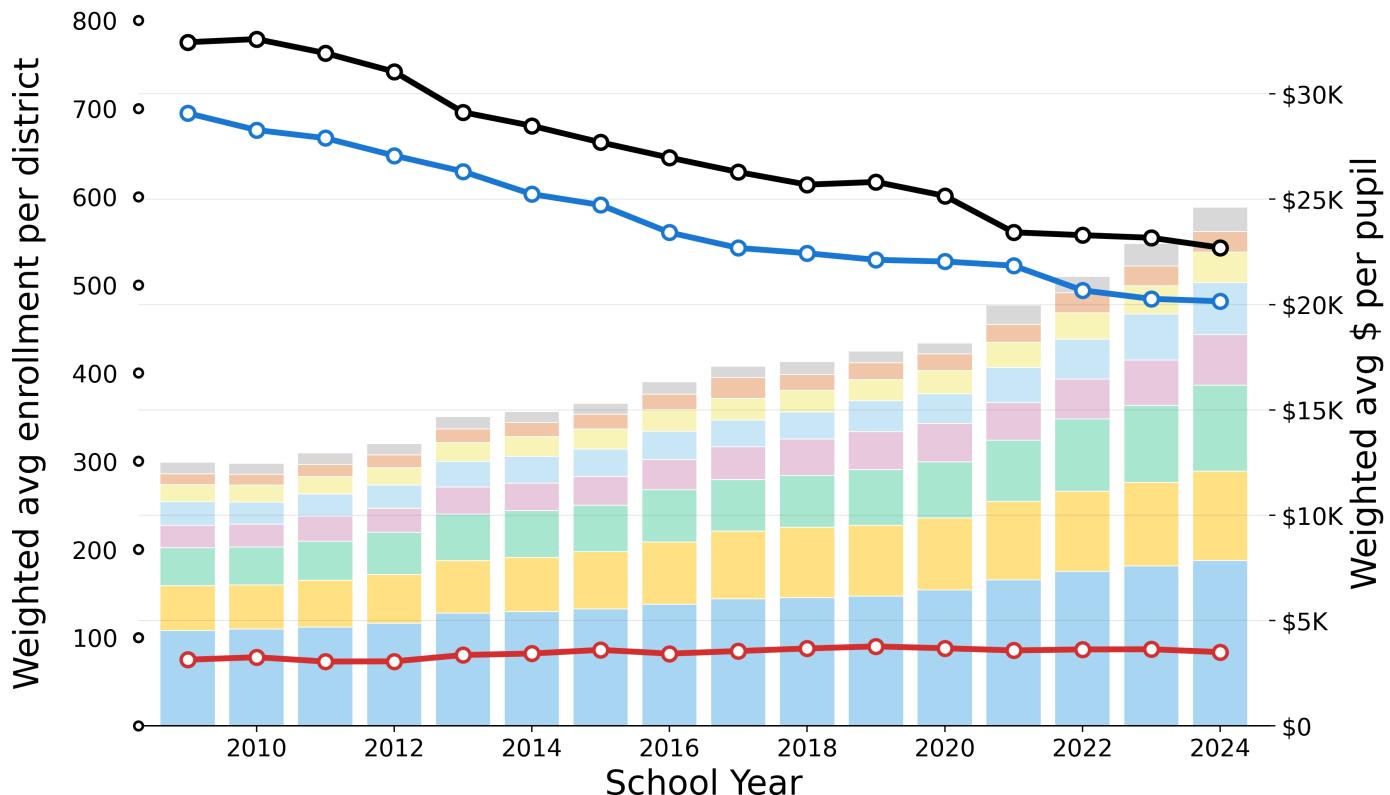


Figure 11

Table 9

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$558 | +4.9% | +8.4% | +15.6% | \$1,150 |
| Administration | \$523 | +4.3% | +3.9% | +4.4% | \$976 |
| Instructional Leadership | \$811 | +4.0% | +4.4% | +7.6% | \$1,463 |
| Operations and Maintenance | \$1,108 | +5.4% | +6.9% | +10.8% | \$2,454 |
| Other Teaching Services | \$1,061 | +5.6% | +6.2% | +6.0% | \$2,402 |
| Pupil Services | \$1,813 | +5.6% | +6.3% | +9.1% | \$4,084 |
| Insurance, Retirement and Other | \$2,128 | +4.7% | +5.2% | +4.8% | \$4,254 |
| Teachers | \$4,522 | +3.7% | +3.8% | +5.0% | \$7,838 |
| Total | \$12,523 | +4.6% | +5.1% | +6.7% | \$24,622 |

Table 10

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|------|----------|----------|---------|------|
| In-District FTE Pupils | 775 | -2.4% | -2.2% | -2.5% | 542 |
| Foundation Enrollment | 695 | -2.4% | -2.2% | -1.8% | 481 |
| Out-of-District FTE Pupils | 75 | +0.7% | +0.2% | -1.5% | 84 |

Shading vs baseline: $|\Delta \$/\text{pupil}| \geq 5.0\%$, $|\Delta \text{Enrollment}| \geq 5.0\%$, $|\Delta \text{CAGR}| \geq 1.0\text{pp}$ Above Western MA baseline

CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$

Below Western MA baseline

Section 2 — Western MA cohort details

Small (201-800 FTE) — Chapter 70 Aid and Net School Spending (NSS).

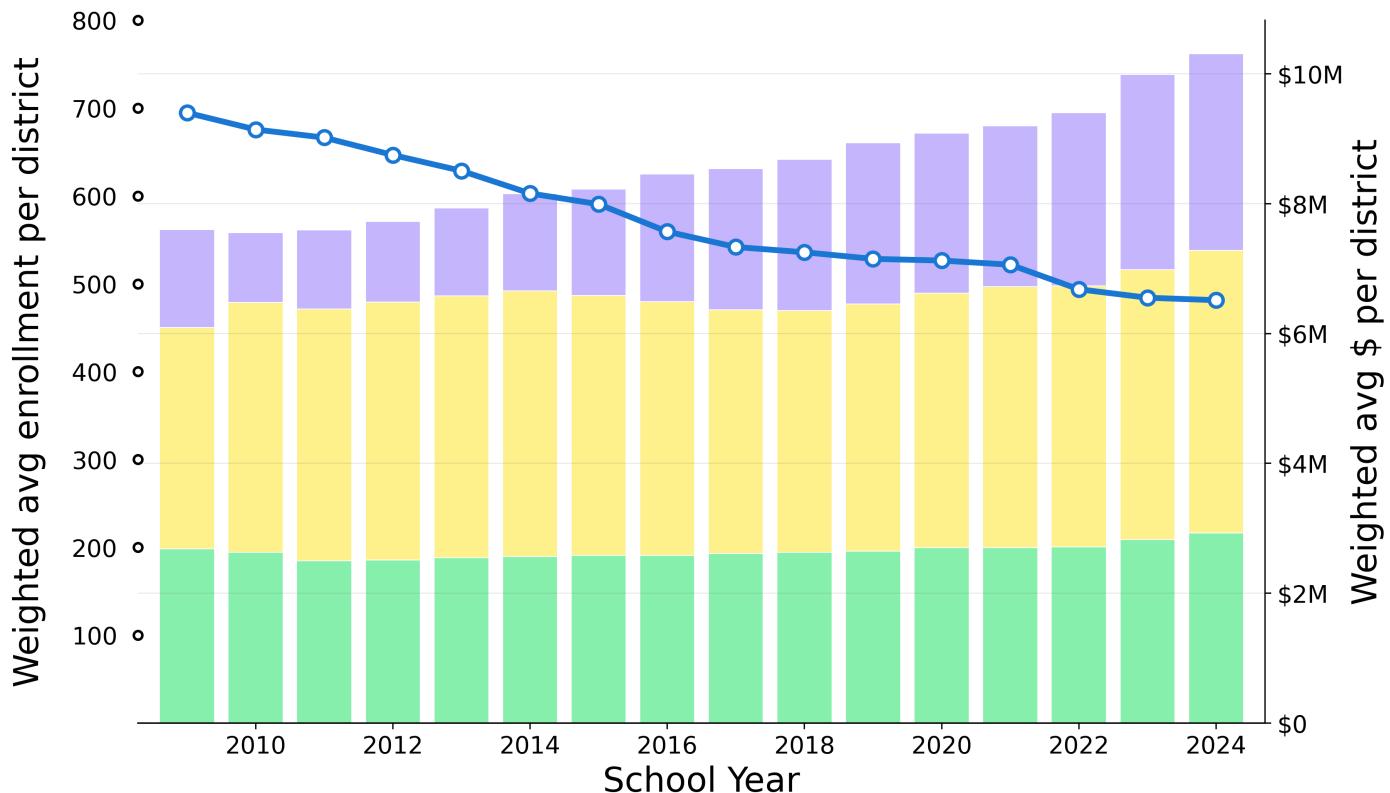


Figure 12

Table 11

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|-------------|-------------|-------------|------------|--------------|
| Actual NSS (minus Req NSS) | \$1,503,377 | 4.78% | 7.28% | 4.04% | \$3,027,779 |
| Req NSS (minus Ch70) | \$3,407,993 | 1.65% | 0.63% | 2.73% | \$4,357,282 |
| Ch70 Aid | \$2,687,050 | 0.57% | 1.32% | 2.03% | \$2,925,814 |
| Total (Actual NSS) | \$7,598,420 | 2.06% | 2.37% | 2.90% | \$10,310,875 |

Table 12

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|--|------|----------|----------|---------|---------------------------|
| Foundation Enrollment | 695 | -2.4% | -2.2% | -1.8% | 481 |
| Shading vs baseline: $ \Delta\$/\text{pupil} \geq 5.0\%$, $ \Delta\text{Enrollment} \geq 5.0\%$, $ \Delta\text{CAGR} \geq 1.0\text{pp}$ | | | | | Above Western MA baseline |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below Western MA baseline |

Small (201-800 FTE) includes 13 members:

Districts (13): Clarksburg, Deerfield, Frontier, Gateway, Granby, Hadley, Hatfield, Lee, Lenox, Orange, Pioneer Valley, Ralph C Mahar, Southern Berkshire.

Section 2 — Western MA cohort details

Medium (801-1600 FTE) — PPE vs Enrollment — Weighted average per district.

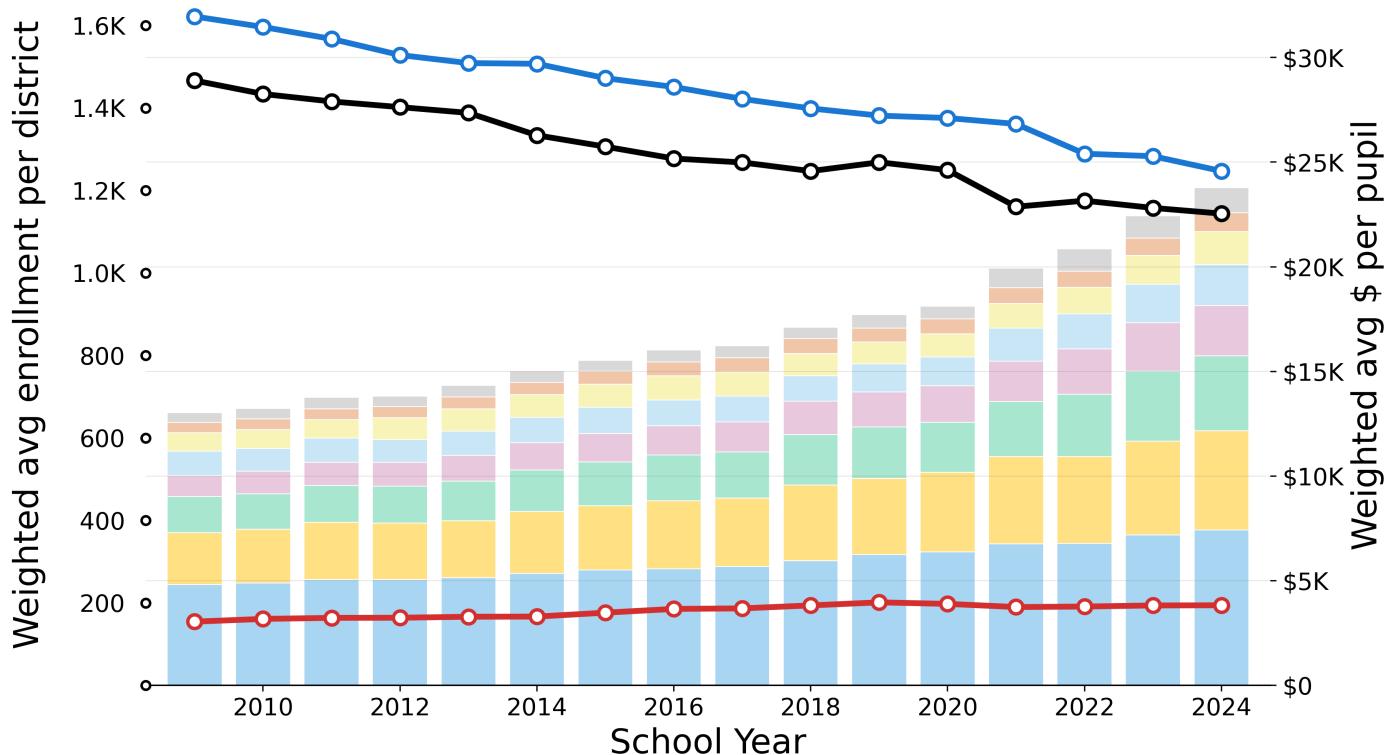


Figure 13

Table 13

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$461 | +6.6% | +8.1% | +13.3% | \$1,200 |
| Administration | \$494 | +4.2% | +4.7% | +6.9% | \$911 |
| Instructional Leadership | \$893 | +3.8% | +3.7% | +8.2% | \$1,573 |
| Operations and Maintenance | \$1,150 | +3.6% | +4.9% | +8.0% | \$1,953 |
| Other Teaching Services | \$1,014 | +5.9% | +6.2% | +7.3% | \$2,395 |
| Pupil Services | \$1,724 | +5.0% | +6.1% | +7.8% | \$3,581 |
| Insurance, Retirement and Other | \$2,483 | +4.4% | +4.9% | +5.5% | \$4,740 |
| Teachers | \$4,813 | +2.9% | +3.3% | +3.5% | \$7,431 |
| Total | \$13,032 | +4.1% | +4.7% | +6.1% | \$23,785 |

Table 14

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|-------|----------|----------|---------|-------|
| In-District FTE Pupils | 1,466 | -1.6% | -1.5% | -2.0% | 1,144 |
| Foundation Enrollment | 1,622 | -1.7% | -1.9% | -2.0% | 1,247 |
| Out-of-District FTE Pupils | 154 | +1.5% | +1.5% | -0.7% | 194 |

Shading vs baseline: $|\Delta \$/\text{pupil}| \geq 5.0\%$, $|\Delta \text{Enrollment}| \geq 5.0\%$, $|\Delta \text{CAGR}| \geq 1.0\text{pp}$

CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$

Above Western MA baseline

Below Western MA baseline

Section 2 — Western MA cohort details

Medium (801-1600 FTE) — Chapter 70 Aid and Net School Spending (NSS).

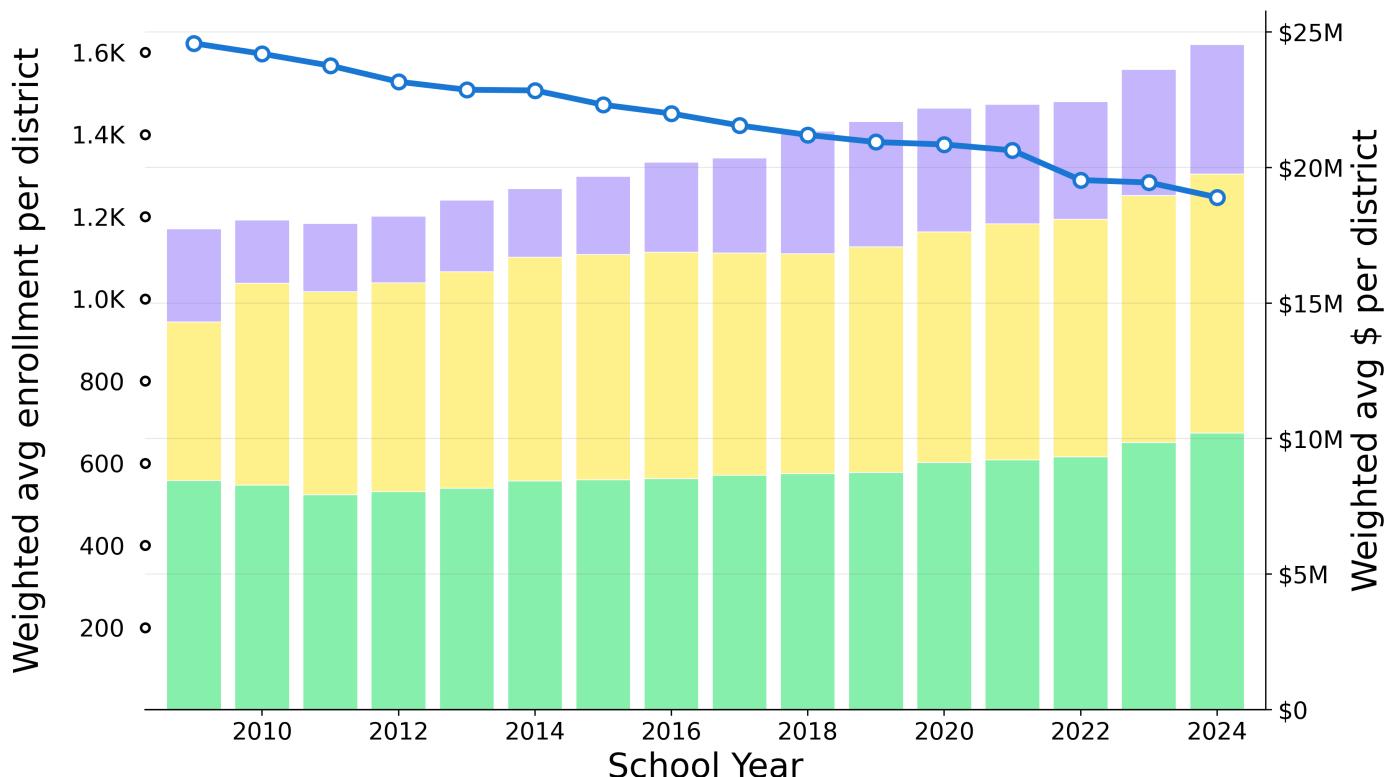


Figure 14

Table 15

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|--------------|-------------|-------------|------------|--------------|
| Actual NSS (minus Req NSS) | \$3,437,076 | 2.23% | 6.62% | 0.71% | \$4,785,662 |
| Req NSS (minus Ch70) | \$5,849,475 | 3.32% | 1.45% | 2.80% | \$9,543,900 |
| Ch70 Aid | \$8,447,177 | 1.27% | 1.93% | 3.12% | \$10,206,872 |
| Total (Actual NSS) | \$17,733,728 | 2.19% | 2.47% | 2.50% | \$24,536,434 |

Table 16

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|--|-------|----------|----------|---------|---------------------------|
| Foundation Enrollment | 1,622 | -1.7% | -1.9% | -2.0% | 1,247 |
| Shading vs baseline: $ \Delta\$/\text{pupil} \geq 5.0\%$, $ \Delta\text{Enrollment} \geq 5.0\%$, $ \Delta\text{CAGR} \geq 1.0\text{pp}$ | | | | | Above Western MA baseline |
| CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below Western MA baseline |

Medium (801-1600 FTE) includes 15 members:

Districts (11): Amherst, Berkshire Hills, Central Berkshire, Easthampton, Greenfield, Mohawk Trail, Monson, Mount Greylock, North Adams, Palmer, Ware.

Unified regions (4): Amherst-Pelham, Gill-Montague, Hoosac Valley Regional, Southwick-Tolland-Granville Regional School District.

Section 2 — Western MA cohort details

Large (1601-10K FTE) — PPE vs Enrollment — Weighted average per district.

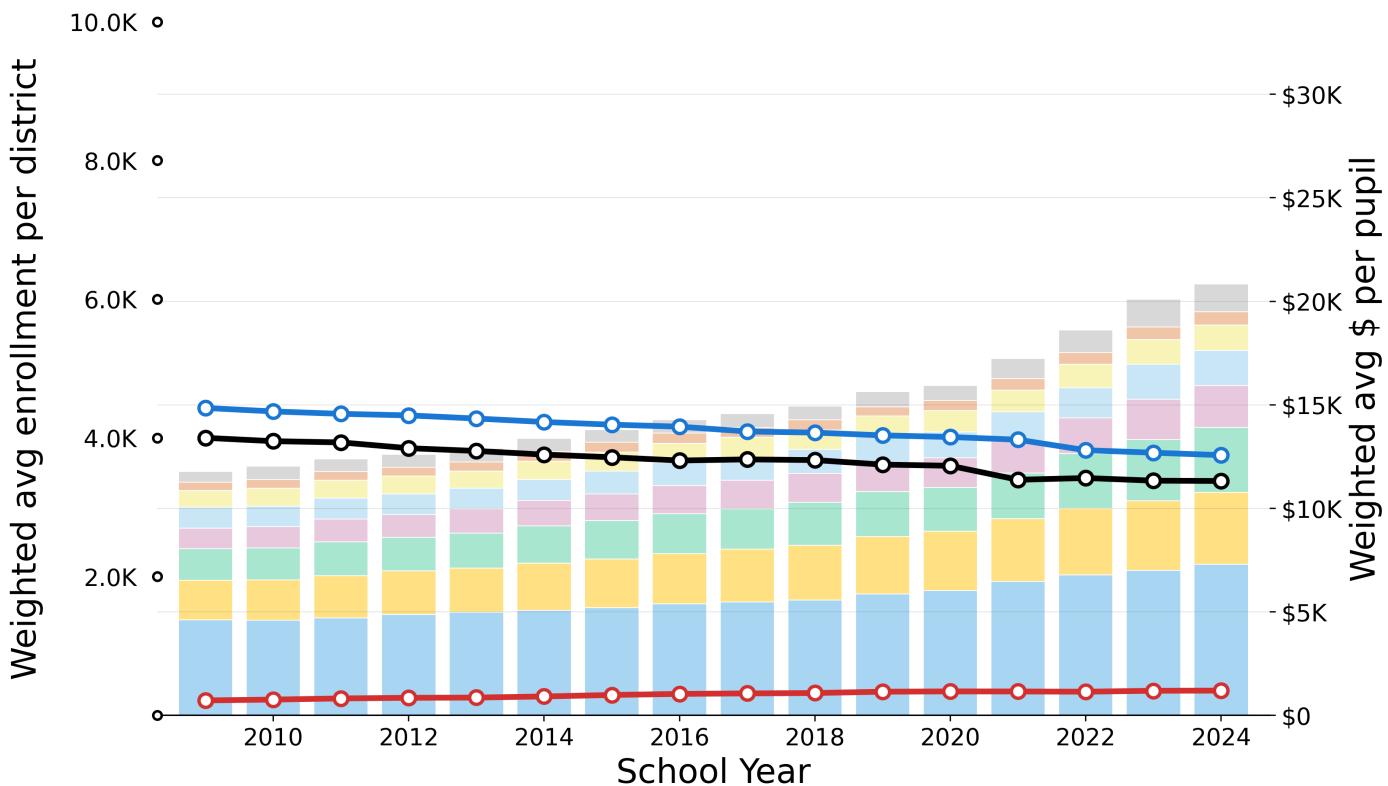


Figure 15

Table 17

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$513 | +6.6% | +7.9% | +13.3% | \$1,348 |
| Administration | \$392 | +3.4% | +3.5% | +7.5% | \$649 |
| Instructional Leadership | \$811 | +2.8% | +3.3% | +4.3% | \$1,231 |
| Operations and Maintenance | \$1,014 | +3.4% | +5.1% | +6.2% | \$1,683 |
| Other Teaching Services | \$990 | +4.9% | +5.1% | +7.5% | \$2,021 |
| Pupil Services | \$1,531 | +4.9% | +5.8% | +7.7% | \$3,148 |
| Insurance, Retirement and Other | \$1,911 | +4.1% | +4.3% | +4.6% | \$3,469 |
| Teachers | \$4,613 | +3.1% | +3.7% | +4.5% | \$7,292 |
| Total | \$11,775 | +3.9% | +4.5% | +5.9% | \$20,841 |

Table 18

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|-------|----------|----------|---------|-------|
| In-District FTE Pupils | 4,001 | -1.1% | -1.1% | -1.3% | 3,379 |
| Foundation Enrollment | 4,432 | -1.1% | -1.2% | -1.5% | 3,752 |
| Out-of-District FTE Pupils | 215 | +3.4% | +2.7% | +0.9% | 357 |

Shading vs baseline: $|\Delta \$/\text{pupil}| \geq 5.0\%$, $|\Delta \text{Enrollment}| \geq 5.0\%$, $|\Delta \text{CAGR}| \geq 1.0\text{pp}$ Above Western MA baseline

CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$

Below Western MA baseline

Section 2 — Western MA cohort details

Large (1601-10K FTE) — Chapter 70 Aid and Net School Spending (NSS).

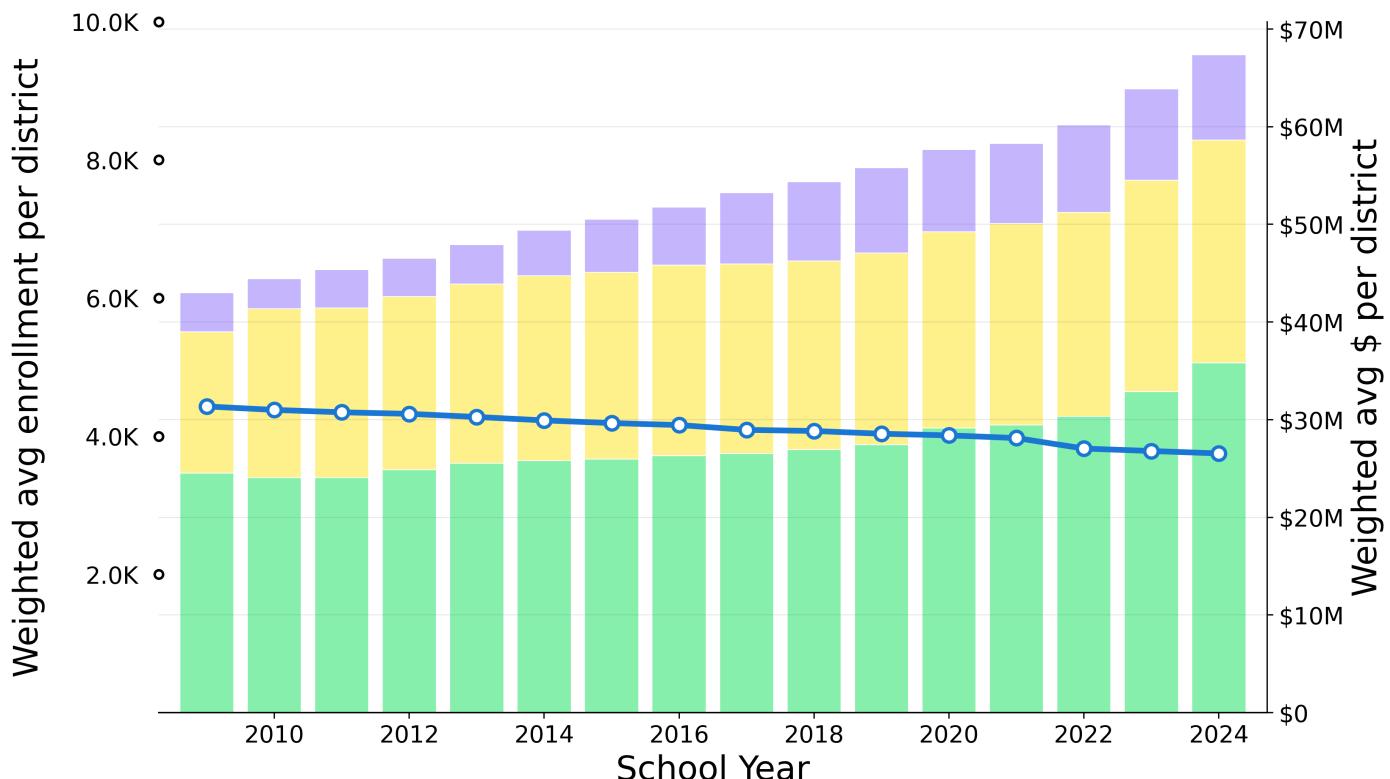


Figure 16

Table 19

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|--------------|-------------|-------------|------------|--------------|
| Actual NSS (minus Req NSS) | \$3,988,107 | 5.37% | 6.43% | 0.02% | \$8,737,489 |
| Req NSS (minus Ch70) | \$14,459,161 | 3.08% | 1.89% | 3.02% | \$22,807,066 |
| Ch70 Aid | \$24,531,702 | 2.56% | 3.33% | 5.49% | \$35,828,178 |
| Total (Actual NSS) | \$42,978,970 | 3.04% | 3.15% | 3.84% | \$67,372,733 |

Table 20

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|---|-------|----------|----------|---------|---------------------------|
| Foundation Enrollment | 4,432 | -1.1% | -1.2% | -1.5% | 3,752 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above Western MA baseline |
| CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below Western MA baseline |

Large (1601-10K FTE) includes 14 members:

Districts (12): Agawam, Belchertown, Chicopee, East Longmeadow, Holyoke, Longmeadow, Ludlow, Northampton, Pittsfield, South Hadley, West Springfield, Westfield.

Unified regions (2): Athol-Royalston, Hampden-Wilbraham.

Section 2 — Western MA cohort details

Outliers (Springfield >10K FTE) — PPE vs Enrollment — Weighted average per district.

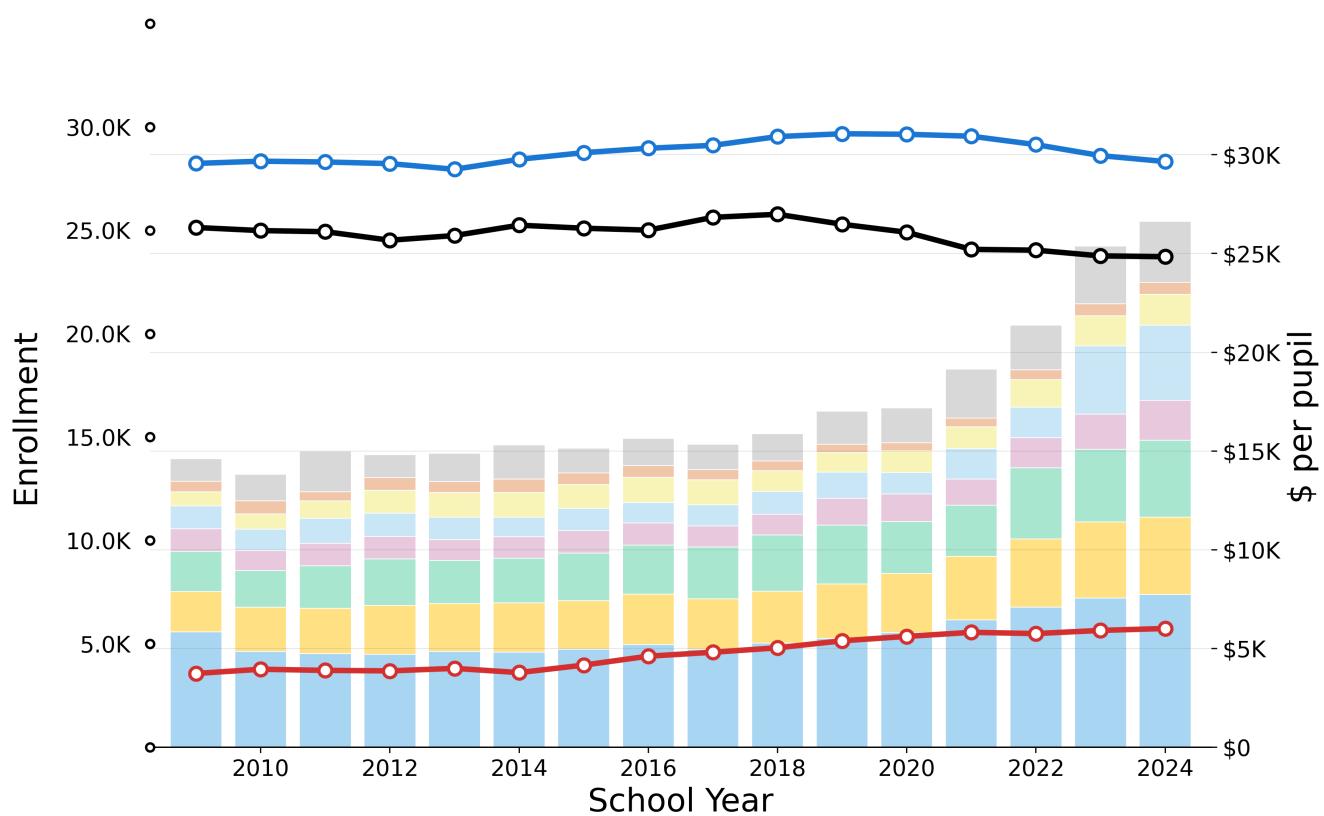


Figure 17

Table 21

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$1,143 | +6.8% | +5.9% | +12.9% | \$3,071 |
| Administration | \$533 | +0.9% | -1.1% | +7.9% | \$609 |
| Instructional Leadership | \$719 | +5.3% | +2.4% | +9.8% | \$1,571 |
| Operations and Maintenance | \$1,150 | +8.3% | +14.3% | +23.3% | \$3,806 |
| Other Teaching Services | \$1,143 | +3.8% | +6.4% | +8.2% | \$2,014 |
| Pupil Services | \$2,031 | +4.4% | +5.6% | +5.6% | \$3,901 |
| Insurance, Retirement and Other | \$2,050 | +4.4% | +4.6% | +7.2% | \$3,906 |
| Teachers | \$5,839 | +1.9% | +4.8% | +7.0% | \$7,737 |
| Total | \$14,608 | +4.1% | +5.7% | +9.4% | \$26,615 |

Table 22

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|---|--------|----------|----------|---------|---------------------------|
| In-District FTE Pupils | 25,137 | -0.4% | -0.6% | -1.3% | 23,723 |
| Foundation Enrollment | 28,235 | +0.0% | -0.0% | -0.9% | 28,326 |
| Out-of-District FTE Pupils | 3,571 | +3.2% | +4.7% | +2.2% | 5,745 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above Western MA baseline |
| CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below Western MA baseline |

Section 2 — Western MA cohort details

Outliers (Springfield >10K FTE) — Chapter 70 Aid and Net School Spending (NSS).

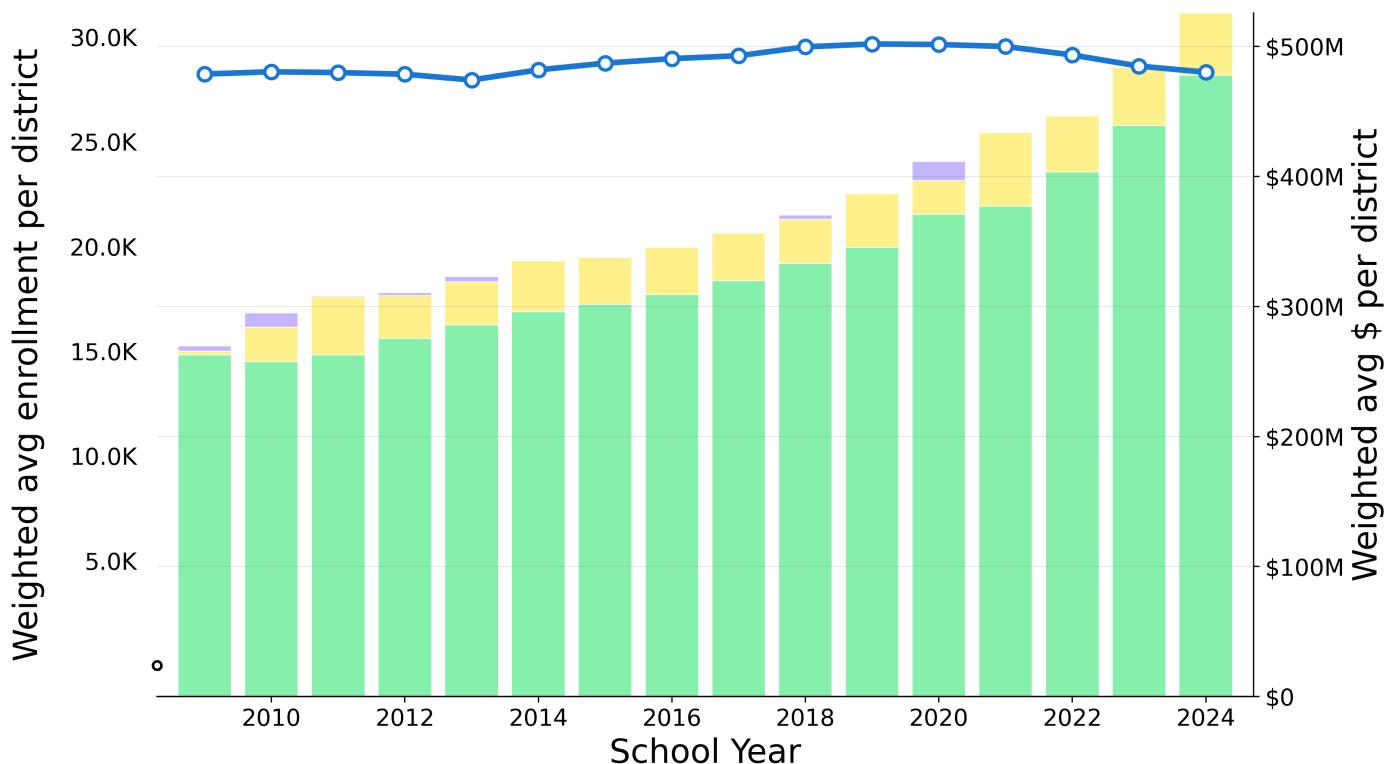


Figure 18

Table 23

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|---------------|-------------|-------------|------------|---------------|
| Actual NSS (minus Req NSS) | \$-4,240,600 | -59.67% | -49.84% | 22.43% | \$-5 |
| Req NSS (minus Ch70) | \$6,986,338 | 13.71% | 2.05% | 3.02% | \$48,026,087 |
| Ch70 Aid | \$262,734,913 | 4.07% | 4.91% | 6.70% | \$477,737,768 |
| Total (Actual NSS) | \$265,480,651 | 4.66% | 4.61% | 6.33% | \$525,763,850 |

Table 24

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|--|--------|----------|----------|---------|---------------------------|
| Foundation Enrollment | 28,235 | +0.0% | -0.0% | -0.9% | 28,326 |
| Shading vs baseline: $ \Delta\$/\text{pupil} \geq 5.0\%$, $ \Delta\text{Enrollment} \geq 5.0\%$, $ \Delta\text{CAGR} \geq 1.0\text{pp}$ | | | | | Above Western MA baseline |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below Western MA baseline |

Outliers (Springfield >10K FTE) includes 1 members:

Districts (1): Springfield.

Section 3 — Specific districts

Amherst-Pelham Regional — PPE vs Enrollment

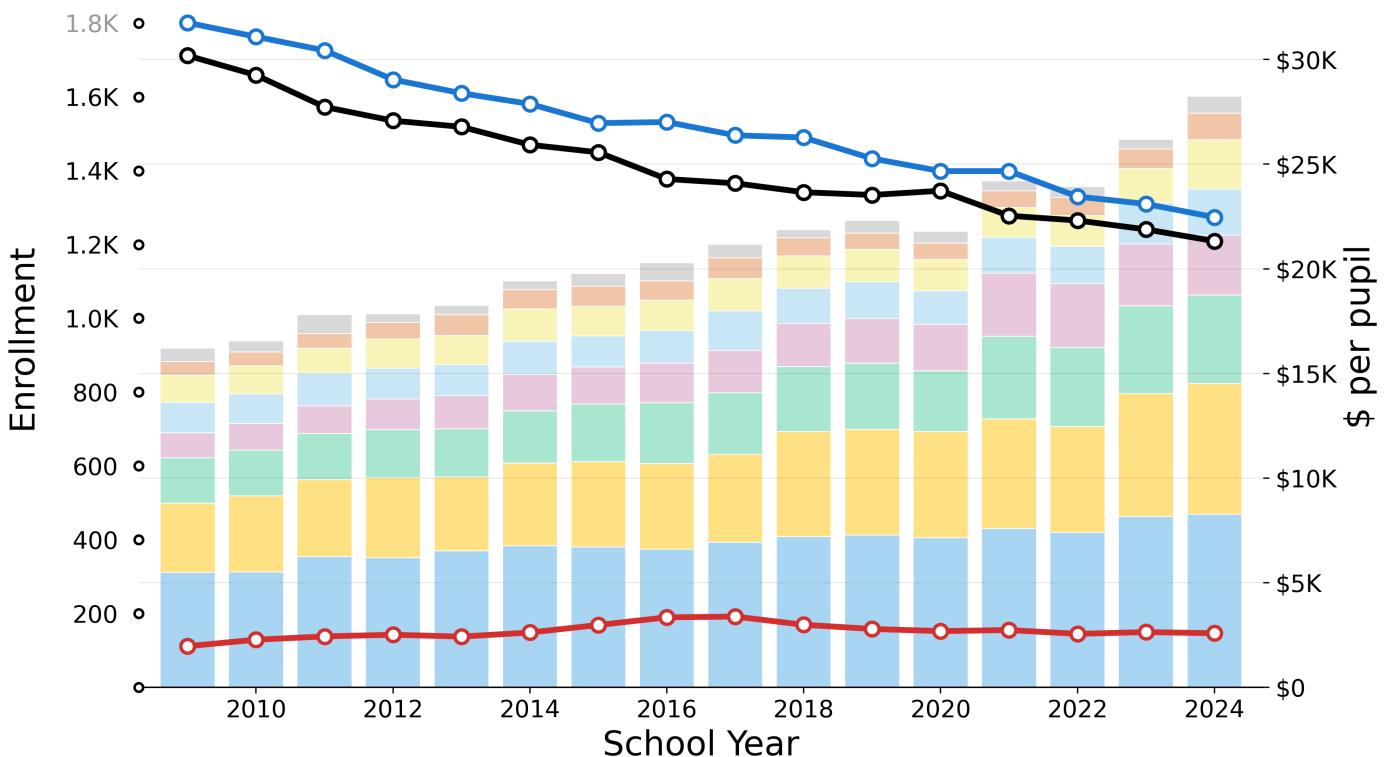


Figure 19

Table 25

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$646 | +1.4% | +6.5% | +5.5% | \$799 |
| Administration | \$652 | +4.6% | +3.5% | +11.0% | \$1,277 |
| Instructional Leadership | \$1,289 | +4.0% | +4.2% | +8.6% | \$2,336 |
| Operations and Maintenance | \$1,459 | +2.8% | +3.4% | +4.6% | \$2,221 |
| Other Teaching Services | \$1,199 | +5.9% | +5.1% | +6.1% | \$2,851 |
| Pupil Services | \$2,170 | +4.6% | +5.4% | +6.0% | \$4,231 |
| Insurance, Retirement and Other | \$3,305 | +4.3% | +4.7% | +4.4% | \$6,248 |
| Teachers | \$5,491 | +2.8% | +2.0% | +2.6% | \$8,270 |
| Total | \$16,211 | +3.8% | +3.8% | +4.8% | \$28,233 |

Table 26

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|-------|----------|----------|---------|-------|
| In-District FTE Pupils | 1,712 | -2.3% | -1.9% | -1.9% | 1,209 |
| Foundation Enrollment | 1,801 | -2.3% | -2.1% | -2.3% | 1,274 |
| Out-of-District FTE Pupils | 112 | +1.8% | -0.1% | -1.5% | 147 |

Shading vs baseline: $|\Delta \$/\text{pupil}| \geq 5.0\%$, $|\Delta \text{Enrollment}| \geq 5.0\%$, $|\Delta \text{CAGR}| \geq 1.0\text{pp}$ Above cohort baseline (Medium (801-1600))

CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$

Below cohort baseline (Medium (801-1600))

Section 3 — Specific districts

Amherst-Pelham Regional — Chapter 70 Aid, Net School Spending (NSS), and Foundation Enrollment

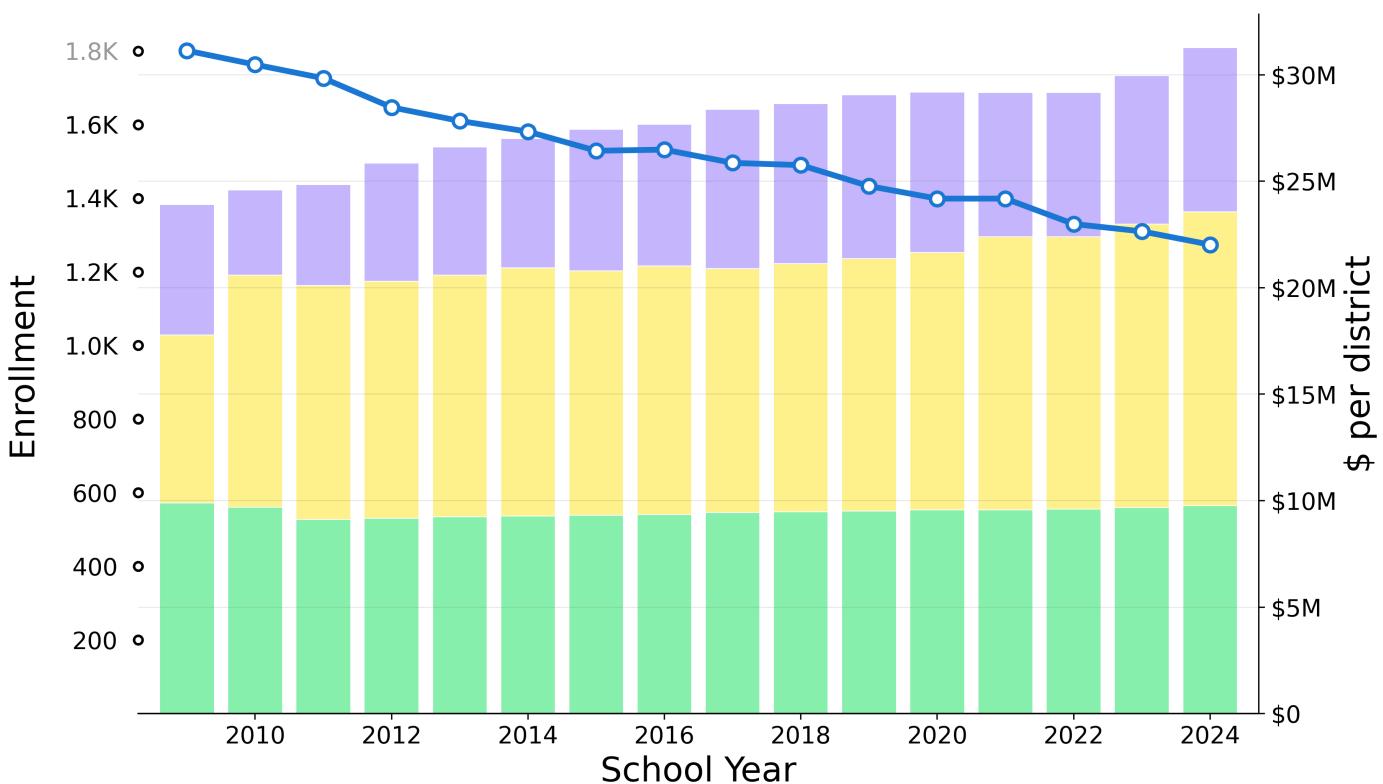


Figure 20

Table 27

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|--------------|-------------|-------------|------------|--------------|
| Actual NSS (minus Req NSS) | \$6,135,991 | 1.54% | 2.44% | 0.08% | \$7,719,079 |
| Req NSS (minus Ch70) | \$7,893,198 | 3.80% | 1.70% | 3.09% | \$13,803,543 |
| Ch70 Aid | \$9,883,632 | -0.09% | 0.51% | 0.49% | \$9,756,397 |
| Total (Actual NSS) | \$23,912,821 | 1.81% | 1.48% | 1.48% | \$31,279,019 |

Table 28

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|--|-------|----------|----------|---------|---|
| Foundation Enrollment | 1,801 | -2.3% | -2.1% | -2.3% | 1,274 |
| Shading vs baseline: $ \Delta\$/\text{pupil} \geq 5.0\%$, $ \Delta\text{Enrollment} \geq 5.0\%$, $ \Delta\text{CAGR} \geq 1.0\text{pp}$ | | | | | Above cohort baseline (Medium (801-1600)) |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below cohort baseline (Medium (801-1600)) |

Section 3 — Specific districts

Amherst — PPE vs Enrollment

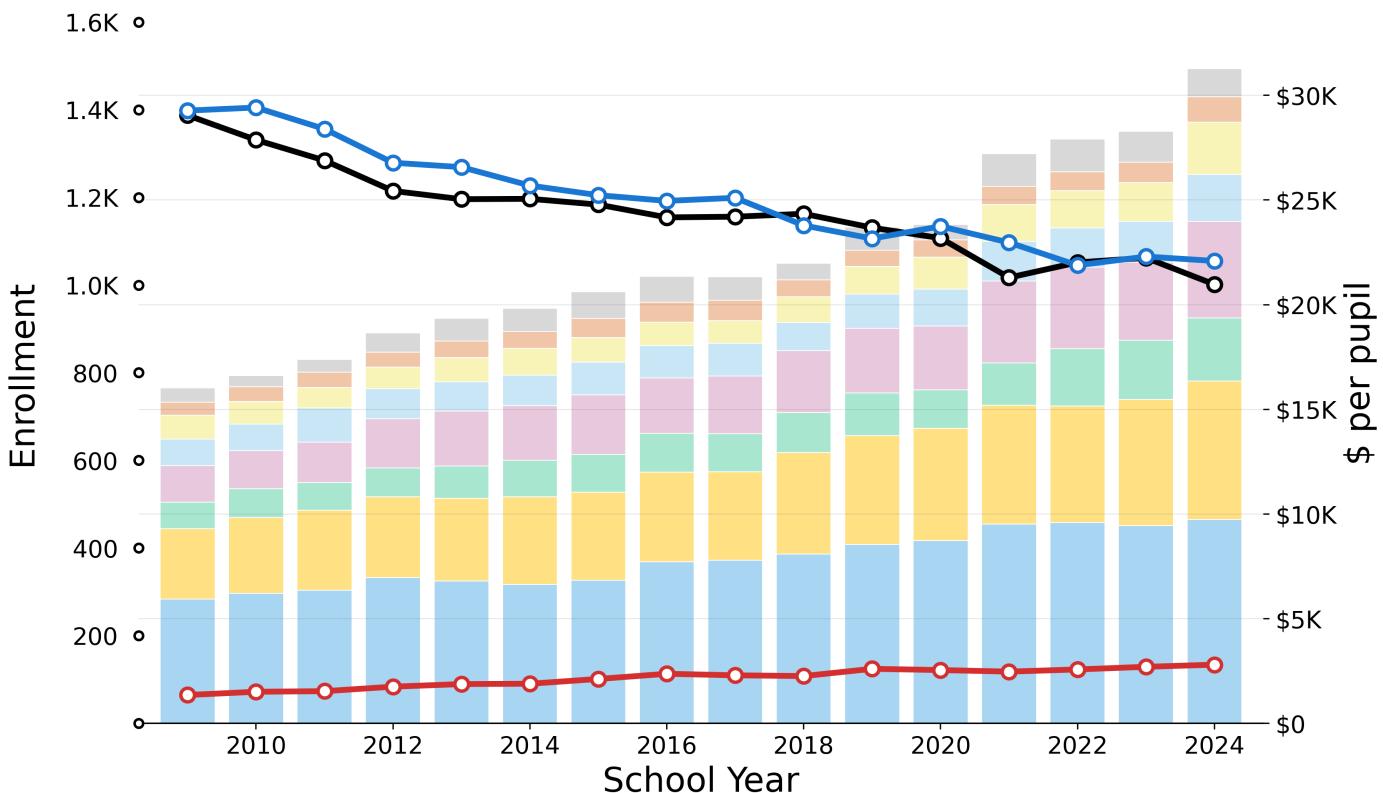


Figure 21

Table 29

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$684 | +4.5% | +1.9% | +4.0% | \$1,328 |
| Administration | \$627 | +4.5% | +4.1% | +9.6% | \$1,213 |
| Instructional Leadership | \$1,134 | +5.4% | +7.0% | +13.5% | \$2,498 |
| Operations and Maintenance | \$1,264 | +3.9% | +4.5% | +6.4% | \$2,248 |
| Other Teaching Services | \$1,762 | +6.6% | +5.9% | +8.4% | \$4,612 |
| Pupil Services | \$1,261 | +6.0% | +5.5% | +8.3% | \$3,018 |
| Insurance, Retirement and Other | \$3,353 | +4.6% | +4.7% | +4.9% | \$6,605 |
| Teachers | \$5,944 | +3.4% | +3.9% | +2.7% | \$9,745 |
| Total | \$16,029 | +4.6% | +4.7% | +5.7% | \$31,267 |

Table 30

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|-------|----------|----------|---------|-------|
| In-District FTE Pupils | 1,387 | -2.1% | -1.8% | -2.4% | 1,002 |
| Foundation Enrollment | 1,398 | -1.9% | -1.5% | -0.9% | 1,055 |
| Out-of-District FTE Pupils | 65 | +5.0% | +4.0% | +1.5% | 134 |

Shading vs baseline: $|\Delta \$/\text{pupil}| \geq 5.0\%$, $|\Delta \text{Enrollment}| \geq 5.0\%$, $|\Delta \text{CAGR}| \geq 1.0\text{pp}$

CAGR = $(\text{End}/\text{Start})^{(1/\text{years})} - 1$

Above cohort baseline (Medium (801-1600))

Below cohort baseline (Medium (801-1600))

Section 3 — Specific districts

Amherst — Chapter 70 Aid, Net School Spending (NSS), and Foundation Enrollment

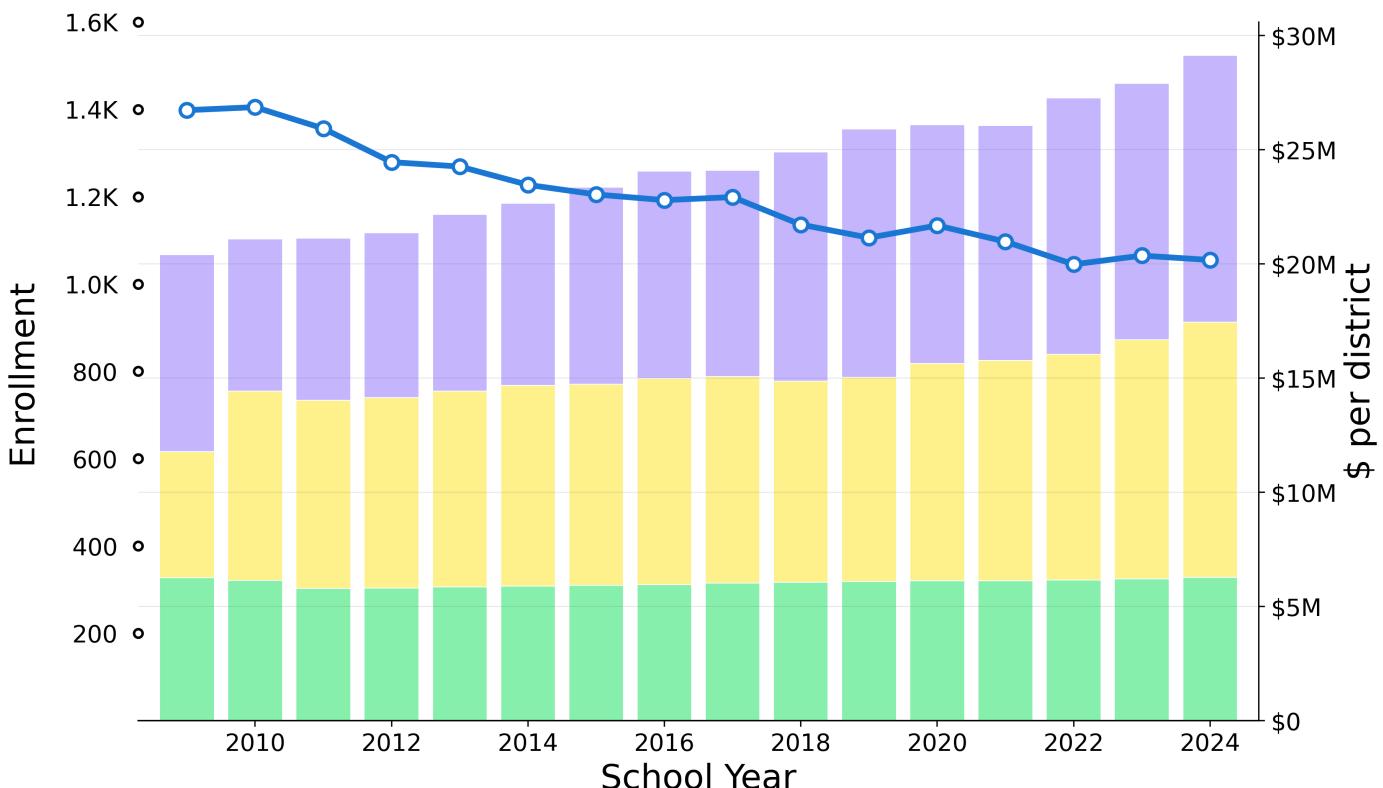


Figure 22

Table 31

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|--------------|-------------|-------------|------------|--------------|
| Actual NSS (minus Req NSS) | \$8,624,390 | 2.05% | 3.90% | 1.45% | \$11,687,238 |
| Req NSS (minus Ch70) | \$5,517,195 | 4.81% | 2.43% | 4.54% | \$11,168,148 |
| Ch70 Aid | \$6,266,707 | 0.01% | 0.64% | 0.62% | \$6,280,773 |
| Total (Actual NSS) | \$20,408,292 | 2.40% | 2.55% | 2.37% | \$29,136,159 |

Table 32

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|--|-------|----------|----------|---------|---|
| Foundation Enrollment | 1,398 | -1.9% | -1.5% | -0.9% | 1,055 |
| Shading vs baseline: $ \Delta\$/\text{pupil} \geq 5.0\%$, $ \Delta\text{Enrollment} \geq 5.0\%$, $ \Delta\text{CAGR} \geq 1.0\text{pp}$ | | | | | Above cohort baseline (Medium (801-1600)) |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below cohort baseline (Medium (801-1600)) |

Section 3 — Specific districts

Leverett — PPE vs Enrollment

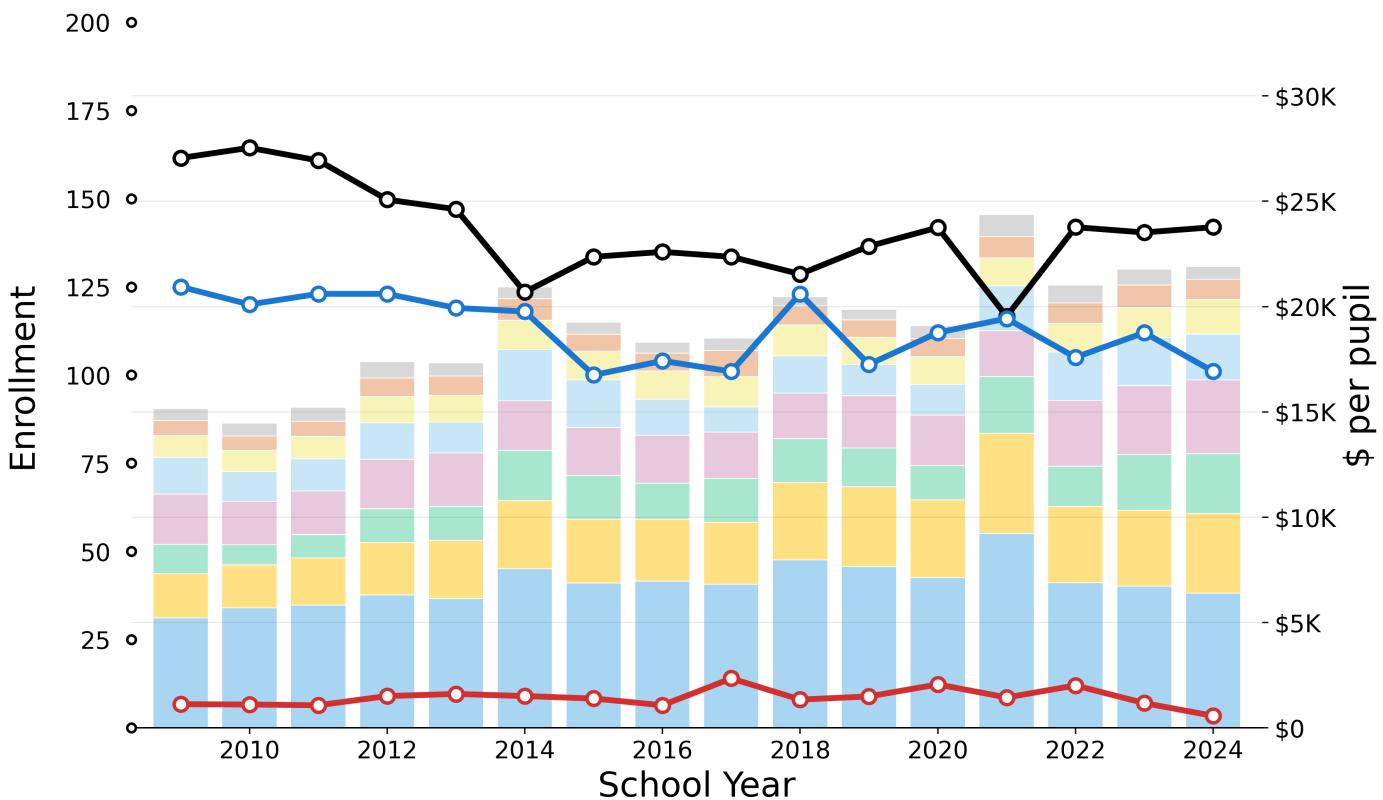


Figure 23

Table 33

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$575 | +0.4% | +0.9% | +3.9% | \$608 |
| Administration | \$715 | +1.9% | -0.8% | +2.9% | \$953 |
| Instructional Leadership | \$1,015 | +3.3% | +1.8% | +5.4% | \$1,663 |
| Operations and Maintenance | \$1,755 | +1.4% | -1.1% | +7.7% | \$2,158 |
| Other Teaching Services | \$2,385 | +2.6% | +4.1% | +7.3% | \$3,526 |
| Pupil Services | \$1,395 | +4.8% | +1.6% | +8.8% | \$2,814 |
| Insurance, Retirement and Other | \$2,098 | +4.0% | +1.6% | +0.1% | \$3,793 |
| Teachers | \$5,218 | +1.4% | -1.6% | -3.6% | \$6,395 |
| Total | \$15,156 | +2.5% | +0.5% | +2.0% | \$21,910 |

Table 34

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|---|------|----------|----------|---------|--------------------------------------|
| In-District FTE Pupils | 162 | -0.9% | +1.4% | +0.8% | 142 |
| Foundation Enrollment | 125 | -1.4% | -1.5% | -0.4% | 101 |
| Out-of-District FTE Pupils | 7 | -4.4% | -9.3% | -17.5% | 3 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above cohort baseline (Tiny (0-200)) |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below cohort baseline (Tiny (0-200)) |

Section 3 — Specific districts

Leverett — Chapter 70 Aid, Net School Spending (NSS), and Foundation Enrollment

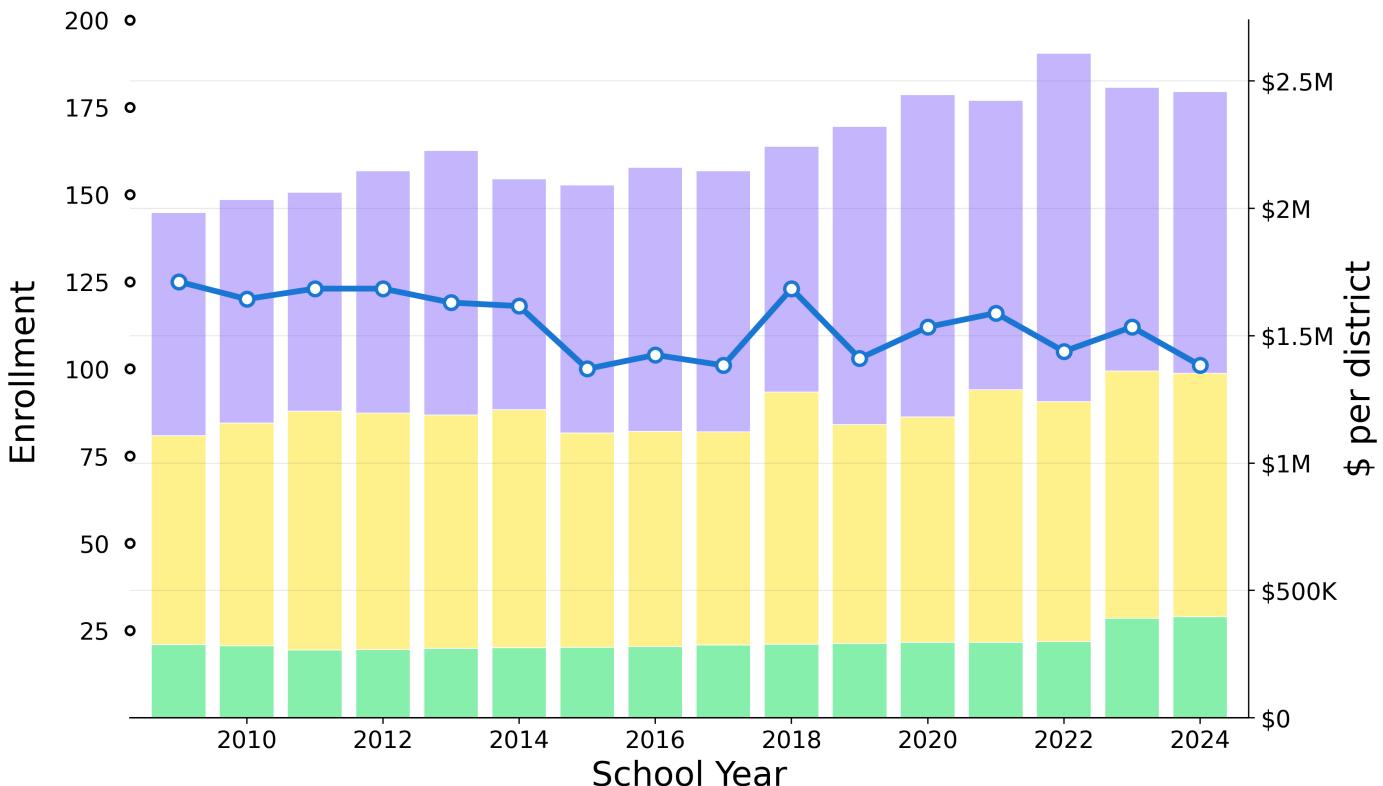


Figure 24

Table 35

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|-------------|-------------|-------------|------------|-------------|
| Actual NSS (minus Req NSS) | \$876,790 | 1.56% | 2.03% | -1.13% | \$1,106,701 |
| Req NSS (minus Ch70) | \$819,372 | 1.02% | 0.21% | 2.15% | \$954,740 |
| Ch70 Aid | \$287,813 | 2.17% | 3.75% | 6.32% | \$396,968 |
| Total (Actual NSS) | \$1,983,975 | 1.44% | 1.52% | 1.15% | \$2,458,409 |

Table 36

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|---|------|----------|----------|---------|--------------------------------------|
| Foundation Enrollment | 125 | -1.4% | -1.5% | -0.4% | 101 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above cohort baseline (Tiny (0-200)) |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below cohort baseline (Tiny (0-200)) |

Section 3 — Specific districts

Pelham — PPE vs Enrollment

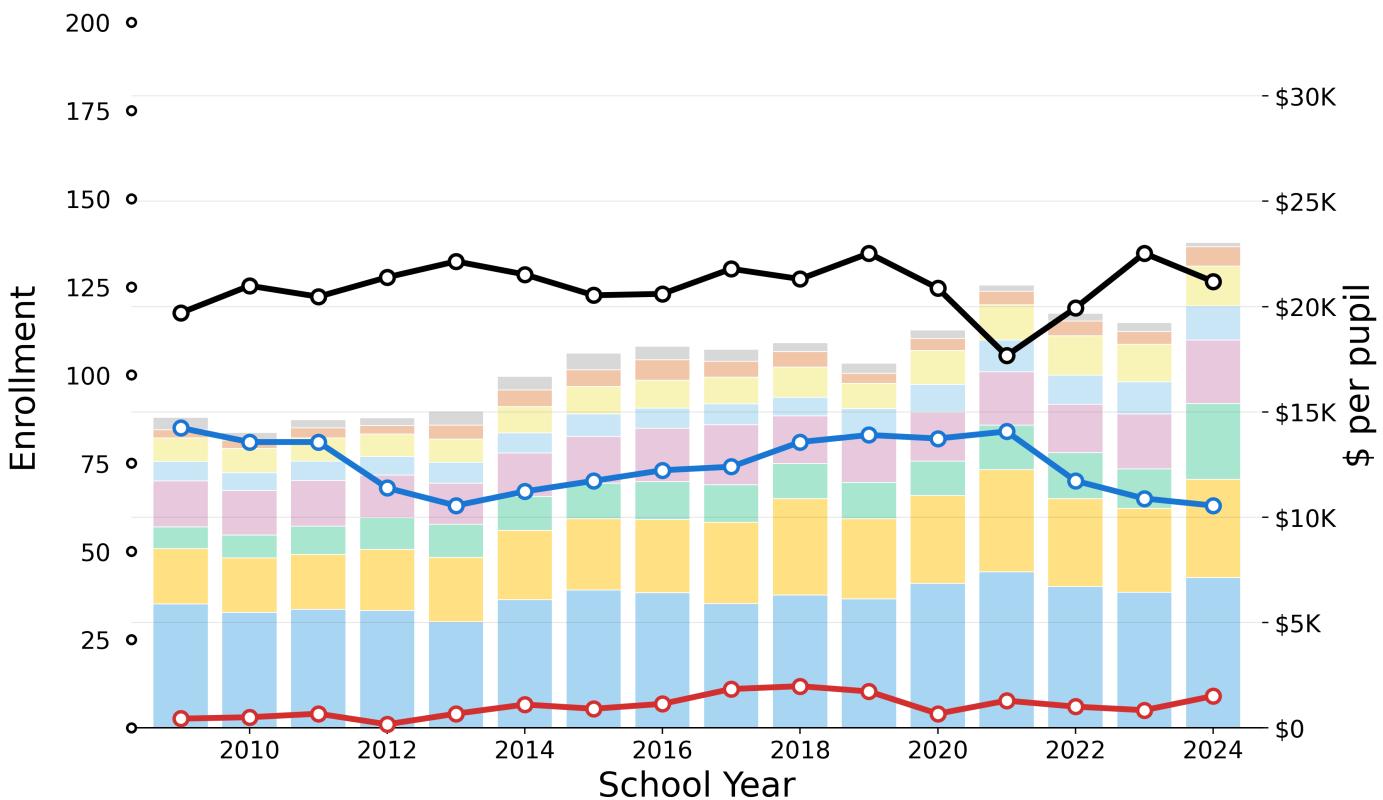


Figure 25

Table 37

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$580 | -6.6% | -10.7% | -15.0% | \$207 |
| Administration | \$390 | +5.9% | +1.4% | +13.4% | \$917 |
| Instructional Leadership | \$1,123 | +3.5% | +4.2% | +9.6% | \$1,885 |
| Operations and Maintenance | \$920 | +3.8% | +5.5% | +5.6% | \$1,614 |
| Other Teaching Services | \$2,184 | +2.2% | +3.9% | +5.8% | \$3,010 |
| Pupil Services | \$1,032 | +8.7% | +8.4% | +15.8% | \$3,610 |
| Insurance, Retirement and Other | \$2,615 | +3.9% | +3.6% | +4.3% | \$4,670 |
| Teachers | \$5,889 | +1.3% | +1.6% | +3.1% | \$7,127 |
| Total | \$14,733 | +3.0% | +3.3% | +5.9% | \$23,040 |

Table 38

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|------|----------|----------|---------|------|
| In-District FTE Pupils | 118 | +0.5% | -0.2% | -1.2% | 126 |
| Foundation Enrollment | 85 | -2.0% | -0.6% | -5.4% | 63 |
| Out-of-District FTE Pupils | 3 | +8.6% | +3.2% | -2.7% | 9 |

Shading vs baseline: $|\Delta\$/\text{pupil}| \geq 5.0\%$, $|\Delta\text{Enrollment}| \geq 5.0\%$, $|\Delta\text{CAGR}| \geq 1.0\text{pp}$

Above cohort baseline (Tiny (0-200))

$\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$

Below cohort baseline (Tiny (0-200))

Section 3 — Specific districts

Pelham — Chapter 70 Aid, Net School Spending (NSS), and Foundation Enrollment

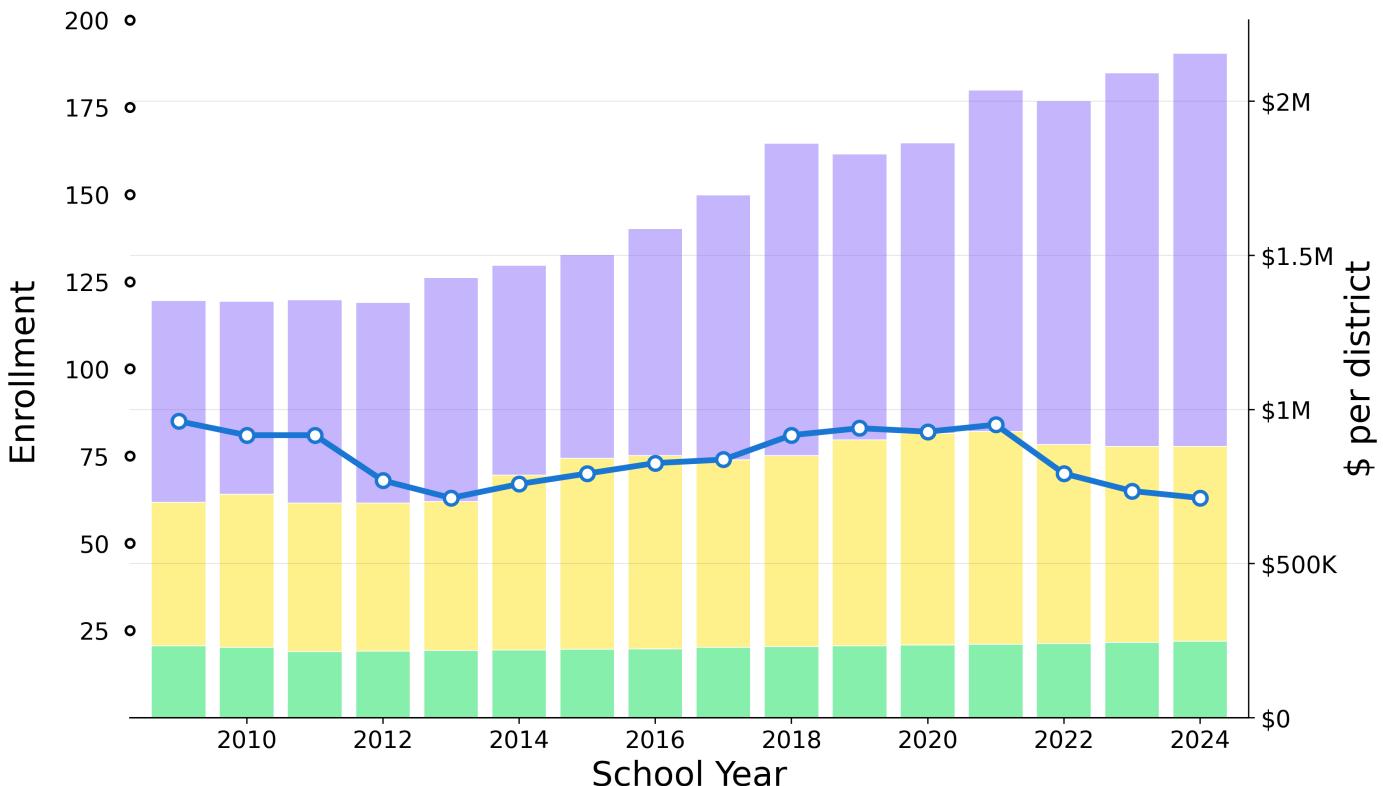


Figure 26

Table 39

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|-------------|-------------|-------------|------------|-------------|
| Actual NSS (minus Req NSS) | \$654,027 | 4.56% | 6.48% | 6.59% | \$1,275,888 |
| Req NSS (minus Ch70) | \$466,026 | 2.05% | 1.10% | -1.12% | \$631,932 |
| Ch70 Aid | \$233,169 | 0.42% | 1.19% | 1.27% | \$248,263 |
| Total (Actual NSS) | \$1,353,222 | 3.15% | 3.92% | 3.35% | \$2,156,083 |

Table 40

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|---|------|----------|----------|---------|--------------------------------------|
| Foundation Enrollment | 85 | -2.0% | -0.6% | -5.4% | 63 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above cohort baseline (Tiny (0-200)) |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below cohort baseline (Tiny (0-200)) |

Section 3 — Specific districts

Shutesbury — PPE vs Enrollment

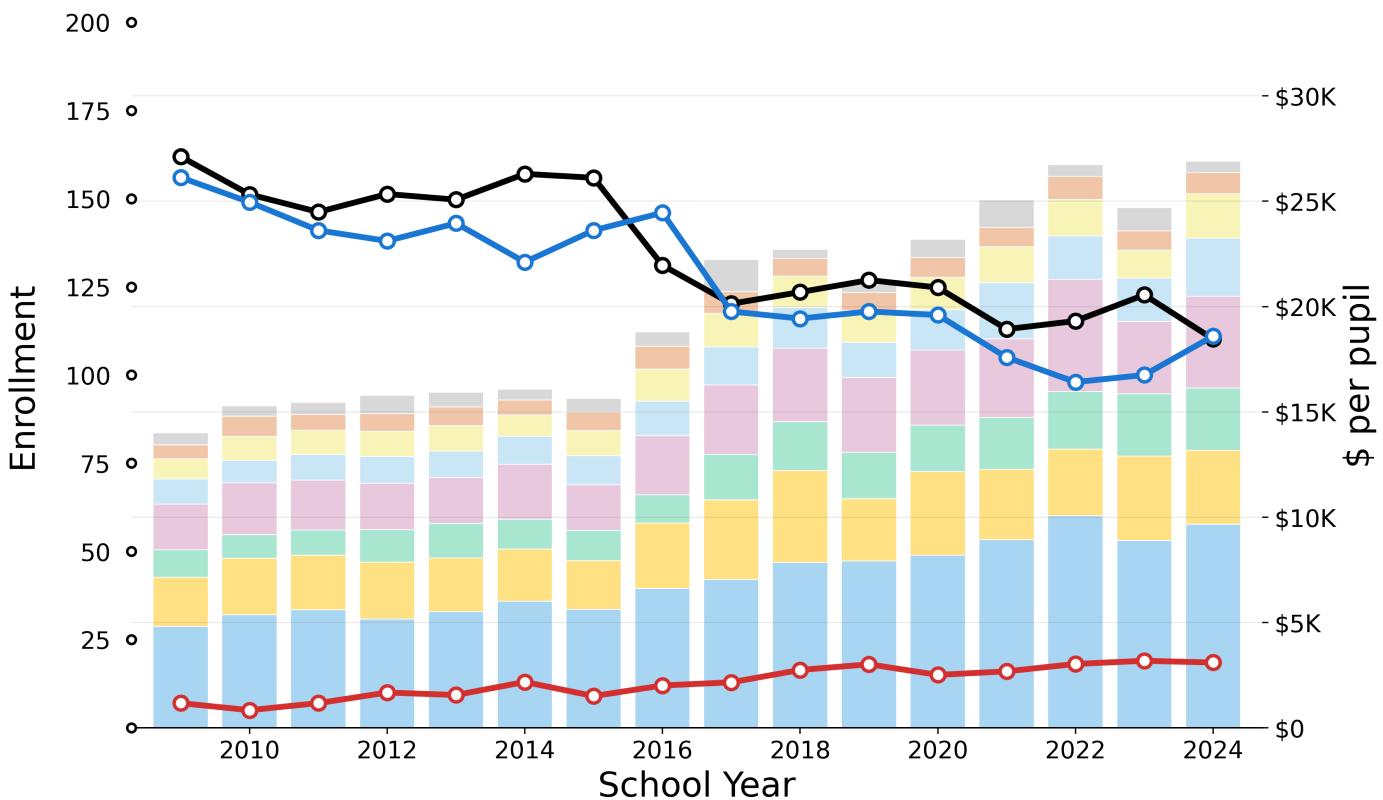


Figure 27

Table 41

| Category | 2009 \$/pupil | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$/pupil |
|---------------------------------|---------------|----------|----------|---------|---------------|
| Other | \$580 | -0.4% | +0.6% | +7.2% | \$545 |
| Administration | \$652 | +3.0% | +3.4% | +3.5% | \$1,015 |
| Instructional Leadership | \$969 | +5.3% | +7.7% | +6.8% | \$2,103 |
| Operations and Maintenance | \$1,180 | +5.8% | +7.5% | +10.6% | \$2,754 |
| Other Teaching Services | \$2,185 | +4.7% | +5.3% | +4.2% | \$4,359 |
| Pupil Services | \$1,292 | +5.7% | +7.6% | +6.1% | \$2,962 |
| Insurance, Retirement and Other | \$2,332 | +2.7% | +3.5% | +3.3% | \$3,501 |
| Teachers | \$4,821 | +4.7% | +4.9% | +4.1% | \$9,669 |
| Total | \$14,011 | +4.4% | +5.3% | +5.0% | \$26,908 |

Table 42

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|----------------------------|------|----------|----------|---------|------|
| In-District FTE Pupils | 162 | -2.5% | -3.5% | -2.8% | 110 |
| Foundation Enrollment | 156 | -2.2% | -1.7% | -1.2% | 111 |
| Out-of-District FTE Pupils | 7 | +6.7% | +3.6% | +0.5% | 18 |

Shading vs baseline: $|\Delta\$/\text{pupil}| \geq 5.0\%$, $|\Delta\text{Enrollment}| \geq 5.0\%$, $|\Delta\text{CAGR}| \geq 1.0\text{pp}$

Above cohort baseline (Tiny (0-200))

$\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$

Below cohort baseline (Tiny (0-200))

Section 3 — Specific districts

Shutesbury — Chapter 70 Aid, Net School Spending (NSS), and Foundation Enrollment

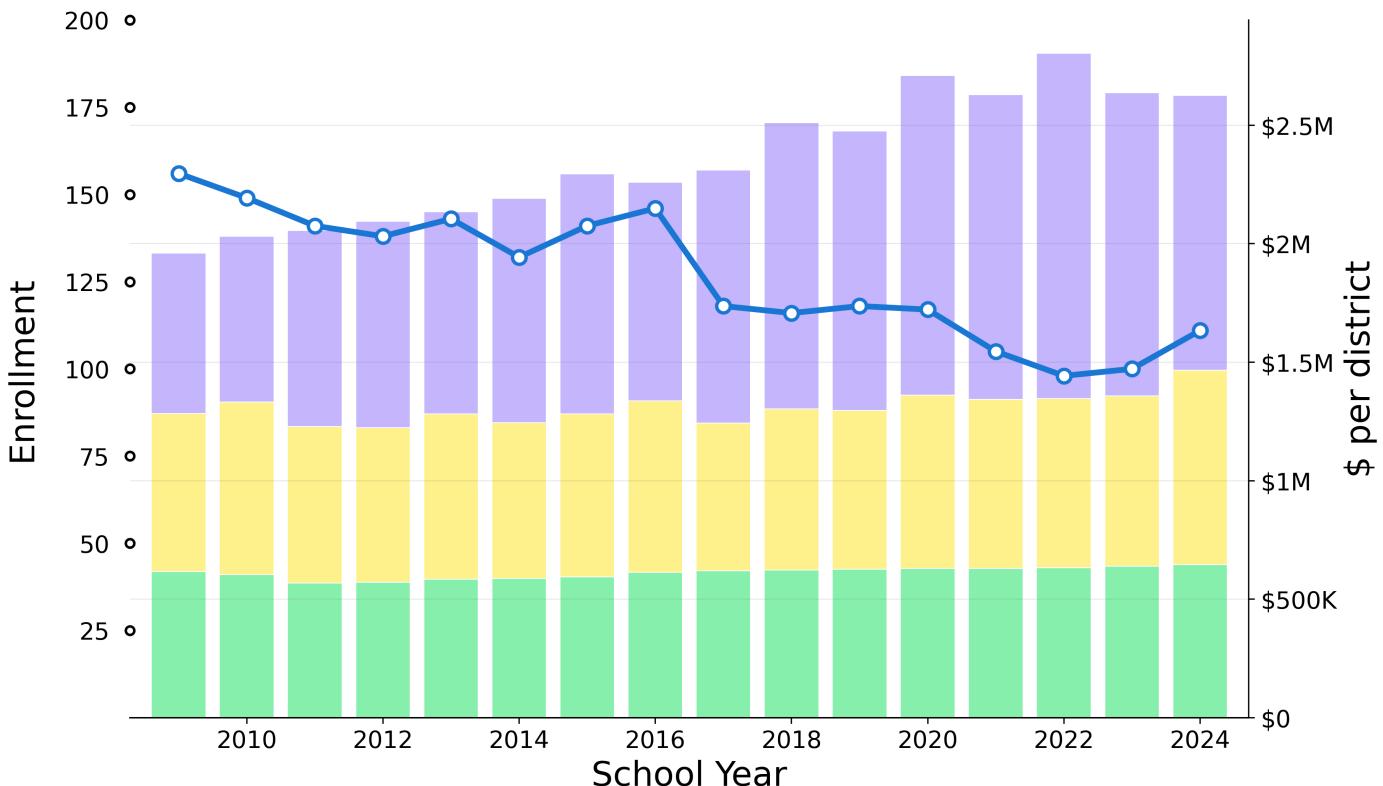


Figure 28

Table 43

| Component | 2009 \$ | CAGR 15y | CAGR 10y | CAGR 5y | 2024 \$ |
|----------------------------|--------------------|--------------|--------------|--------------|--------------------|
| Actual NSS (minus Req NSS) | \$675,633 | 3.67% | 2.06% | -0.35% | \$1,159,959 |
| Req NSS (minus Ch70) | \$667,645 | 1.38% | 2.24% | 4.16% | \$820,401 |
| Ch70 Aid | \$616,453 | 0.31% | 0.94% | 0.60% | \$645,986 |
| Total (Actual NSS) | \$1,959,731 | 1.97% | 1.83% | 1.18% | \$2,626,346 |

Table 44

| Enrollment | 2009 | CAGR 15y | CAGR 10y | CAGR 5y | 2024 |
|---|------|----------|----------|---------|--------------------------------------|
| Foundation Enrollment | 156 | -2.2% | -1.7% | -1.2% | 111 |
| Shading vs baseline: $ \Delta \$/\text{pupil} \geq 5.0\%$, $ \Delta \text{Enrollment} \geq 5.0\%$, $ \Delta \text{CAGR} \geq 1.0\text{pp}$ | | | | | Above cohort baseline (Tiny (0-200)) |
| $\text{CAGR} = (\text{End}/\text{Start})^{(1/\text{years})} - 1$ | | | | | Below cohort baseline (Tiny (0-200)) |

Appendix A. Data Sources & Calculation Methodology

1. Data Sources

District Expenditures by Spending Category: Source: Massachusetts Department of Elementary and Secondary Education (DESE) Last updated: August 12, 2025 URL: <https://educationtocareer.data.mass.gov/Finance-and-Budget/District-Expenditures-by-Spending-Category/er3w-dtyi/>

This dataset provides detailed expenditure data by category for all Massachusetts school districts, including:

- Expenditures per pupil (EPP) by spending category
- Student enrollment (In-District FTE, Out-of-District FTE, Total FTE)
- Annual data from FY1993 to present

Chapter 70 District Profiles: Source: Massachusetts Department of Elementary and Secondary Education (DESE) URL: Various sources compiled in profile_DataC70 spreadsheet tab

From the Ch70 website: "Chapter 70 District Profiles: The on-line Chapter 70 database shows, for each school district, yearly spending and state aid totals in comparison to the foundation budget. Trend data is available for each year going back to FY1993."

This dataset provides:

- Chapter 70 Aid (c70aid): State aid received by each district
- Required Net School Spending (rqnss2): Minimum spending required by state law
- Actual Net School Spending (actualNSS): Total district spending on education
- Foundation Enrollment (distfoundenro): District foundation enrollment used for Ch70 funding calculations

Regional Classifications: Source: DESE district profiles and regional service mappings • Districts classified as Western MA based on EOHHHS regional designations • School type classifications (Traditional, Regional, Charter, etc.)

Appendix A. Data Sources & Calculation Methodology (continued)

2. Per-Pupil Expenditure (PPE) Definition

Per-pupil expenditure (PPE) is reported in the End of Year Report (EOYR) for municipal and regional districts, and is calculated by in-district FTE.

Per the DESE's Researcher's Guide, section XV. Using financial data: "*The out-of-district total cannot be properly reported as a per-pupil expenditure because the cost of tuitions varies greatly depending on the reason for going out of district.*"

3. Compound Annual Growth Rate (CAGR)

CAGR measures the mean annual growth rate over a specified time period, assuming constant growth.

Formula: $\text{CAGR} = (\text{End_Value} / \text{Start_Value})^{(1 / \text{Years})} - 1$

Example: If expenditures grow from \$10,000 to \$12,000 over 5 years: $\text{CAGR} = (\$12,000 / \$10,000)^{(1/5)} - 1 = 1.2^{0.2} - 1 = 0.0371 = 3.71\%$ per year

Note: CAGR requires positive values at both endpoints and is undefined if data is missing.

3a. Year-over-Year (YoY) Growth Rate

YoY growth rate measures the percentage change from one year to the next, providing insight into annual fluctuations.

Formula: $\text{YoY Growth} = (\text{Value}_{\text{year}} / \text{Value}_{\text{previous_year}} - 1) \times 100$

Example: If expenditures increase from \$10,000 (Year 1) to \$10,500 (Year 2): $\text{YoY Growth} = (\$10,500 / \$10,000 - 1) \times 100 = 5.0\%$

If expenditures then increase to \$11,000 (Year 3): $\text{YoY Growth} = (\$11,000 / \$10,500 - 1) \times 100 = 4.76\%$

Key differences from CAGR: • YoY shows year-to-year changes; CAGR smooths growth over multiple years • YoY captures annual volatility; CAGR assumes constant growth • YoY is useful for identifying specific years with unusual growth patterns

4. Enrollment-Based Cohorts

Districts are grouped by total in-district FTE enrollment into five cohorts (based on IQR analysis) for meaningful peer comparison:

Tiny (0-200 FTE): 17 districts (Cohort 1: below Q1) **Member districts:** conway, erving, farmington river reg, florida, hancock, hawlemont, leverett, new salem-wendell, pelham, petersham, richmond, rowe, savoy, shutesbury, sunderland, and 2 others

Small (201-800 FTE): 13 districts (Cohort 2: Q1 to median) **Member districts:** clarksburg, deerfield, frontier, gateway, granby, hadley, hatfield, lee, lenox, orange, pioneer valley, ralph c mahar, southern berkshire

Medium (801-1600 FTE): 15 districts (Cohort 3: median to Q3) **Member districts:** amherst, amherst-pelham, berkshire hills, central berkshire, easthampton, gill-montague, greenfield, hoosac valley regional, mohawk trail, monson, mount greylock, north adams, palmer, southwick-tolland-granville regional school district, ware

Large (1601-10K FTE): 14 districts (Cohort 4: above Q3) **Member districts:** agawam, athol-royalston, belchertown, chicopee, east longmeadow, hampden-wilbraham, holyoke, longmeadow, ludlow, northampton, pittsfield, south hadley, west springfield, westfield

Outliers (Springfield >10K FTE): 1 district (Cohort 5: statistical outlier, analyzed separately) **Member districts:** springfield

Weighted EPP Formula (for aggregate calculations): For each category and year: $\text{Weighted_EPP} = \sum(\text{District_EPP} \times \text{District_In-District_FTE}) / \sum(\text{District_In-District_FTE})$

Example: District A spends \$5,000/pupil (500 students), District B spends \$6,000/pupil (300 students) Weighted average = $(\$5,000 \times 500 + \$6,000 \times 300) / (500 + 300) = \$5,375/\text{pupil}$

Enrollment Calculation: For each series (In-District FTE, Out-of-District FTE) and year: Sum across all member districts in the enrollment group.

Appendix A. Data Sources & Calculation Methodology (continued)

5. Orange/Blue Shading Logic (District Comparison Tables)

District pages include tables comparing each district's per-pupil expenditures (PPE) and growth rates (CAGR) to their enrollment-based peer group aggregate (Tiny, Small, Medium, Large, or Springfield).

Two independent tests determine shading:

Test 1 - Dollar Amount (2024 \$/pupil column): Compares the district's 2024 PPE to the baseline's 2024 PPE using relative difference: $(\text{District} - \text{Baseline}) / \text{Baseline}$ • **Orange shading:** District spending is $\geq 5.0\%$ higher than baseline • **Blue shading:** District spending is $\geq 5.0\%$ lower than baseline • **No shading:** Difference is less than 5.0%

Test 2 - CAGR (5y, 10y, 15y columns): Compares the district's CAGR to the baseline's CAGR using absolute percentage point difference: $\text{District_CAGR} - \text{Baseline_CAGR}$ • **Orange shading:** District CAGR is ≥ 1.0 percentage points higher than baseline • **Blue shading:** District CAGR is ≥ 1.0 percentage points lower than baseline • **No shading:** Difference is less than 1.0 percentage points

Shading Intensity: Both metrics use graduated shading where darker colors indicate larger differences: • PPE/Enrollment bins: 5% (lightest), 10%, 15%, 20%+ (darkest) • CAGR bins: 1pp (lightest), 2pp, 3pp, 4pp+ (darkest)

Key insight: The tests are independent. An orange 2024 \$/pupil with unshaded CAGRs typically means: • The district started at a higher baseline 15 years ago, AND • The district has been growing at roughly the same rate as peers • Therefore it remains higher in absolute dollars but isn't growing faster

Statistical Rationale: The 5%/1pp thresholds were selected through analysis of variation across all Western MA districts. See the Threshold Analysis page for detailed methodology and alternative scenarios considered.

Appendix A. Data Sources & Calculation Methodology (continued)

6. Chapter 70 Aid and Net School Spending (NSS) Calculations

Chapter 70 is Massachusetts' primary state aid program for K-12 education. Net School Spending (NSS) is the total amount a district spends on education from local and state sources.

Data Sources: • **Chapter 70 Aid (c70aid):** State aid received by the district (DESE profile_DataC70 sheet) • **Required NSS (rqnss2):** Minimum spending required by state law, adjusted (DESE profile_DataC70 sheet) • **Actual NSS (actualNSS):** Total district spending on education (DESE profile_DataC70 sheet)

Important Note: NSS/Ch70 values are reported in **absolute dollars**, NOT per-pupil. Unlike PPE (which divides by in-district FTE), NSS/Ch70 values represent total district funding amounts.

- Stacked Components (bottom to top in plots):**
1. **Ch70 Aid (\$):** c70aid • Green bar in plots • State funding received by district
 2. **Req NSS (adj) (\$):** $\max(0, \text{rqnss2} - \text{c70aid})$ • Amber bar in plots • Required local contribution (after subtracting Ch70) • Uses $\max(0, \dots)$ to handle rare cases where Ch70 > Required NSS
 3. **Actual NSS (adj) (\$):** actualNSS – rqnss2 • Purple bar in plots • Spending above minimum requirement • Represents discretionary local spending beyond state mandates

Total NSS (\$): Sum of all three components = actualNSS

Example Calculation (Amherst, FY2024): • Ch70 Aid: \$6,791,000 • Required NSS: \$18,859,000; Req NSS (adj): \$18,859,000
– \$6,791,000 = \$12,068,000 • Actual NSS: \$31,511,000; Actual NSS (adj): \$31,511,000 – \$18,859,000 = \$12,652,000 • Total NSS: \$6,791,000 + \$12,068,000 + \$12,652,000 = \$31,511,000

Aggregate Calculation (Weighted Per-District Average): For aggregate enrollment groups (Tiny, Small, Medium, Large, Outliers): 1. Convert each district's absolute dollars to per-pupil values 2. Compute enrollment-weighted average per-pupil across all member districts 3. Multiply by average enrollment per district to get weighted avg \$ per district

This methodology produces per-district values that are weighted by enrollment size, enabling fair comparison across different-sized district aggregates.

Important: Only districts with valid PPE (per-pupil expenditure) data are included in NSS/Ch70 aggregates to ensure data quality and consistency across all analyses.

Shading: NSS/Ch70 comparison tables use the same orange/blue shading logic as PPE tables (5% dollar threshold, 1pp CAGR threshold).

Appendix A. Data Sources & Calculation Methodology (continued)

Rationale for 5% / 1pp Shading Thresholds

Table 45

| Scenario | PPE/ Enrollment | CAGR | PPE Sensitivity | CAGR Sensitivity | Balance Ratio | Assessment |
|--------------------------|--------------------|---------------|--------------------|---------------------|------------------|----------------------|
| Previous (2%/2pp) | 2.0% | 2.00pp | 0.09 SD | 0.62 SD | 6.97x | Unbalanced |
| Equal SD (5%/0.72pp) | 5.0% | 0.72pp | 0.22 SD | 0.22 SD | 1.00x | Too tight for CAGR |
| Selected (5%/1pp) | 5.0% | 1.00pp | 0.22 SD | 0.31 SD | 1.41x | Well-balanced |
| Proportional (5%/5pp) | 5.0% | 5.00pp | 0.22 SD | 1.55 SD | 6.97x | CAGR too loose |

Rationale for 5% / 1pp Shading Thresholds

Problem Statement: Different metrics have different natural variation. Using a uniform threshold (e.g., 2% for everything) creates unbalanced sensitivity where some comparisons over-flag minor differences while others under-flag meaningful ones.

Data Analysis: Examining all 59 Western MA traditional districts:

- **PPE variation:** Mean = \$24,237, SD = \$5,462, CV = 0.225 (22.5% typical variation)
- **CAGR variation:** Mean = 6.00pp, SD = 3.24pp, CV = 0.540 (54% typical variation)
- **Key insight:** CAGR naturally varies 2.4x more than PPE relative to their means

Methodology:

1. Calculated how many standard deviations each threshold represents
2. Compared 'sensitivity' (how strict each threshold is relative to typical variation)
3. Tested scenarios ranging from 2%/2pp (original) to 5%/5pp (proportional loosening)
4. Selected thresholds that balance statistical rigor with practical communication

Scenario Comparison:

- **Previous (2% / 2pp):** PPE=0.09 SD, CAGR=0.62 SD → CAGR 7x more sensitive (unbalanced)
- **Equal SD (5% / 0.72pp):** Both=0.22 SD → Perfect balance but 0.72pp too precise to communicate
- **Selected (5% / 1pp):** PPE=0.22 SD, CAGR=0.31 SD → 1.4x ratio (well-balanced, simple numbers)
- **Proportional (5% / 5pp):** PPE=0.22 SD, CAGR=1.55 SD → CAGR 7x looser (under-flags growth differences)

Selected Thresholds (5% / 1pp):

- **5% for PPE and enrollment:** Flags differences $\geq \$1,212$ (at mean), or $\sim 1/5$ of typical variation
- **1pp for CAGR:** Flags growth rate differences $\geq 1\text{pp}$, or $\sim 1/3$ of typical variation
- **Balance ratio:** 1.4x (CAGR slightly more sensitive, recognizing higher natural variation)
- **Flagging rates:** ~82% for PPE, ~76% for CAGR (similar selectivity)

Design Philosophy: Why ~80% Flagging Rates Work with Gradient Shading

With **gradient shading** (not binary on/off), having ~80% of comparisons show some level of shading is actually ideal. The threshold acts as a **noise floor** that filters trivial differences while the graduated intensity creates three distinct levels of information:

- **No shading (white background):** Districts are statistically similar to their cohort (differences $<5\% / <1\text{pp}$)
- **Light shading (subtle color):** Notable differences worth attention but not alarming
- **Intense shading (saturated color):** Exceptional outliers that immediately grab the eye

This creates a natural visual hierarchy where readers' eyes are drawn to the most intense colors (true outliers) while still being able to see the full pattern of variation across the lighter-shaded cells. The threshold filters out noise while the gradient intensity tells you *how much* a district differs from its peers.

The Goldilocks Solution (5% / 1pp):

This threshold pair hits the sweet spot across multiple dimensions:

Statistical balance:

- Similar flagging rates (~82% vs ~76%) despite very different natural variation (CV = 22.5% vs 54%)
- Proportional to underlying variation - neither metric dominates the visual attention

Practical communication:

- Round, memorable numbers (5% and 1pp)
- Easy to explain: "We flag 5% differences in dollars/enrollment, 1 percentage point differences in growth rates"
- Contrast with alternatives: 0.72pp would be statistically perfect but impractically precise to communicate

Appropriate sensitivity:

- Loosens overly-tight previous thresholds (2%/2pp had 93% PPE flagging)
- Filters trivial noise while capturing meaningful differences
- Reserves intense shading for truly exceptional cases

Shading Intensity: Both metrics use graduated shading with darker colors for larger differences:

- PPE/Enrollment: 5% (lightest), 10%, 15%, 20%+ (darkest)
- CAGR: 1pp (lightest), 2pp, 3pp, 4pp+ (darkest)

Note: These thresholds apply to all comparison tables throughout this report. They represent a balance between highlighting meaningful differences and avoiding excessive flagging of normal variation.

Appendix B. Calculations and Examples

Complete calculations and worked examples for all figures and tables

Purpose

This appendix provides calculations and worked examples for all figures and tables in the report. It combines step-by-step calculation procedures with detailed examples for verification.

Figure 1: Year-over-Year (YoY) Growth Rates

Location: Executive Summary page

Source: executive_summary_plots.py, lines 44-63

Formula:

$$\text{YoY Growth}(\text{year}) = [(\text{PPE}(\text{year}) / \text{PPE}(\text{year}-1)) - 1] \times 100$$

Calculation Steps:

1. For each district, get total PPE by year:

- Load expenditure data from df (all expense categories)
- Pivot to get PPE by category and year
- Sum across all categories: $\text{total_ppe}[\text{year}] = \text{sum}(\text{PPE_category}[\text{year}] \text{ for all categories})$

2. Calculate YoY growth:

- For year in [2010, 2011, ..., 2024]:
 $\text{YoY}[\text{year}] = [(\text{total_ppe}[\text{year}] / \text{total_ppe}[\text{year}-1]) - 1] \times 100$
- First year (2009) has no YoY value (no prior year)

3. For cohort aggregates:

- Get all districts in cohort
- Calculate weighted aggregate PPE (see Calculation #5)
- Apply same YoY formula to aggregate PPE series

Example (Amherst 2023-2024):

- $\text{PPE}(2023) = \$25,432.18$
 - $\text{PPE}(2024) = \$26,789.45$
 - $\text{YoY Growth} = [(26,789.45 / 25,432.18) - 1] \times 100 = 5.34\%$
-

Figure 2: 5-Year CAGR (Compound Annual Growth Rate) - Grouped Bars

Location: Executive Summary page

Source: executive_summary_plots.py, lines 66-95

Formula:

$$\text{CAGR} = [(\text{End_Value} / \text{Start_Value})^{(1/\text{Years})} - 1] \times 100$$

Calculation Steps:

1. Define three 5-year periods:
 - Period 1: 2009-2014 (5 years)

- Period 2: 2014-2019 (5 years)

- Period 3: 2019-2024 (5 years)

2. For each district and each period:

- Get total_ppe[start_year] and total_ppe[end_year]

- CAGR = $[(\text{total_ppe}[\text{end}] / \text{total_ppe}[\text{start}])^{(1/5)} - 1] \times 100$

3. For cohort aggregates:

- Use weighted aggregate PPE (see Calculation #5)

- Apply same CAGR formula

Example (Medium Cohort 2019-2024):

- Weighted PPE(2019) = \$22,145.67

- Weighted PPE(2024) = \$28,934.21

- CAGR = $[(28,934.21 / 22,145.67)^{(1/5)} - 1] \times 100$

- CAGR = $[1.30672^{0.2} - 1] \times 100$

- CAGR = $[1.05497 - 1] \times 100 = 5.50\%$

Figure 3: 15-Year CAGR (2009-2024)

Location: Executive Summary page

Source: executive_summary_plots.py, lines 98-118

Formula:

CAGR_15yr = $[(\text{PPE}(2024) / \text{PPE}(2009))^{(1/15)} - 1] \times 100$

Calculation Steps:

1. Get total_ppe[2009] and total_ppe[2024] for each district

2. Apply CAGR formula with years = 15

3. For cohort aggregates, use weighted aggregate PPE

Example (Amherst):

- PPE(2009) = \$18,234.56

- PPE(2024) = \$26,789.45

- CAGR = $[(26,789.45 / 18,234.56)^{(1/15)} - 1] \times 100$

- CAGR = $[1.46923^{0.06667} - 1] \times 100 = 2.61\%$

2. COHORT DETERMINATION CALCULATIONS

Purpose: Assign each district to one of 6 enrollment-based cohorts

Source: school_shared.py, lines 140-200 (calculate_cohort_boundaries)

Cohort Definitions:

- TINY: 0 - Q1 (25th percentile)

- SMALL: Q1 - Q2 (median)

- MEDIUM: Q2 - Q3 (75th percentile)

- LARGE: Q3 - 10,000 FTE

- SPRINGFIELD: > 10,000 FTE (outlier district)

Calculation Steps (FY2024):

1. Get all Western MA traditional districts

2. Get FY2024 FTE enrollment for each district

3. Create array of all enrollments (INCLUDING Springfield):

all_enrollments = [154.7, 287.3, ..., 24,567.8] # 59 districts

4. Calculate percentiles ON FULL DATASET:

- Q1 (25th) = np.percentile(all_enrollments, 25) = 154.7

- Q2 (50th) = np.percentile(all_enrollments, 50) = 520.3

- Q3 (75th) = np.percentile(all_enrollments, 75) = 1,597.6

- P90 (90th) = np.percentile(all_enrollments, 90) = 3,892.1

5. Round to clean boundaries:

- Q1: 154.7 → 200 FTE

- Median: 520.3 → 500 FTE

- Q3: 1,597.6 → 1,600 FTE

- P90: 3,892.1 → 4,000 FTE

- Outlier threshold: Fixed at 10,000 FTE

6. Final FY2024 Cohort Boundaries:

- TINY: 0-200 FTE (13 districts)

- SMALL: 201-500 FTE (16 districts)

- MEDIUM: 501-1,600 FTE (15 districts)

- LARGE: 1,601-10,000 FTE (14 districts)

- SPRINGFIELD: >10,000 FTE (1 district: 24,567.8 FTE)

Note: For historical data, cohorts are calculated year-by-year using that year's enrollment distribution.

3. WEIGHTED AGGREGATION METHODOLOGY

Purpose: Calculate enrollment-weighted per-pupil expenditure for a group of districts

Source: school_shared.py, lines 1001-1050 (weighted_epp_aggregation)

Formula:

Weighted PPE(category, year) = $\sum[PPE(d, cat, yr) \times FTE(d, yr)] / \sum[FTE(d, yr)]$

where d = district, cat = category, yr = year

Calculation Steps:

1. For each district d in cohort:

- Get PPE by category and year: PPE(d, category, year)

- Get FTE enrollment by year: FTE(d, year)

2. For each category and year:

- Calculate weighted numerator:

numerator(cat, yr) = $\sum[PPE(d, cat, yr) \times FTE(d, yr)]$ for all d in cohort

- Calculate total FTE:

denominator(yr) = $\sum[FTE(d, yr)]$ for all d in cohort

- Weighted PPE(cat, yr) = numerator(cat, yr) / denominator(yr)

Example (Medium Cohort, Instruction category, 2024):

Districts in Medium cohort (FY2024): 15 districts

District A: PPE_instruction = \$12,345, FTE = 678

District B: PPE_instruction = \$13,456, FTE = 891

...

District O: PPE_instruction = \$11,234, FTE = 1,234

$$\text{Numerator} = (12,345 \times 678) + (13,456 \times 891) + \dots + (11,234 \times 1,234)$$

$$= 8,369,910 + 11,989,296 + \dots + 13,862,756$$

$$= 156,432,890$$

$$\text{Denominator} = 678 + 891 + \dots + 1,234 = 13,456 \text{ FTE}$$

$$\text{Weighted PPE_instruction} = 156,432,890 / 13,456 = \$11,627.45/\text{pupil}$$

4. SHADING THRESHOLD CALCULATIONS

Purpose: Determine 5% / 1pp thresholds for gradient shading in comparison tables

Source: Appendix A (Threshold Analysis), compose_pdf.py lines 1212-1349

Statistical Analysis (All 59 Western MA Districts):

1. Calculate variation in PPE:

- Mean PPE = \$24,237

- Std Dev PPE = \$5,462

- Coefficient of Variation (CV) = $5,462 / 24,237 = 0.225$ (22.5%)

2. Calculate variation in CAGR:

- Mean CAGR = 6.00 percentage points

- Std Dev CAGR = 3.24 percentage points

- Coefficient of Variation (CV) = $3.24 / 6.00 = 0.540$ (54.0%)

3. Key insight: CAGR varies 2.4x more than PPE relative to means ($54.0\% / 22.5\% = 2.4$)

4. Evaluate threshold scenarios:

Scenario: 5% PPE / 1pp CAGR (SELECTED)

- PPE: $5\% = 0.05 \times 24,237 = \$1,212$

- PPE Standard Deviations: $1,212 / 5,462 = 0.22$ SD

- CAGR Standard Deviations: $1.00 / 3.24 = 0.31$ SD

- Balance ratio: $0.31 / 0.22 = 1.4x$ (well-balanced)

- PPE flagging rate: ~82% of comparisons

- CAGR flagging rate: ~76% of comparisons

Gradient Shading Bins:

- CAGR bins (absolute percentage points): [1pp, 2pp, 3pp, 4pp+]
 - Dollar bins (relative percent): [5%, 10%, 15%, 20%+]
 - Intensity increases with bin: lightest shade → darkest shade
-

5. DISTRICT COMPARISON TABLE CALCULATIONS

Purpose: Compare district PPE to baseline (cohort or Western MA aggregate)

Source: compose_pdf.py, lines 425-583 (_build_category_table)

For Each Category (e.g., Instruction, Student Support, etc.):

1. Get latest year (2024) and 5-year-ago baseline (2019)

2. Calculate CAGR:

District CAGR = $[(PPE_2024 / PPE_2019)^{(1/5)} - 1] \times 100$

Baseline CAGR = $[(Baseline_PPE_2024 / Baseline_PPE_2019)^{(1/5)} - 1] \times 100$

3. Calculate CAGR difference (absolute percentage points):

CAGR_diff = |District_CAGR - Baseline_CAGR|

4. Determine CAGR shading:

if CAGR_diff < 1.0pp: No shading (white)

elif CAGR_diff < 2.0pp: Lightest shade

elif CAGR_diff < 3.0pp: Light shade

elif CAGR_diff < 4.0pp: Medium shade

else: Darkest shade

Color: Amber if above baseline, Teal if below

5. Calculate dollar difference (relative percent):

Dollar_diff = $|PPE_2024 - Baseline_PPE_2024| / Baseline_PPE_2024$

6. Determine dollar shading:

if Dollar_diff < 5%: No shading

elif Dollar_diff < 10%: Lightest shade

elif Dollar_diff < 15%: Light shade

elif Dollar_diff < 20%: Medium shade

else: Darkest shade

Color: Amber if above baseline, Teal if below

Example (Amherst Instruction vs Medium Cohort):

- Amherst PPE_2019 = \$10,234, PPE_2024 = \$12,456

- Medium PPE_2019 = \$9,876, PPE_2024 = \$11,234

CAGR calculations:

- Amherst CAGR = $[(12,456 / 10,234)^{0.2} - 1] \times 100 = 4.01\%$

- Medium CAGR = $[(11,234 / 9,876)^{0.2} - 1] \times 100 = 2.60\%$

- CAGR_diff = $|4.01 - 2.60| = 1.41\text{pp}$ → Light amber shade

Dollar calculations:

- Dollar_diff = $|12,456 - 11,234| / 11,234 = 10.88\%$
 - 10.88% is in [10%, 15%) range → Light amber shade
-

6. ENROLLMENT FTE CALCULATIONS

Purpose: Calculate total FTE enrollment from component categories

Source: school_shared.py, prepare_district_epp_lines()

FTE Categories:

- Foundation Enrollment (low-income, ELL, special ed weighted)
- PK (Pre-Kindergarten)
- K-6 (Kindergarten through 6th grade)
- 7-12 (7th through 12th grade)

Calculation:

Total FTE(year) = Foundation(year) + PK(year) + K6(year) + 712(year)

Example (Amherst 2024):

- Foundation = 1,234.5 FTE
 - PK = 89.2 FTE
 - K-6 = 678.3 FTE
 - 7-12 = 543.1 FTE
 - Total FTE = $1,234.5 + 89.2 + 678.3 + 543.1 = 2,545.1$ FTE
-

7. NSS/CH70 FUNDING CALCULATIONS

Purpose: Calculate Chapter 70 aid and Net School Spending from components

Source: school_shared.py, prepare_district_nss_ch70()

Components:

- Foundation Budget: State-determined minimum spending level
- Required Local Contribution: Municipality's required contribution
- Chapter 70 Aid: State aid = Foundation - Required Local Contribution
- Actual Net School Spending (NSS): Actual spending by district

Calculations:

Ch70 Aid = Foundation Budget - Required Local Contribution

NSS Gap = Actual NSS - Foundation Budget

Total Spending = Required Local Contribution + Ch70 Aid + NSS Gap

Example (Amherst 2024):

- Foundation Budget = \$45,678,901
- Required Local Contribution = \$38,234,567
- Ch70 Aid = $\$45,678,901 - \$38,234,567 = \$7,444,334$
- Actual NSS = \$52,123,456
- NSS Gap = $\$52,123,456 - \$45,678,901 = \$6,444,555$

NOTES

- All dollar values shown are illustrative examples for demonstration purposes
 - Actual data values are stored in Appendix C (Data Tables)
 - All calculations use enrollment-weighted aggregations for cohort comparisons
 - CAGR calculations exclude negative or zero values
 - Shading applies independently to CAGR and dollar comparisons
 - Year-specific cohort assignments are used for all historical maps and scatterplots
-

DETAILED WORKED EXAMPLES

The following sections provide complete worked examples for specific districts and cohorts:

This appendix provides calculation examples showing the source of numbers and demonstrating every step of the analysis for two examples:

1. Western MA Medium Cohort (aggregate cohort calculations)
2. Amherst-Pelham Regional (individual district calculations)

The following pages detail:

- Data sources and cohort determination methodology
- Weighted average per-pupil expenditure calculations
- Time series analysis and compound annual growth rate (CAGR) formulas
- Chapter 70 state aid and Net School Spending calculations
- Comparative analysis methods

PART 1: DATA SOURCES AND COHORT DETERMINATION

All calculations use data from the file "E2C_Hub_MA_DESE_Data.xlsx" which contains multiple sheets:

- Sheet "District Expend by Category": Contains expenditure and enrollment data with columns DIST_NAME, YEAR, IND_CAT, IND_SUBCAT, IND_VALUE, SOURCE
- Sheet "District Regions": Contains regional classifications and school types
- Sheet "profile_DataC70": Contains Chapter 70 and Net School Spending data

Data sources by sheet (per SOURCE column):

District Expend by Category - Expenditures per Pupil:

Source: Massachusetts Department of Elementary and Secondary Education (DESE)

Dataset: "District Expenditures by Spending Category"

Last updated: August 12, 2025

URL: <https://educationtocareer.data.mass.gov/Finance-and-Budget/District-Expenditures-by-Spending-Category/er3w-dyt/>

This dataset provides:

- Expenditures per pupil (EPP) by spending category for all Massachusetts school districts
- Annual data from FY1993 to present

- Eight spending categories: Teachers, Insurance/Retirement/Other, Pupil Services, Other Teaching Services, Operations and Maintenance, Instructional Leadership, Administration, Other

District Expend by Category - Student Enrollment:

Source: Massachusetts Department of Elementary and Secondary Education (DESE)

Dataset: "District Expenditures by Spending Category"

URL: <https://educationtocareer.data.mass.gov/Finance-and-Budget/District-Expenditures-by-Spending-Category/er3w-dyti/>

This dataset provides three enrollment indicators:

- In-District FTE Pupils: Students enrolled in district-operated schools (used for cohort calculations)
- Out-of-District FTE Pupils: District students placed in other schools
- Total FTE Pupils: Sum of In-District and Out-of-District FTE

profile_DataC70 - Chapter 70 and Net School Spending:

Source: Massachusetts Department of Elementary and Secondary Education (DESE)

Dataset: Chapter 70 District Profiles (compiled from various DESE sources)

URL: Various sources compiled in profile_DataC70 spreadsheet

This dataset provides:

- Chapter 70 Aid (c70aid): State aid received by each district
- Required Net School Spending (rqnss2): Minimum spending required by state law
- Actual Net School Spending (actualNSS): Total district spending on education
- Foundation Enrollment (distfoundenro): District foundation enrollment used for Ch70 funding calculations

District Regions - Regional Classifications:

Source: DESE district profiles and regional service mappings

This dataset provides:

- EOHHS regional designations (Western MA, Central MA, etc.)
- School type classifications (Traditional, Regional, Charter, Virtual, etc.)

1.1 COHORT BOUNDARY DETERMINATION

Cohort boundaries are determined by reference to Interquartile Range (IQR) analysis on Fiscal Year 2024 Full-Time Equivalent (FTE) in-district enrollment for all traditional public school districts in Western Massachusetts. Cohort boundaries are rounded for easier readability.

Step 1: Extract FY24 In-district FTE enrollment data

From Sheet "District Expend by Category", filter rows where:

- IND_CAT = "Student Enrollment"
- IND_SUBCAT = "In-District FTE Pupils" (Full-Time Equivalent students enrolled in district-operated schools)
- YEAR = 2024

Step 2: Calculate quartile statistics

Using the 60 traditional districts in Western MA with valid data (including Springfield), calculate:

- First quartile (Q1) = 25th percentile = 154.7 In-district FTE
- Second quartile/Median (Q2) = 50th percentile = 792.0 In-district FTE
- Third quartile (Q3) = 75th percentile = 1,597.6 In-district FTE
- 90th percentile (P90) = 3,571.1 In-district FTE

Step 3: Define cohort boundaries

- TINY: 0 to 200 In-district FTE (from zero to Q1 rounded to nearest 100)
- SMALL: 201 to 800 In-district FTE (from max TINY +1 to Median rounded to nearest 100)
- MEDIUM: 801 to 1,600 In-district FTE (from max SMALL +1 to Q3 rounded to nearest 100)
- LARGE: 1,601 to 4,000 In-district FTE (from max MEDIUM +1 to P90 rounded to nearest 1,000)
- X-LARGE: 4,001 to 10K In-district FTE (from max LARGE +1 to fixed threshold of 10,000)
- OUTLIERS (Springfield): Greater than fixed threshold of 10,000 In-district FTE

Step 4: Assign each district to its cohort

For each district, compare its FY24 In-district FTE enrollment to the boundaries above.

Example: Amherst-Pelham Regional has 1,209.3 In-district FTE in FY24

Since $801 \leq 1,209.3 \leq 1,600$, Amherst-Pelham is assigned to the MEDIUM cohort.

Example: Gill-Montague Regional has 899.8 In-district FTE in FY24

Since $801 \leq 899.8 \leq 1,600$, Gill-Montague is assigned to the MEDIUM cohort.

Example: Belchertown has 2,067.8 In-district FTE in FY24

Since $1,601 \leq 2,067.8 \leq 4,000$, Belchertown is assigned to the LARGE cohort.

1.2 EXPENDITURE CATEGORIES

All Per-Pupil Expenditure (PPE) calculations use eight categories:

1. Teachers
2. Insurance, Retirement and Other
3. Pupil Services
4. Other Teaching Services
5. Operations and Maintenance
6. Instructional Leadership
7. Administration
8. Other

These categories are derived from the Massachusetts Department of Elementary and Secondary Education (DESE) function code groupings in end-of-year reporting, and provide a standardized breakdown of all district expenditures. Note: District budgeting practices typically use categories that do not match the DESE end-of-year reporting standard.

PART 2: WESTERN MA MEDIUM COHORT CALCULATIONS

The Medium cohort contains 15 districts with in-district enrollment between 801 and 1,600 FTE in FY24. This section demonstrates how weighted average Per-Pupil Expenditure (PPE) is calculated for the cohort.

2.1 MEMBER DISTRICTS

Districts in the Medium cohort (sorted by FY24 In-district FTE enrollment):

1. Mohawk Trail: 804.8 In-district FTE
2. Monson: 807.8 In-district FTE
3. Gill-Montague: 899.8 In-district FTE
4. Amherst: 1,001.5 In-district FTE
5. Hoosac Valley Regional: 1,002.7 In-district FTE

6. Palmer: 1,061.5 In-district FTE
7. Ware: 1,095.8 In-district FTE
8. Berkshire Hills: 1,174.4 In-district FTE
9. North Adams: 1,196.0 In-district FTE
10. Mount Greylock: 1,206.9 In-district FTE
11. Amherst-Pelham: 1,209.3 In-district FTE
12. Southwick-Tolland-Granville Regional School District: 1,312.8 In-district FTE
13. Greenfield: 1,394.0 In-district FTE
14. Easthampton: 1,403.7 In-district FTE
15. Central Berkshire: 1,585.9 In-district FTE

Total In-district FTE for Medium cohort = Sum of all member In-district FTE = 17,156.9 FTE

2.2 WEIGHTED AVERAGE PPE CALCULATION (EXAMPLE: FY2024 TEACHERS)

For each expenditure category, we calculate an enrollment-weighted average across all districts in the cohort.

Step 1: Extract per-pupil expenditure data for Teachers category

From Sheet "District Expend by Category", filter rows where:

- IND_CAT = "Expenditures per Pupil"
- IND_SUBCAT = "Teachers"
- YEAR = 2024

Step 2: For each district, multiply PPE by enrollment weight

Example calculations for first three districts:

Mohawk Trail:

- FY24 Teachers PPE = [actual value from data] per pupil
- FY24 In-district FTE Enrollment = 804.8 FTE
- Weight = $804.8 / 17,156.9 = 0.0469$ (4.69% of cohort enrollment)
- Weighted contribution = [Teachers PPE] $\times 0.0469$

Monson:

- FY24 Teachers PPE = [actual value from data] per pupil
- FY24 In-district FTE Enrollment = 807.8 FTE
- Weight = $807.8 / 17,156.9 = 0.0471$ (4.71% of cohort enrollment)
- Weighted contribution = [Teachers PPE] $\times 0.0471$

Gill-Montague:

- FY24 Teachers PPE = [actual value from data] per pupil
- FY24 In-district FTE Enrollment = 899.8 FTE
- Weight = $899.8 / 17,156.9 = 0.0524$ (5.24% of cohort enrollment)
- Weighted contribution = [Teachers PPE] $\times 0.0524$

[Continue for all 15 districts...]

Step 3: Sum all weighted contributions

Weighted Average Teachers PPE = Sum of all weighted contributions = [calculated value] per pupil

This weighted average calculation is repeated for all eight categories:

1. Teachers
2. Insurance, Retirement and Other
3. Pupil Services
4. Other Teaching Services
5. Operations and Maintenance
6. Instructional Leadership
7. Administration
8. Other

Step 4: Calculate total weighted average PPE

Total Weighted Average PPE (FY24) = Sum of all eight category weighted averages

$$\begin{aligned} &= \text{Teachers} + \text{Insurance} + \text{Pupil Services} + \text{Other Teaching} + \text{Operations} + \text{Instructional Leadership} + \text{Administration} + \text{Other} \\ &= [\text{sum of actual calculated values}] \text{ per pupil} \end{aligned}$$

2.3 TIME SERIES CALCULATIONS

The same weighted average calculation is performed for each fiscal year from 2009 to 2024, producing a time series of cohort-level PPE values.

For each year Y from 2009 to 2024:

1. Extract FY Y enrollment for all 13 Medium cohort districts
2. Calculate cohort total enrollment for year Y
- 3. For each of the 8 expenditure categories:**
 - a. Extract PPE values for year Y
 - b. Calculate enrollment weight for each district in year Y
 - c. Calculate weighted average PPE for that category in year Y
4. Sum the 8 category weighted averages to get total PPE for year Y

This produces arrays:

- Years: [2009, 2010, 2011, ..., 2024]
- Total PPE: [PPE_2009, PPE_2010, PPE_2011, ..., PPE_2024]
- Teachers PPE: [Teachers_2009, Teachers_2010, ..., Teachers_2024]
- [Similar arrays for other 7 categories]

2.4 COMPOUND ANNUAL GROWTH RATE (CAGR)

CAGR measures the annualized growth rate over multiple years.

Formula:

$$\text{CAGR} = ((\text{Value_end} / \text{Value_start})^{(1/\text{number_of_years})} - 1) \times 100\%$$

Where:

- Value_end = PPE in final year (2024)
- Value_start = PPE in initial year (2009)
- number_of_years = 2024 - 2009 = 15 years

Example for Medium cohort Total PPE:

- PPE_2009 = [calculated weighted average for 2009] per pupil

- PPE_2024 = [calculated weighted average for 2024] per pupil

- Number of years = 15

$$\text{CAGR} = ((\text{PPE}_{2024} / \text{PPE}_{2009})^{(1/15)} - 1) \times 100\%$$

= [calculated value] % per year

This calculation is performed for:

- Total PPE CAGR
- Each of the 8 category-specific PPE CAGRs
- Chapter 70 state aid CAGR
- Net School Spending (NSS) CAGR
- Enrollment CAGR

2.5 YEAR-OVER-YEAR (YOY) GROWTH RATE

Year-over-Year (YoY) growth rate measures the percentage change from one year to the next, providing insight into annual fluctuations in expenditures.

Formula:

$$\text{YoY Growth Rate} = ((\text{Value}_{\text{year}} / \text{Value}_{\text{previous year}}) - 1) \times 100\%$$

Where:

- Value_year = PPE in current year
- Value_previous_year = PPE in previous year

Example for Medium cohort Total PPE:

Assume the time series shows:

- PPE_2009 = \$12,000 per pupil
- PPE_2010 = \$12,500 per pupil
- PPE_2011 = \$13,000 per pupil
- PPE_2012 = \$13,100 per pupil
- ...

YoY calculations:

- YoY_2010 = $((\$12,500 / \$12,000) - 1) \times 100\% = 4.17\%$
- YoY_2011 = $((\$13,000 / \$12,500) - 1) \times 100\% = 4.00\%$
- YoY_2012 = $((\$13,100 / \$13,000) - 1) \times 100\% = 0.77\%$
- ...

Key differences from CAGR:

- YoY shows year-to-year changes; CAGR smooths growth over multiple years
- YoY captures annual volatility; CAGR assumes constant growth
- YoY is useful for identifying specific years with unusual growth patterns

Example comparison:

If CAGR from 2009 to 2024 is 3.71% per year, but YoY rates vary from 0.5% to 8.0% across individual years, this reveals that growth was not constant—some years had much higher or lower increases than the average.

Use cases:

- Identifying years with budget constraints (low YoY)

- Identifying years with significant increases (high YoY)
- Understanding the impact of specific events (e.g., pandemic, policy changes) on year-to-year spending

This YoY calculation is performed for:

- Total PPE YoY for each year from 2010 to 2024 (15 values)
- Each of the 8 category-specific PPE YoY rates
- Chapter 70 state aid YoY
- Net School Spending (NSS) YoY
- Enrollment YoY

Note: YoY for year N requires data from year N-1, so the first YoY value is for 2010 (comparing 2010 to 2009).

PART 3: AMHERST-PELHAM REGIONAL DISTRICT CALCULATIONS

This section demonstrates all calculations for a single district: Amherst-Pelham Regional.

3.1 DISTRICT PROFILE

District: Amherst-Pelham Regional

Cohort Assignment: MEDIUM (801-1,600 In-district FTE)

FY24 In-district FTE Enrollment: 1,209.3 FTE

Data Source: Appendix A Data Tables

- Enrollment data: See "In-District FTE" column in Appendix A
- PPE data: See expenditure category columns in Appendix A
- Chapter 70 data: See "Chapter 70 Aid" column in Appendix A
- NSS data: See "Required NSS" and "Actual NSS" columns in Appendix A

3.2 ENROLLMENT TIME SERIES

Step 1: Extract in-district enrollment data

From Appendix A Data Tables, locate:

- District: "Amherst-Pelham Regional"
- Find the "In-District FTE" column
- Read values for all years from 2009 to 2024

Step 2: Create time series array

Years: [2009, 2010, 2011, ..., 2023, 2024]

In-district FTE: [FTE_2009, FTE_2010, FTE_2011, ..., FTE_2023, 1,209.3]

(Extract actual values for each year from Appendix A)

Step 3: Calculate enrollment CAGR

$$\begin{aligned} \text{CAGR} &= ((\text{FTE}_{2024} / \text{FTE}_{2009})^{(1/15)} - 1) \times 100\% \\ &= ((1,209.3 / \text{FTE}_{2009})^{(1/15)} - 1) \times 100\% \\ &= [\text{calculated value}] \% \text{ per year} \end{aligned}$$

Where:

- $\text{FTE}_{2024} = 1,209.3$ In-district FTE (from data)

- FTE_2009 = [actual value from data] In-district FTE

- Number of years = 15 (2024 - 2009)

A negative CAGR indicates declining enrollment, positive indicates growth.

3.3 PER-PUPIL EXPENDITURE CALCULATIONS

For Amherst-Pelham Regional, PPE is calculated for each of the eight categories:

1. Teachers
2. Insurance, Retirement and Other
3. Pupil Services
4. Other Teaching Services
5. Operations and Maintenance
6. Instructional Leadership
7. Administration
8. Other

Step 1: Extract PPE data for each category

From Appendix A Data Tables, locate:

- District: "Amherst-Pelham Regional"
- Find the columns for each of the 8 expenditure categories
- Read values for all years from 2009 to 2024

Step 2: Example calculation for Teachers category (FY2024)

From Appendix A Data Tables:

- District: "Amherst-Pelham Regional"
- Year: 2024
- Column: "Teachers"
- Value: [actual value from Appendix A] per pupil

This value represents the amount Amherst-Pelham Regional spent per Full-Time Equivalent (FTE) student on Teachers in FY2024.

Step 3: Calculate total PPE for FY2024

Total PPE (FY2024) = Teachers + Insurance, Retirement and Other + Pupil Services + Other Teaching Services + Operations and Maintenance + Instructional Leadership + Administration + Other

Using column IND_VALUE for YEAR = 2024 and each category:

- Teachers: [actual value]
- Insurance, Retirement and Other: [actual value]
- Pupil Services: [actual value]
- Other Teaching Services: [actual value]
- Operations and Maintenance: [actual value]
- Instructional Leadership: [actual value]
- Administration: [actual value]
- Other: [actual value]

Total PPE (FY2024) = [sum of actual values] per pupil

Step 4: Repeat for all years 2009-2024

For each year from 2009 to 2024, extract IND_VALUE for each of the 8 categories and sum them to get total PPE for that year.

This produces time series arrays:

- Years: [2009, 2010, ..., 2024]
- Total PPE: [PPE_2009, PPE_2010, ..., PPE_2024]
- Teachers: [Teachers_2009, Teachers_2010, ..., Teachers_2024]
- Insurance, Retirement and Other: [Insurance_2009, Insurance_2010, ..., Insurance_2024]
- Pupil Services: [Pupil_Services_2009, Pupil_Services_2010, ..., Pupil_Services_2024]
- Other Teaching Services: [Other_Teaching_2009, Other_Teaching_2010, ..., Other_Teaching_2024]
- Operations and Maintenance: [Operations_2009, Operations_2010, ..., Operations_2024]
- Instructional Leadership: [Instructional_Leadership_2009, Instructional_Leadership_2010, ..., Instructional_Leadership_2024]
- Administration: [Administration_2009, Administration_2010, ..., Administration_2024]
- Other: [Other_2009, Other_2010, ..., Other_2024]

Step 5: Calculate CAGR for each category

Formula: $CAGR = ((Value_{2024} / Value_{2009})^{(1/15)} - 1) \times 100\%$

Example for Teachers:

- Teachers_2009 = [actual value from data] per pupil
- Teachers_2024 = [actual value from data] per pupil
- $CAGR_{Teachers} = ((Teachers_{2024} / Teachers_{2009})^{(1/15)} - 1) \times 100\%$
= [calculated value] % per year

Repeat this calculation for all 8 categories plus total PPE to get 9 CAGR values.

3.4 CHAPTER 70 STATE AID CALCULATIONS

Chapter 70 is the major state aid program for Massachusetts K-12 public schools.

Step 1: Extract Chapter 70 data

From Appendix A Data Tables, locate:

- District: "Amherst-Pelham Regional"
- Column: "Chapter 70 Aid"
- Read values for all years from 2009 to 2024

Step 2: Extract total district expenditures

From Appendix A Data Tables, calculate total expenditure as:

- District: "Amherst-Pelham Regional"
- Sum of all expenditure categories for each year
- Alternatively, use "Actual NSS" column if available

Step 3: Calculate Chapter 70 as percentage of total expenditure (FY2024 example)

- Chapter 70 Aid (FY2024) = [value from "Chapter 70 Aid" column in Appendix A for 2024]
- Total Expenditure (FY2024) = [sum of expenditure categories from Appendix A for 2024]
- Percentage = $(\text{Chapter 70 Aid} / \text{Total Expenditure}) \times 100\%$

This percentage shows what portion of the district's total expenditure came from Chapter 70 state aid in FY2024.

Step 4: Calculate Chapter 70 per-pupil (FY2024 example)

- Chapter 70 Aid (FY2024) = [value from "Chapter 70 Aid" column in Appendix A]
- Enrollment (FY2024) = 1,209.3 In-district FTE
- Chapter 70 Per-Pupil = Chapter 70 Aid / 1,209.3 FTE = [calculated value] per FTE

Step 5: Calculate Chapter 70 CAGR

- Chapter 70 Aid (2009) = [value from "Chapter 70 Aid" column in Appendix A for 2009]
- Chapter 70 Aid (2024) = [value from "Chapter 70 Aid" column in Appendix A for 2024]
- CAGR = $((\text{Ch70Aid_2024} / \text{Ch70Aid_2009})^{(1/15)} - 1) \times 100\%$
= [calculated value] % per year

A negative CAGR indicates that Chapter 70 aid decreased, positive indicates growth.

3.5 NET SCHOOL SPENDING (NSS) CALCULATIONS

Net School Spending (NSS) is the total amount a school district spends on education from all sources, excluding certain items like transportation, debt service, and capital expenditures.

Step 1: Extract NSS data

From Appendix A Data Tables, locate:

- District: "Amherst-Pelham Regional"
- Columns: "Required NSS" and "Actual NSS"
- Read values for all years from 2009 to 2024

Step 2: Calculate NSS per-pupil (FY2024 example)

- Total NSS (FY2024) = [value from "Actual NSS" column in Appendix A for 2024]
- Enrollment (FY2024) = 1,209.3 In-district FTE
- NSS Per-Pupil = Total NSS / 1,209.3 FTE = [calculated value] per FTE

Step 3: Calculate NSS CAGR

- NSS (2009) = [value from "Actual NSS" column in Appendix A for 2009]
- NSS (2024) = [value from "Actual NSS" column in Appendix A for 2024]
- CAGR = $((\text{NSS_2024} / \text{NSS_2009})^{(1/15)} - 1) \times 100\%$
= [calculated value] % per year

This indicates the average annual growth rate of NSS from 2009 to 2024.

Step 4: Compare NSS per-pupil to cohort average

Using the weighted average calculation method described in Part 2, the MEDIUM cohort average NSS per-pupil (FY2024) = [calculated weighted average] per FTE.

Amherst-Pelham's NSS per-pupil ([actual value from calculation]) is [percentage difference]% [above/below] the MEDIUM cohort average.

Calculation: $((\text{Amherst-Pelham NSS per-pupil} - \text{MEDIUM cohort average}) / \text{MEDIUM cohort average}) \times 100\%$

3.6 COMPARATIVE ANALYSIS

All district-specific calculations can be compared to:

1. Cohort averages (in this case, MEDIUM cohort weighted averages for Amherst-Pelham Regional)
2. Regional averages (all Western MA traditional districts)

3. Statewide averages (if available)

For each metric (Total PPE, each of 8 category PPEs, Chapter 70 per-pupil, NSS per-pupil, enrollment growth), calculate:

- District value
- Cohort average
- Difference = District value - Cohort average
- Percentage difference = (Difference / Cohort average) × 100%

These comparisons reveal whether a district is spending more or less than similar-sized districts, and where specific spending differences occur across the eight categories:

1. Teachers
2. Insurance, Retirement and Other
3. Pupil Services
4. Other Teaching Services
5. Operations and Maintenance
6. Instructional Leadership
7. Administration
8. Other

Appendix C. Data Tables

All data values used in plots

This appendix contains the underlying data tables for all districts and regions shown in the report. Each table shows PPE by category (in \$/pupil), FTE enrollment counts, and NSS/Ch70 funding components (in absolute dollars) across all available years.

Data: All Western MA Traditional Districts: Tiny (0-200 FTE)

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

| Category | Table 46 | | | | | | | | | | | | | | | |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Other | \$577 | \$571 | \$623 | \$643 | \$647 | \$665 | \$676 | \$709 | \$780 | \$579 | \$673 | \$738 | \$1,380 | \$1,042 | \$1,304 | \$1,057 |
| Administration | \$770 | \$808 | \$814 | \$853 | \$915 | \$851 | \$774 | \$819 | \$863 | \$869 | \$770 | \$833 | \$950 | \$1,003 | \$1,114 | \$1,126 |
| Instructional Leadership | \$1,042 | \$1,096 | \$1,125 | \$1,225 | \$1,269 | \$1,316 | \$1,496 | \$1,584 | \$1,510 | \$1,524 | \$1,543 | \$1,589 | \$1,817 | \$1,733 | \$1,777 | \$1,991 |
| Operations and Maintenance | \$1,374 | \$1,312 | \$1,460 | \$1,416 | \$1,359 | \$1,558 | \$1,554 | \$1,452 | \$1,433 | \$1,468 | \$1,811 | \$1,670 | \$2,060 | \$2,389 | \$2,232 | \$2,652 |
| Other Teaching Services | \$1,899 | \$1,926 | \$1,987 | \$2,112 | \$2,412 | \$2,378 | \$2,494 | \$2,635 | \$2,673 | \$2,707 | \$3,004 | \$3,115 | \$3,322 | \$3,677 | \$3,638 | \$3,757 |
| Pupil Services | \$1,669 | \$1,792 | \$1,802 | \$1,899 | \$2,023 | \$2,061 | \$2,145 | \$2,206 | \$2,290 | \$2,261 | \$2,323 | \$2,204 | \$2,695 | \$2,673 | \$2,954 | \$3,406 |
| Insurance, Retirement and Other | \$2,258 | \$2,405 | \$2,595 | \$2,737 | \$2,926 | \$3,148 | \$3,125 | \$3,143 | \$3,905 | \$3,390 | \$3,662 | \$3,769 | \$4,357 | \$4,048 | \$4,506 | \$5,009 |
| Teachers | \$5,148 | \$5,382 | \$5,545 | \$5,277 | \$5,430 | \$5,906 | \$6,187 | \$6,222 | \$6,245 | \$6,520 | \$6,792 | \$6,982 | \$8,015 | \$7,858 | \$7,808 | \$8,507 |
| Total | \$14,738 | \$15,291 | \$15,950 | \$16,161 | \$16,981 | \$17,882 | \$18,452 | \$18,770 | \$19,700 | \$19,319 | \$20,577 | \$20,900 | \$24,596 | \$24,423 | \$25,334 | \$27,504 |

FTE Enrollment

| FTE Series | Table 47 | | | | | | | | | | | | | | | |
|----------------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| In-District FTE Pupils | 131 | 127 | 125 | 125 | 123 | 120 | 122 | 116 | 121 | 123 | 122 | 122 | 107 | 115 | 114 | 113 |
| Foundation Enrollment | 123 | 120 | 116 | 109 | 109 | 108 | 107 | 111 | 108 | 107 | 105 | 102 | 101 | 91 | 93 | 94 |
| Out-of-District FTE Pupils | 41 | 41 | 41 | 37 | 40 | 38 | 37 | 39 | 38 | 36 | 35 | 33 | 31 | 34 | 34 | 32 |

NSS/Ch70 Funding Components (\$)

| Component | Table 48 | | | | | | | | | | | | | | | |
|----------------------------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Ch70 Aid | \$412K | \$404K | \$386K | \$387K | \$394K | \$397K | \$400K | \$417K | \$423K | \$426K | \$430K | \$433K | \$441K | \$446K | \$469K | \$500K |
| Req NSS (minus Ch70) | \$680K | \$762K | \$749K | \$752K | \$766K | \$790K | \$786K | \$837K | \$811K | \$819K | \$830K | \$838K | \$867K | \$835K | \$867K | \$917K |
| Actual NSS (minus Req NSS) | \$565K | \$539K | \$597K | \$598K | \$645K | \$642K | \$673K | \$709K | \$891K | \$895K | \$1.0M | \$999K | \$1.0M | \$1.1M | \$1.1M | \$1.1M |
| Total NSS | \$1.7M | \$1.7M | \$1.7M | \$1.7M | \$1.8M | \$1.8M | \$1.9M | \$2.0M | \$2.1M | \$2.1M | \$2.3M | \$2.3M | \$2.4M | \$2.5M | \$2.5M | \$2.5M |

Data: All Western MA Traditional Districts: Small (201-800 FTE)

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 49

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$558 | \$505 | \$540 | \$533 | \$585 | \$515 | \$503 | \$583 | \$539 | \$596 | \$558 | \$512 | \$915 | \$777 | \$1,064 | \$1,150 |
| Administration | \$523 | \$515 | \$567 | \$601 | \$648 | \$665 | \$701 | \$739 | \$999 | \$752 | \$788 | \$802 | \$854 | \$942 | \$948 | \$976 |
| Instructional Leadership | \$811 | \$805 | \$838 | \$824 | \$909 | \$947 | \$967 | \$1,024 | \$1,028 | \$1,042 | \$1,016 | \$1,097 | \$1,188 | \$1,260 | \$1,336 | \$1,463 |
| Operations and Maintenance | \$1,108 | \$1,056 | \$1,043 | \$1,101 | \$1,198 | \$1,264 | \$1,295 | \$1,338 | \$1,254 | \$1,285 | \$1,473 | \$1,422 | \$1,676 | \$1,878 | \$2,176 | \$2,454 |
| Other Teaching Services | \$1,061 | \$1,089 | \$1,193 | \$1,151 | \$1,289 | \$1,311 | \$1,353 | \$1,446 | \$1,575 | \$1,718 | \$1,799 | \$1,806 | \$1,779 | \$1,899 | \$2,151 | \$2,402 |
| Pupil Services | \$1,813 | \$1,788 | \$1,859 | \$1,993 | \$2,216 | \$2,221 | \$2,216 | \$2,477 | \$2,438 | \$2,470 | \$2,643 | \$2,670 | \$2,903 | \$3,433 | \$3,656 | \$4,084 |
| Insurance, Retirement and Other | \$2,128 | \$2,107 | \$2,230 | \$2,317 | \$2,486 | \$2,568 | \$2,711 | \$2,955 | \$3,219 | \$3,345 | \$3,362 | \$3,420 | \$3,734 | \$3,801 | \$3,969 | \$4,254 |
| Teachers | \$4,522 | \$4,588 | \$4,679 | \$4,870 | \$5,353 | \$5,423 | \$5,557 | \$5,771 | \$6,026 | \$6,075 | \$6,152 | \$6,450 | \$6,922 | \$7,338 | \$7,596 | \$7,838 |
| Total | \$12,523 | \$12,453 | \$12,949 | \$13,388 | \$14,684 | \$14,916 | \$15,302 | \$16,333 | \$17,077 | \$17,283 | \$17,791 | \$18,177 | \$19,972 | \$21,330 | \$22,896 | \$24,622 |

FTE Enrollment

Table 50

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| In-District FTE Pupils | 775 | 779 | 763 | 742 | 696 | 680 | 661 | 644 | 628 | 614 | 617 | 601 | 560 | 556 | 553 | 542 |
| Foundation Enrollment | 695 | 676 | 666 | 646 | 628 | 603 | 590 | 559 | 542 | 536 | 528 | 526 | 522 | 494 | 484 | 481 |
| Out-of-District FTE Pupils | 75 | 78 | 73 | 73 | 80 | 82 | 86 | 82 | 85 | 88 | 90 | 88 | 85 | 87 | 87 | 84 |

NSS/Ch70 Funding Components (\$)

Table 51

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| Ch70 Aid | \$2.7M | \$2.6M | \$2.5M | \$2.5M | \$2.5M | \$2.6M | \$2.6M | \$2.6M | \$2.6M | \$2.6M | \$2.6M | \$2.7M | \$2.7M | \$2.7M | \$2.8M | \$2.9M |
| Req NSS (minus Ch70) | \$3.4M | \$3.8M | \$3.9M | \$4.0M | \$4.0M | \$4.1M | \$4.0M | \$3.9M | \$3.8M | \$3.7M | \$3.8M | \$3.9M | \$4.0M | \$4.0M | \$4.2M | \$4.4M |
| Actual NSS (minus Req NSS) | \$1.5M | \$1.1M | \$1.2M | \$1.2M | \$1.4M | \$1.5M | \$1.6M | \$2.0M | \$2.2M | \$2.3M | \$2.5M | \$2.5M | \$2.5M | \$2.7M | \$3.0M | \$3.0M |
| Total NSS | \$7.6M | \$7.6M | \$7.6M | \$7.7M | \$7.9M | \$8.2M | \$8.2M | \$8.5M | \$8.5M | \$8.7M | \$8.9M | \$9.1M | \$9.2M | \$9.4M | \$10.0M | \$10.3M |

Data: All Western MA Traditional Districts: Medium (801-1600 FTE)

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 52

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$461 | \$484 | \$558 | \$494 | \$561 | \$552 | \$524 | \$573 | \$586 | \$534 | \$644 | \$607 | \$930 | \$1,064 | \$1,055 | \$1,200 |
| Administration | \$494 | \$521 | \$512 | \$533 | \$575 | \$576 | \$614 | \$653 | \$678 | \$711 | \$653 | \$700 | \$747 | \$785 | \$835 | \$911 |
| Instructional Leadership | \$893 | \$902 | \$885 | \$1,039 | \$1,062 | \$1,091 | \$1,113 | \$1,169 | \$1,150 | \$1,071 | \$1,063 | \$1,113 | \$1,191 | \$1,263 | \$1,373 | \$1,573 |
| Operations and Maintenance | \$1,150 | \$1,085 | \$1,155 | \$1,095 | \$1,146 | \$1,208 | \$1,233 | \$1,218 | \$1,228 | \$1,203 | \$1,326 | \$1,383 | \$1,564 | \$1,663 | \$1,836 | \$1,953 |
| Other Teaching Services | \$1,014 | \$1,078 | \$1,100 | \$1,135 | \$1,235 | \$1,317 | \$1,362 | \$1,400 | \$1,444 | \$1,596 | \$1,681 | \$1,729 | \$1,936 | \$2,180 | \$2,311 | \$2,395 |
| Pupil Services | \$1,724 | \$1,693 | \$1,757 | \$1,763 | \$1,901 | \$1,984 | \$2,096 | \$2,184 | \$2,208 | \$2,406 | \$2,464 | \$2,403 | \$2,634 | \$2,967 | \$3,353 | \$3,581 |
| Insurance, Retirement and Other | \$2,483 | \$2,574 | \$2,743 | \$2,707 | \$2,707 | \$2,943 | \$3,074 | \$3,251 | \$3,266 | \$3,622 | \$3,631 | \$3,789 | \$4,169 | \$4,166 | \$4,480 | \$4,740 |
| Teachers | \$4,813 | \$4,890 | \$5,055 | \$5,048 | \$5,152 | \$5,357 | \$5,513 | \$5,578 | \$5,674 | \$5,960 | \$6,251 | \$6,385 | \$6,758 | \$6,773 | \$7,182 | \$7,431 |
| Total | \$13,032 | \$13,227 | \$13,766 | \$13,815 | \$14,340 | \$15,028 | \$15,529 | \$16,025 | \$16,234 | \$17,103 | \$17,713 | \$18,110 | \$19,930 | \$20,859 | \$22,426 | \$23,785 |

FTE Enrollment

Table 53

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| In-District FTE Pupils | 1,466 | 1,434 | 1,416 | 1,402 | 1,388 | 1,334 | 1,306 | 1,277 | 1,268 | 1,247 | 1,268 | 1,249 | 1,160 | 1,175 | 1,158 | 1,144 |
| Foundation Enrollment | 1,622 | 1,596 | 1,567 | 1,528 | 1,509 | 1,507 | 1,472 | 1,451 | 1,422 | 1,399 | 1,381 | 1,376 | 1,361 | 1,289 | 1,283 | 1,247 |
| Out-of-District FTE Pupils | 154 | 161 | 164 | 164 | 166 | 167 | 176 | 185 | 187 | 194 | 201 | 198 | 190 | 191 | 194 | 194 |

NSS/Ch70 Funding Components (\$)

Table 54

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ch70 Aid | \$8.4M | \$8.3M | \$7.9M | \$8.0M | \$8.2M | \$8.4M | \$8.5M | \$8.5M | \$8.7M | \$8.7M | \$8.8M | \$9.1M | \$9.2M | \$9.3M | \$9.9M | \$10.2M |
| Req NSS (minus Ch70) | \$5.8M | \$7.4M | \$7.5M | \$7.7M | \$8.0M | \$8.3M | \$8.3M | \$8.3M | \$8.2M | \$8.1M | \$8.3M | \$8.5M | \$8.7M | \$8.8M | \$9.1M | \$9.5M |
| Actual NSS (minus Req NSS) | \$3.4M | \$2.3M | \$2.5M | \$2.5M | \$2.6M | \$2.5M | \$2.9M | \$3.3M | \$3.5M | \$4.5M | \$4.6M | \$4.6M | \$4.4M | \$4.3M | \$4.6M | \$4.8M |
| Total NSS | \$17.7M | \$18.1M | \$17.9M | \$18.2M | \$18.8M | \$19.2M | \$19.7M | \$20.2M | \$20.3M | \$21.3M | \$21.7M | \$22.2M | \$22.3M | \$22.4M | \$23.6M | \$24.5M |

Data: All Western MA Traditional Districts: Large (1601-10K FTE)

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 55

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$513 | \$648 | \$614 | \$611 | \$654 | \$631 | \$610 | \$644 | \$664 | \$667 | \$722 | \$716 | \$972 | \$1,075 | \$1,331 | \$1,348 |
| Administration | \$392 | \$415 | \$426 | \$437 | \$441 | \$462 | \$484 | \$496 | \$480 | \$494 | \$453 | \$502 | \$537 | \$571 | \$616 | \$649 |
| Instructional Leadership | \$811 | \$859 | \$865 | \$856 | \$837 | \$886 | \$915 | \$932 | \$956 | \$940 | \$998 | \$1,028 | \$1,060 | \$1,153 | \$1,195 | \$1,231 |
| Operations and Maintenance | \$1,014 | \$993 | \$1,009 | \$986 | \$984 | \$1,023 | \$1,093 | \$1,098 | \$1,111 | \$1,152 | \$1,244 | \$1,238 | \$1,401 | \$1,450 | \$1,685 | \$1,683 |
| Other Teaching Services | \$990 | \$1,037 | \$1,103 | \$1,105 | \$1,177 | \$1,228 | \$1,290 | \$1,365 | \$1,383 | \$1,395 | \$1,407 | \$1,429 | \$1,561 | \$1,717 | \$1,951 | \$2,021 |
| Pupil Services | \$1,531 | \$1,536 | \$1,622 | \$1,611 | \$1,697 | \$1,797 | \$1,849 | \$1,926 | \$1,948 | \$2,069 | \$2,171 | \$2,128 | \$2,200 | \$2,654 | \$2,955 | \$3,148 |
| Insurance, Retirement and Other | \$1,911 | \$1,943 | \$2,045 | \$2,123 | \$2,115 | \$2,282 | \$2,366 | \$2,419 | \$2,543 | \$2,652 | \$2,773 | \$2,855 | \$3,037 | \$3,212 | \$3,364 | \$3,469 |
| Teachers | \$4,613 | \$4,604 | \$4,707 | \$4,868 | \$4,990 | \$5,067 | \$5,194 | \$5,393 | \$5,482 | \$5,569 | \$5,863 | \$6,031 | \$6,461 | \$6,780 | \$7,001 | \$7,292 |
| Total | \$11,775 | \$12,034 | \$12,391 | \$12,597 | \$12,895 | \$13,376 | \$13,801 | \$14,273 | \$14,568 | \$14,937 | \$15,629 | \$15,927 | \$17,229 | \$18,612 | \$20,097 | \$20,841 |

FTE Enrollment

Table 56

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| In-District FTE Pupils | 4,001 | 3,953 | 3,935 | 3,852 | 3,812 | 3,760 | 3,721 | 3,674 | 3,690 | 3,680 | 3,616 | 3,598 | 3,397 | 3,422 | 3,384 | 3,379 |
| Foundation Enrollment | 4,432 | 4,382 | 4,347 | 4,325 | 4,280 | 4,230 | 4,191 | 4,163 | 4,093 | 4,077 | 4,037 | 4,013 | 3,975 | 3,823 | 3,787 | 3,752 |
| Out-of-District FTE Pupils | 215 | 227 | 244 | 253 | 256 | 272 | 293 | 309 | 316 | 322 | 341 | 345 | 344 | 341 | 354 | 357 |

NSS/Ch70 Funding Components (\$)

Table 57

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ch70 Aid | \$24.5M | \$24.0M | \$24.1M | \$24.9M | \$25.5M | \$25.8M | \$25.9M | \$26.3M | \$26.5M | \$26.9M | \$27.4M | \$29.1M | \$29.4M | \$30.3M | \$32.9M | \$35.8M |
| Req NSS (minus Ch70) | \$14.5M | \$17.3M | \$17.4M | \$17.8M | \$18.3M | \$18.9M | \$19.2M | \$19.5M | \$19.4M | \$19.3M | \$19.7M | \$20.1M | \$20.6M | \$20.9M | \$21.7M | \$22.8M |
| Actual NSS (minus Req NSS) | \$4.0M | \$3.1M | \$3.9M | \$3.9M | \$4.0M | \$4.7M | \$5.4M | \$5.9M | \$7.3M | \$8.1M | \$8.7M | \$8.4M | \$8.2M | \$9.0M | \$9.3M | \$8.7M |
| Total NSS | \$43.0M | \$44.4M | \$45.4M | \$46.5M | \$47.9M | \$49.4M | \$50.5M | \$51.8M | \$53.2M | \$54.4M | \$55.8M | \$57.6M | \$58.3M | \$60.2M | \$63.9M | \$67.4M |

Data: All Western MA Traditional Districts: Outliers (Springfield at 23,723 FTE in 2024)

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 58

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$1,143 | \$1,337 | \$2,068 | \$1,143 | \$1,424 | \$1,734 | \$1,241 | \$1,376 | \$1,286 | \$1,371 | \$1,673 | \$1,765 | \$2,487 | \$2,260 | \$2,923 | \$3,071 |
| Administration | \$533 | \$654 | \$446 | \$645 | \$550 | \$677 | \$596 | \$580 | \$507 | \$490 | \$416 | \$407 | \$441 | \$501 | \$599 | \$609 |
| Instructional Leadership | \$719 | \$778 | \$892 | \$1,173 | \$1,257 | \$1,245 | \$1,208 | \$1,282 | \$1,280 | \$1,060 | \$983 | \$1,090 | \$1,103 | \$1,402 | \$1,534 | \$1,571 |
| Operations and Maintenance | \$1,150 | \$1,081 | \$1,262 | \$1,176 | \$1,132 | \$997 | \$1,121 | \$1,027 | \$1,063 | \$1,156 | \$1,337 | \$1,093 | \$1,534 | \$1,536 | \$3,453 | \$3,806 |
| Other Teaching Services | \$1,143 | \$1,002 | \$1,146 | \$1,130 | \$1,051 | \$1,086 | \$1,150 | \$1,135 | \$1,070 | \$1,036 | \$1,357 | \$1,390 | \$1,337 | \$1,518 | \$1,776 | \$2,014 |
| Pupil Services | \$2,031 | \$1,873 | \$2,156 | \$2,353 | \$2,183 | \$2,257 | \$2,393 | \$2,467 | \$2,613 | \$2,845 | \$2,968 | \$2,631 | \$2,590 | \$3,602 | \$3,675 | \$3,901 |
| Insurance, Retirement and Other | \$2,050 | \$2,226 | \$2,280 | \$2,474 | \$2,437 | \$2,496 | \$2,467 | \$2,566 | \$2,562 | \$2,635 | \$2,765 | \$3,001 | \$3,217 | \$3,461 | \$3,852 | \$3,906 |
| Teachers | \$5,839 | \$4,859 | \$4,750 | \$4,711 | \$4,848 | \$4,823 | \$4,963 | \$5,196 | \$4,962 | \$5,274 | \$5,510 | \$5,800 | \$6,442 | \$7,095 | \$7,561 | \$7,737 |
| Total | \$14,608 | \$13,810 | \$15,000 | \$14,805 | \$14,882 | \$15,315 | \$15,139 | \$15,629 | \$15,343 | \$15,867 | \$17,009 | \$17,177 | \$19,151 | \$21,375 | \$25,373 | \$26,615 |

FTE Enrollment

Table 59

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| In-District FTE Pupils | 25,137 | 24,987 | 24,935 | 24,521 | 24,747 | 25,249 | 25,101 | 25,009 | 25,629 | 25,776 | 25,294 | 24,906 | 24,079 | 24,040 | 23,763 | 23,723 |
| Foundation Enrollment | 28,235 | 28,343 | 28,305 | 28,226 | 27,951 | 28,434 | 28,755 | 28,970 | 29,109 | 29,533 | 29,670 | 29,645 | 29,551 | 29,144 | 28,613 | 28,326 |
| Out-of-District FTE Pupils | 3,571 | 3,775 | 3,719 | 3,695 | 3,817 | 3,613 | 3,974 | 4,406 | 4,596 | 4,812 | 5,150 | 5,363 | 5,559 | 5,500 | 5,652 | 5,745 |

NSS/Ch70 Funding Components (\$)

Table 60

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Ch70 Aid | \$262.7M | \$257.5M | \$262.7M | \$275.4M | \$285.9M | \$295.8M | \$301.6M | \$309.2M | \$319.9M | \$333.0M | \$345.4M | \$370.7M | \$377.2M | \$403.3M | \$439.2M | \$477.7M |
| Req NSS (minus Ch70) | \$7.0M | \$37.5M | \$45.6M | \$35.2M | \$37.1M | \$39.2M | \$36.1M | \$36.4M | \$36.7M | \$37.4M | \$41.4M | \$40.8M | \$56.7M | \$43.2M | \$44.7M | \$48.0M |
| Actual NSS (minus Req NSS) | -\$4.2M | -\$10.9M | -\$985K | -\$2.4M | -\$4.0M | \$1 | \$50K | \$59K | \$-1 | -\$3.1M | -\$2 | -\$14.8M | \$3 | \$7 | -\$2 | -\$5 |
| Total NSS | \$265.5M | \$284.1M | \$307.3M | \$308.2M | \$319.0M | \$335.0M | \$337.7M | \$345.7M | \$356.6M | \$367.2M | \$386.8M | \$396.8M | \$433.8M | \$446.5M | \$483.9M | \$525.8M |

Data: Amherst-Pelham

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 61

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$646 | \$534 | \$900 | \$417 | \$459 | \$424 | \$599 | \$860 | \$635 | \$384 | \$610 | \$559 | \$477 | \$527 | \$457 | \$799 |
| Administration | \$652 | \$664 | \$687 | \$789 | \$987 | \$907 | \$953 | \$926 | \$996 | \$857 | \$759 | \$780 | \$788 | \$859 | \$928 | \$1,277 |
| Instructional Leadership | \$1,289 | \$1,337 | \$1,209 | \$1,397 | \$1,390 | \$1,545 | \$1,429 | \$1,437 | \$1,541 | \$1,555 | \$1,544 | \$1,501 | \$1,436 | \$1,472 | \$1,644 | \$2,336 |
| Operations and Maintenance | \$1,459 | \$1,416 | \$1,559 | \$1,468 | \$1,481 | \$1,585 | \$1,473 | \$1,577 | \$1,904 | \$1,678 | \$1,776 | \$1,601 | \$1,705 | \$1,778 | \$1,957 | \$2,221 |
| Other Teaching Services | \$1,199 | \$1,264 | \$1,313 | \$1,468 | \$1,588 | \$1,739 | \$1,770 | \$1,883 | \$2,014 | \$2,066 | \$2,122 | \$2,214 | \$3,010 | \$3,050 | \$2,968 | \$2,851 |
| Pupil Services | \$2,170 | \$2,196 | \$2,205 | \$2,302 | \$2,291 | \$2,497 | \$2,753 | \$2,908 | \$2,931 | \$3,109 | \$3,161 | \$2,902 | \$3,951 | \$3,780 | \$4,177 | \$4,231 |
| Insurance, Retirement and Other | \$3,305 | \$3,636 | \$3,673 | \$3,811 | \$3,526 | \$3,954 | \$4,086 | \$4,103 | \$4,218 | \$5,006 | \$5,047 | \$5,074 | \$5,237 | \$5,062 | \$5,887 | \$6,248 |
| Teachers | \$5,491 | \$5,511 | \$6,254 | \$6,199 | \$6,533 | \$6,765 | \$6,704 | \$6,590 | \$6,927 | \$7,208 | \$7,285 | \$7,155 | \$7,592 | \$7,404 | \$8,158 | \$8,270 |
| Total | \$16,211 | \$16,558 | \$17,800 | \$17,851 | \$18,255 | \$19,416 | \$19,767 | \$20,284 | \$21,166 | \$21,863 | \$22,304 | \$21,786 | \$24,196 | \$23,932 | \$26,176 | \$28,233 |

FTE Enrollment

Table 62

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| In-District FTE Pupils | 1,712 | 1,659 | 1,573 | 1,536 | 1,519 | 1,470 | 1,450 | 1,378 | 1,366 | 1,342 | 1,334 | 1,346 | 1,278 | 1,265 | 1,241 | 1,209 |
| Foundation Enrollment | 1,801 | 1,763 | 1,726 | 1,647 | 1,610 | 1,581 | 1,529 | 1,532 | 1,496 | 1,490 | 1,433 | 1,399 | 1,399 | 1,330 | 1,310 | 1,274 |
| Out-of-District FTE Pupils | 112 | 129 | 138 | 143 | 138 | 149 | 169 | 190 | 192 | 170 | 158 | 152 | 155 | 145 | 150 | 147 |

NSS/Ch70 Funding Components (\$)

Table 63

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ch70 Aid | \$9.9M | \$9.7M | \$9.1M | \$9.2M | \$9.2M | \$9.3M | \$9.3M | \$9.3M | \$9.4M | \$9.5M | \$9.5M | \$9.6M | \$9.6M | \$9.6M | \$9.7M | \$9.8M |
| Req NSS (minus Ch70) | \$7.9M | \$10.9M | \$11.0M | \$11.1M | \$11.4M | \$11.7M | \$11.5M | \$11.7M | \$11.5M | \$11.6M | \$11.9M | \$12.1M | \$12.8M | \$12.8M | \$13.3M | \$13.8M |
| Actual NSS (minus Req NSS) | \$6.1M | \$4.0M | \$4.7M | \$5.5M | \$6.0M | \$6.1M | \$6.6M | \$6.7M | \$7.5M | \$7.5M | \$7.7M | \$7.5M | \$6.8M | \$6.8M | \$7.0M | \$7.7M |
| Total NSS | \$23.9M | \$24.6M | \$24.8M | \$25.8M | \$26.6M | \$27.0M | \$27.4M | \$27.7M | \$28.4M | \$28.6M | \$29.1M | \$29.2M | \$29.2M | \$30.0M | \$31.3M | |

Data: Amherst

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 64

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$684 | \$547 | \$606 | \$931 | \$1,098 | \$1,098 | \$1,265 | \$1,242 | \$1,119 | \$798 | \$1,092 | \$733 | \$1,563 | \$1,561 | \$1,475 | \$1,328 |
| Administration | \$627 | \$698 | \$735 | \$709 | \$787 | \$809 | \$919 | \$944 | \$981 | \$799 | \$767 | \$827 | \$874 | \$896 | \$981 | \$1,213 |
| Instructional Leadership | \$1,134 | \$1,079 | \$965 | \$1,032 | \$1,153 | \$1,275 | \$1,175 | \$1,131 | \$1,087 | \$1,231 | \$1,325 | \$1,527 | \$1,750 | \$1,783 | \$1,847 | \$2,498 |
| Operations and Maintenance | \$1,264 | \$1,271 | \$1,636 | \$1,436 | \$1,399 | \$1,451 | \$1,577 | \$1,530 | \$1,555 | \$1,340 | \$1,646 | \$1,764 | \$1,897 | \$1,874 | \$1,941 | \$2,248 |
| Other Teaching Services | \$1,762 | \$1,813 | \$1,923 | \$2,345 | \$2,621 | \$2,610 | \$2,840 | \$2,652 | \$2,751 | \$2,973 | \$3,084 | \$3,053 | \$3,908 | \$3,898 | \$3,746 | \$4,612 |
| Pupil Services | \$1,261 | \$1,386 | \$1,335 | \$1,386 | \$1,553 | \$1,761 | \$1,802 | \$1,850 | \$1,818 | \$1,909 | \$2,030 | \$1,844 | \$2,035 | \$2,740 | \$2,821 | \$3,018 |
| Insurance, Retirement and Other | \$3,353 | \$3,610 | \$3,821 | \$3,852 | \$3,941 | \$4,189 | \$4,201 | \$4,295 | \$4,231 | \$4,840 | \$5,212 | \$5,363 | \$5,661 | \$5,561 | \$6,022 | \$6,605 |
| Teachers | \$5,944 | \$6,213 | \$6,355 | \$6,963 | \$6,804 | \$6,627 | \$6,841 | \$7,712 | \$7,792 | \$8,091 | \$8,538 | \$8,725 | \$9,528 | \$9,598 | \$9,451 | \$9,745 |
| Total | \$16,029 | \$16,617 | \$17,376 | \$18,654 | \$19,356 | \$19,820 | \$20,620 | \$21,356 | \$21,334 | \$21,981 | \$23,694 | \$23,836 | \$27,216 | \$27,911 | \$28,284 | \$31,267 |

FTE Enrollment

Table 65

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| In-District FTE Pupils | 1,387 | 1,331 | 1,284 | 1,215 | 1,196 | 1,197 | 1,184 | 1,154 | 1,156 | 1,163 | 1,131 | 1,107 | 1,017 | 1,052 | 1,062 | 1,002 |
| Foundation Enrollment | 1,398 | 1,405 | 1,356 | 1,279 | 1,269 | 1,227 | 1,205 | 1,192 | 1,199 | 1,136 | 1,106 | 1,134 | 1,097 | 1,045 | 1,065 | 1,055 |
| Out-of-District FTE Pupils | 65 | 72 | 73 | 84 | 90 | 90 | 101 | 113 | 110 | 108 | 124 | 122 | 118 | 123 | 129 | 134 |

NSS/Ch70 Funding Components (\$)

Table 66

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ch70 Aid | \$6.3M | \$6.1M | \$5.8M | \$5.8M | \$5.9M | \$5.9M | \$5.9M | \$6.0M | \$6.0M | \$6.1M | \$6.1M | \$6.1M | \$6.1M | \$6.2M | \$6.2M | \$6.3M |
| Req NSS (minus Ch70) | \$5.5M | \$8.3M | \$8.2M | \$8.3M | \$8.6M | \$8.8M | \$8.8M | \$9.0M | \$9.1M | \$8.8M | \$8.9M | \$9.5M | \$9.6M | \$9.9M | \$10.5M | \$11.2M |
| Actual NSS (minus Req NSS) | \$8.6M | \$6.7M | \$7.1M | \$7.2M | \$7.7M | \$8.0M | \$8.6M | \$9.1M | \$9.0M | \$10.0M | \$10.9M | \$10.5M | \$10.3M | \$11.2M | \$11.2M | \$11.7M |
| Total NSS | \$20.4M | \$21.1M | \$21.1M | \$21.4M | \$22.2M | \$22.6M | \$23.4M | \$24.1M | \$24.1M | \$24.9M | \$25.9M | \$26.1M | \$26.1M | \$27.3M | \$27.9M | \$29.1M |

Data: Leverett

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 67

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$575 | \$602 | \$651 | \$766 | \$616 | \$556 | \$563 | \$529 | \$596 | \$453 | \$503 | \$606 | \$1,041 | \$840 | \$756 | \$608 |
| Administration | \$715 | \$676 | \$710 | \$888 | \$925 | \$1,029 | \$809 | \$842 | \$1,244 | \$899 | \$826 | \$857 | \$1,010 | \$987 | \$1,061 | \$953 |
| Instructional Leadership | \$1,015 | \$1,008 | \$1,072 | \$1,244 | \$1,257 | \$1,393 | \$1,357 | \$1,344 | \$1,431 | \$1,461 | \$1,278 | \$1,317 | \$1,318 | \$1,354 | \$1,430 | \$1,663 |
| Operations and Maintenance | \$1,755 | \$1,427 | \$1,532 | \$1,741 | \$1,479 | \$2,421 | \$2,272 | \$1,707 | \$1,209 | \$1,765 | \$1,491 | \$1,458 | \$2,131 | \$2,296 | \$2,292 | \$2,158 |
| Other Teaching Services | \$2,385 | \$2,040 | \$2,074 | \$2,346 | \$2,540 | \$2,352 | \$2,274 | \$2,281 | \$2,193 | \$2,175 | \$2,477 | \$2,386 | \$2,178 | \$3,119 | \$3,266 | \$3,526 |
| Pupil Services | \$1,395 | \$970 | \$1,096 | \$1,599 | \$1,613 | \$2,392 | \$2,073 | \$1,701 | \$2,082 | \$2,081 | \$1,845 | \$1,641 | \$2,690 | \$1,910 | \$2,635 | \$2,814 |
| Insurance, Retirement and Other | \$2,098 | \$2,041 | \$2,253 | \$2,499 | \$2,753 | \$3,245 | \$3,041 | \$2,937 | \$2,943 | \$3,677 | \$3,781 | \$3,686 | \$4,766 | \$3,630 | \$3,611 | \$3,793 |
| Teachers | \$5,218 | \$5,690 | \$5,818 | \$6,301 | \$6,138 | \$7,547 | \$6,868 | \$6,967 | \$6,814 | \$7,967 | \$7,665 | \$7,134 | \$9,224 | \$6,888 | \$6,724 | \$6,395 |
| Total | \$15,156 | \$14,454 | \$15,206 | \$17,384 | \$17,321 | \$20,935 | \$19,257 | \$18,308 | \$18,512 | \$20,478 | \$19,866 | \$19,085 | \$24,358 | \$21,024 | \$21,775 | \$21,910 |

FTE Enrollment

Table 68

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| In-District FTE Pupils | 162 | 164 | 161 | 150 | 147 | 124 | 134 | 135 | 134 | 129 | 136 | 142 | 117 | 142 | 140 | 142 |
| Foundation Enrollment | 125 | 120 | 123 | 123 | 119 | 118 | 100 | 104 | 101 | 123 | 103 | 112 | 116 | 105 | 112 | 101 |
| Out-of-District FTE Pupils | 7 | 7 | 6 | 9 | 10 | 9 | 8 | 6 | 14 | 8 | 9 | 12 | 9 | 12 | 7 | 3 |

NSS/Ch70 Funding Components (\$)

Table 69

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Ch70 Aid | \$288K | \$282K | \$266K | \$267K | \$272K | \$275K | \$277K | \$280K | \$285K | \$289K | \$292K | \$296K | \$296K | \$299K | \$391K | \$397K |
| Req NSS (minus Ch70) | \$819K | \$875K | \$938K | \$929K | \$916K | \$935K | \$841K | \$844K | \$837K | \$990K | \$858K | \$885K | \$993K | \$943K | \$971K | \$955K |
| Actual NSS (minus Req NSS) | \$877K | \$878K | \$860K | \$952K | \$1.0M | \$905K | \$974K | \$1.0M | \$1.0M | \$963K | \$1.2M | \$1.3M | \$1.1M | \$1.4M | \$1.1M | \$1.1M |
| Total NSS | \$2.0M | \$2.0M | \$2.1M | \$2.1M | \$2.2M | \$2.1M | \$2.1M | \$2.2M | \$2.1M | \$2.2M | \$2.3M | \$2.4M | \$2.4M | \$2.6M | \$2.5M | \$2.5M |

Data: Pelham

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

| Category | Table 70 | | | | | | | | | | | | | | | |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Other | \$580 | \$361 | \$384 | \$366 | \$658 | \$639 | \$780 | \$652 | \$569 | \$414 | \$466 | \$407 | \$292 | \$365 | \$422 | \$207 |
| Administration | \$390 | \$398 | \$478 | \$391 | \$664 | \$796 | \$806 | \$980 | \$739 | \$731 | \$489 | \$574 | \$656 | \$688 | \$614 | \$917 |
| Instructional Leadership | \$1,123 | \$1,159 | \$1,089 | \$1,064 | \$1,113 | \$1,252 | \$1,288 | \$1,322 | \$1,278 | \$1,431 | \$1,194 | \$1,609 | \$1,670 | \$1,873 | \$1,782 | \$1,885 |
| Operations and Maintenance | \$920 | \$847 | \$925 | \$884 | \$992 | \$947 | \$1,080 | \$942 | \$987 | \$889 | \$1,229 | \$1,304 | \$1,498 | \$1,380 | \$1,524 | \$1,614 |
| Other Teaching Services | \$2,184 | \$2,109 | \$2,166 | \$2,026 | \$1,937 | \$2,063 | \$2,218 | \$2,541 | \$2,850 | \$2,269 | \$2,273 | \$2,324 | \$2,540 | \$2,292 | \$2,594 | \$3,010 |
| Pupil Services | \$1,032 | \$1,090 | \$1,347 | \$1,507 | \$1,584 | \$1,615 | \$1,696 | \$1,797 | \$1,774 | \$1,672 | \$1,732 | \$1,642 | \$2,112 | \$2,203 | \$1,888 | \$3,610 |
| Insurance, Retirement and Other | \$2,615 | \$2,585 | \$2,602 | \$2,897 | \$3,052 | \$3,283 | \$3,376 | \$3,473 | \$3,863 | \$4,561 | \$3,791 | \$4,168 | \$4,850 | \$4,157 | \$3,983 | \$4,670 |
| Teachers | \$5,889 | \$5,474 | \$5,627 | \$5,576 | \$5,035 | \$6,090 | \$6,540 | \$6,418 | \$5,904 | \$6,310 | \$6,129 | \$6,860 | \$7,406 | \$6,714 | \$6,430 | \$7,127 |
| Total | \$14,733 | \$14,023 | \$14,618 | \$14,711 | \$15,035 | \$16,685 | \$17,784 | \$18,125 | \$17,964 | \$18,277 | \$17,303 | \$18,888 | \$21,024 | \$19,672 | \$19,237 | \$23,040 |

FTE Enrollment

| FTE Series | Table 71 | | | | | | | | | | | | | | | |
|----------------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| In-District FTE Pupils | 118 | 125 | 122 | 128 | 132 | 128 | 123 | 123 | 130 | 127 | 134 | 125 | 106 | 119 | 134 | 126 |
| Foundation Enrollment | 85 | 81 | 81 | 68 | 63 | 67 | 70 | 73 | 74 | 81 | 83 | 82 | 84 | 70 | 65 | 63 |
| Out-of-District FTE Pupils | 3 | 3 | 4 | 1 | 4 | 7 | 5 | 7 | 11 | 12 | 10 | 4 | 8 | 6 | 5 | 9 |

NSS/Ch70 Funding Components (\$)

| Component | Table 72 | | | | | | | | | | | | | | | |
|----------------------------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| Ch70 Aid | \$233K | \$229K | \$215K | \$216K | \$219K | \$221K | \$222K | \$224K | \$228K | \$231K | \$233K | \$236K | \$238K | \$241K | \$244K | \$248K |
| Req NSS (minus Ch70) | \$466K | \$497K | \$482K | \$480K | \$483K | \$566K | \$620K | \$627K | \$609K | \$620K | \$668K | \$688K | \$690K | \$646K | \$636K | \$632K |
| Actual NSS (minus Req NSS) | \$654K | \$626K | \$660K | \$651K | \$726K | \$681K | \$660K | \$736K | \$859K | \$1.0M | \$927K | \$942K | \$1.1M | \$1.1M | \$1.2M | \$1.3M |
| Total NSS | \$1.4M | \$1.4M | \$1.4M | \$1.3M | \$1.4M | \$1.5M | \$1.5M | \$1.6M | \$1.7M | \$1.9M | \$1.8M | \$1.9M | \$2.0M | \$2.1M | \$2.2M | |

Data: Shutesbury

PPE (\$/pupil), FTE Enrollment, and NSS/Ch70 Funding (\$)

PPE by Category (\$/pupil)

Table 73

| Category | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Other | \$580 | \$498 | \$564 | \$865 | \$704 | \$515 | \$636 | \$684 | \$1,510 | \$420 | \$385 | \$873 | \$1,296 | \$551 | \$1,102 | \$545 |
| Administration | \$652 | \$943 | \$767 | \$836 | \$877 | \$726 | \$884 | \$1,084 | \$1,040 | \$846 | \$856 | \$938 | \$925 | \$1,100 | \$934 | \$1,015 |
| Instructional Leadership | \$969 | \$1,138 | \$1,149 | \$1,198 | \$1,227 | \$1,003 | \$1,192 | \$1,517 | \$1,604 | \$1,481 | \$1,517 | \$1,541 | \$1,707 | \$1,736 | \$1,323 | \$2,103 |
| Operations and Maintenance | \$1,180 | \$1,079 | \$1,221 | \$1,276 | \$1,251 | \$1,338 | \$1,384 | \$1,637 | \$1,791 | \$1,941 | \$1,663 | \$1,916 | \$2,665 | \$2,048 | \$2,051 | \$2,754 |
| Other Teaching Services | \$2,185 | \$2,447 | \$2,361 | \$2,193 | \$2,179 | \$2,591 | \$2,164 | \$2,817 | \$3,301 | \$3,491 | \$3,545 | \$3,560 | \$3,722 | \$5,320 | \$3,441 | \$4,359 |
| Pupil Services | \$1,292 | \$1,128 | \$1,195 | \$1,556 | \$1,628 | \$1,418 | \$1,427 | \$1,340 | \$2,165 | \$2,301 | \$2,206 | \$2,198 | \$2,456 | \$2,748 | \$2,946 | \$2,962 |
| Insurance, Retirement and Other | \$2,332 | \$2,687 | \$2,596 | \$2,690 | \$2,564 | \$2,484 | \$2,328 | \$3,107 | \$3,773 | \$4,388 | \$2,970 | \$3,963 | \$3,350 | \$3,154 | \$4,007 | \$3,501 |
| Teachers | \$4,821 | \$5,363 | \$5,603 | \$5,169 | \$5,509 | \$6,012 | \$5,620 | \$6,612 | \$7,043 | \$7,838 | \$7,914 | \$8,204 | \$8,933 | \$10,075 | \$8,898 | \$9,669 |
| Total | \$14,011 | \$15,283 | \$15,456 | \$15,783 | \$15,939 | \$16,087 | \$15,635 | \$18,798 | \$22,227 | \$22,706 | \$21,056 | \$23,193 | \$25,054 | \$26,732 | \$24,702 | \$26,908 |

FTE Enrollment

Table 74

| FTE Series | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| In-District FTE Pupils | 162 | 151 | 146 | 151 | 150 | 157 | 156 | 131 | 120 | 124 | 127 | 125 | 113 | 115 | 123 | 110 |
| Foundation Enrollment | 156 | 149 | 141 | 138 | 143 | 132 | 141 | 146 | 118 | 116 | 118 | 117 | 105 | 98 | 100 | 111 |
| Out-of-District FTE Pupils | 7 | 5 | 7 | 10 | 9 | 13 | 9 | 12 | 13 | 16 | 18 | 15 | 16 | 18 | 19 | 18 |

NSS/Ch70 Funding Components (\$)

Table 75

| Component | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Ch70 Aid | \$616K | \$604K | \$569K | \$572K | \$585K | \$588K | \$594K | \$613K | \$620K | \$623K | \$627K | \$630K | \$630K | \$633K | \$639K | \$646K |
| Req NSS (minus Ch70) | \$668K | \$728K | \$660K | \$653K | \$697K | \$658K | \$689K | \$723K | \$624K | \$680K | \$669K | \$730K | \$712K | \$713K | \$719K | \$820K |
| Actual NSS (minus Req NSS) | \$676K | \$700K | \$826K | \$870K | \$854K | \$946K | \$1.0M | \$923K | \$1.1M | \$1.2M | \$1.2M | \$1.3M | \$1.3M | \$1.5M | \$1.3M | \$1.2M |
| Total NSS | \$2.0M | \$2.0M | \$2.1M | \$2.1M | \$2.1M | \$2.2M | \$2.3M | \$2.3M | \$2.3M | \$2.5M | \$2.5M | \$2.7M | \$2.6M | \$2.8M | \$2.6M | \$2.6M |

Appendix D. Additional Visualizations

Scatterplot of enrollment vs. per-pupil expenditure with quartile boundaries (2019)

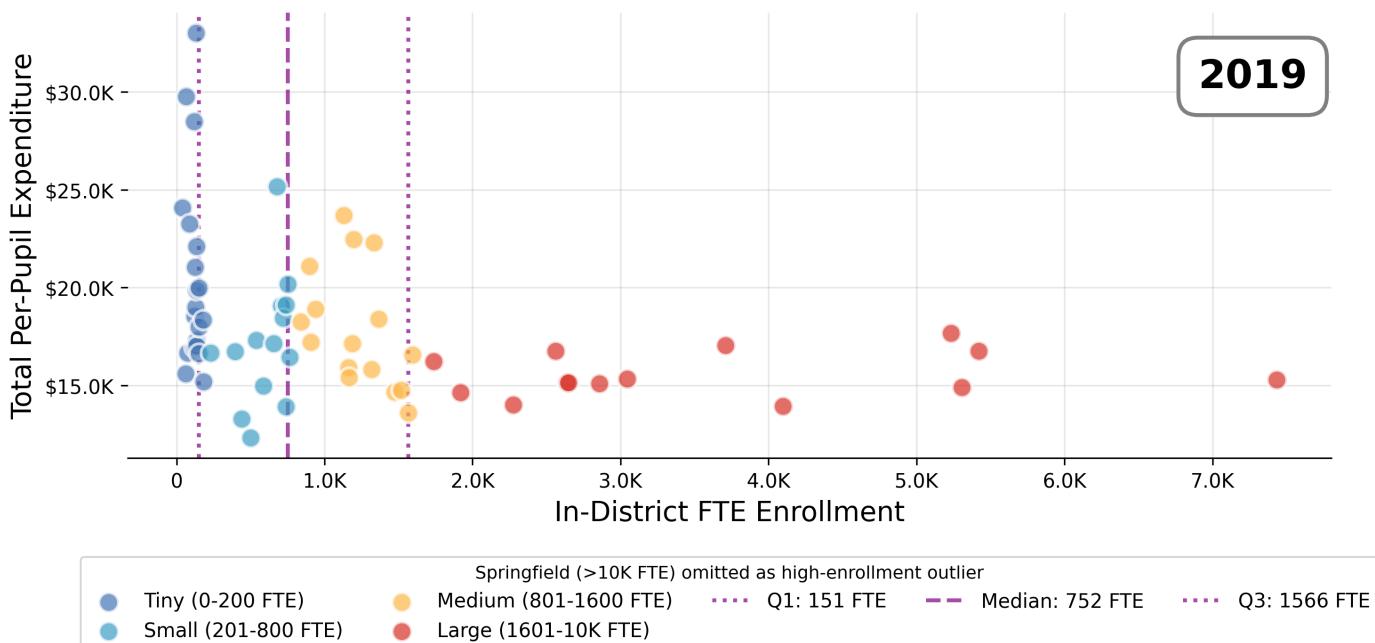


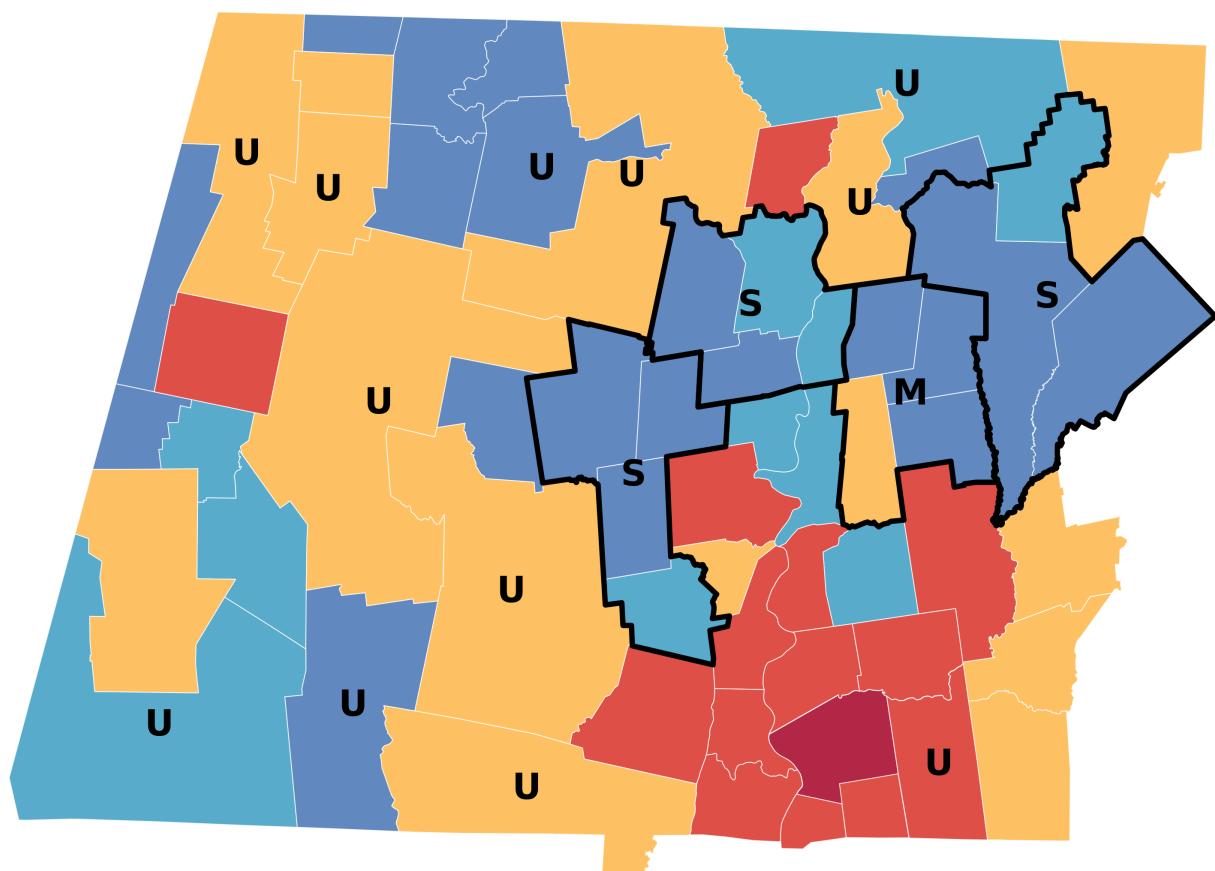
Figure 29

This appendix contains historical scatterplots and geographic maps showing the evolution of district enrollment and per-pupil expenditures over time. These visualizations provide context for understanding how enrollment patterns and spending levels have shifted across Western Massachusetts districts from 2009 to 2024.

This scatterplot shows the relationship between district enrollment (x-axis) and per-pupil expenditure (y-axis) for Western Massachusetts traditional districts in 2019. Each point represents one district, colored by enrollment cohort. Horizontal lines show quartile boundaries used to define cohorts.

Appendix D. Additional Visualizations (continued)

Geographic map showing district locations and enrollment cohorts (2019)



Enrollment Cohorts - 2019

- | | |
|--|---|
| Tiny (0-200 FTE): 20 district(s) | Secondary regional (black border) Cohort: T, S, M, L, XL |
| Small (201-800 FTE): 14 district(s) | U = Unified regional district (PK-12) |
| Medium (801-1600 FTE): 16 district(s) | |
| Large (1601-10K FTE): 14 district(s) | |
| Outliers (Springfield >10K FTE): 1 district(s) | |

Figure 30

This map situates the districts within their geographic context in Western Massachusetts. Districts are shaded according to their enrollment cohort: Tiny (blue), Small (light blue), Medium (yellow), Large (orange). Elementary and PK-12 districts that are associated with a single town appear as solid filled areas. PK-12 unified regional districts (marked with 'U') span across multiple towns. Secondary regional districts are bounded by a thick black border with a cohort letter indicator (T = Tiny, S = Small, M = Medium, L = Large) showing the enrollment cohort of the secondary regional district. Note a secondary regional district's underlying member districts may belong to different enrollment cohorts.

Appendix D. Additional Visualizations (continued)

Scatterplot of enrollment vs. per-pupil expenditure with quartile boundaries (2014)

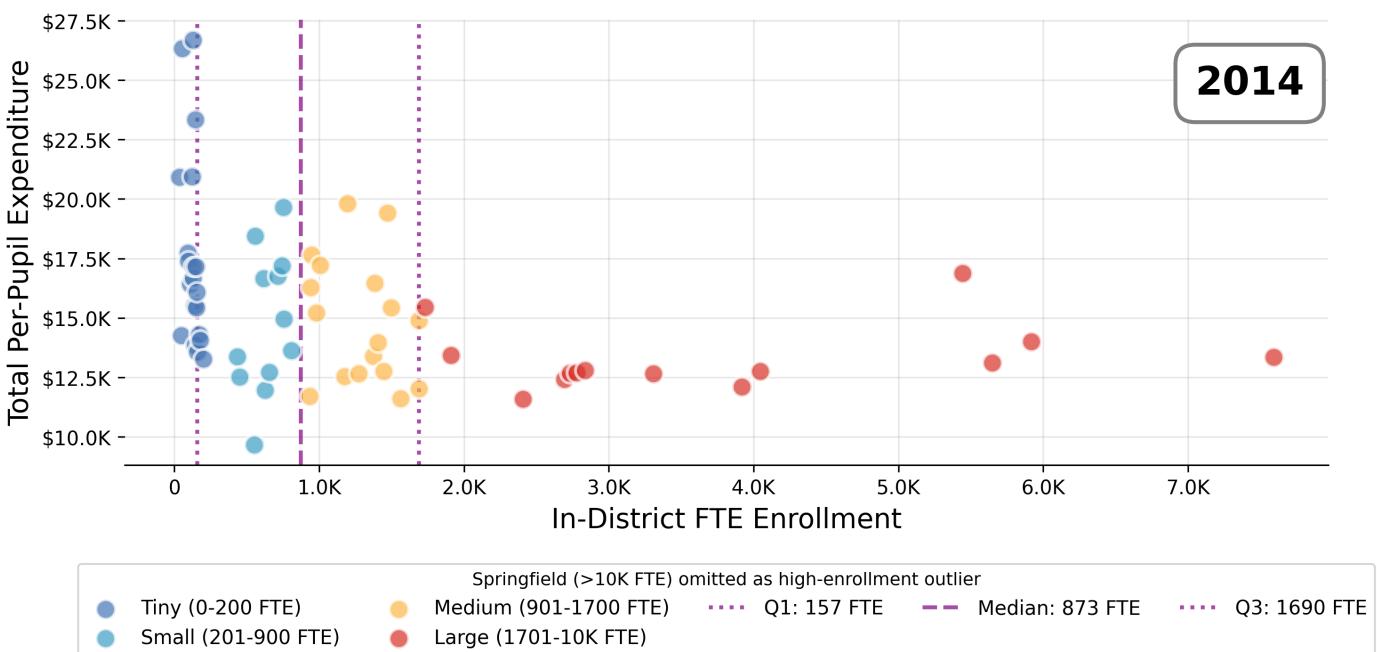
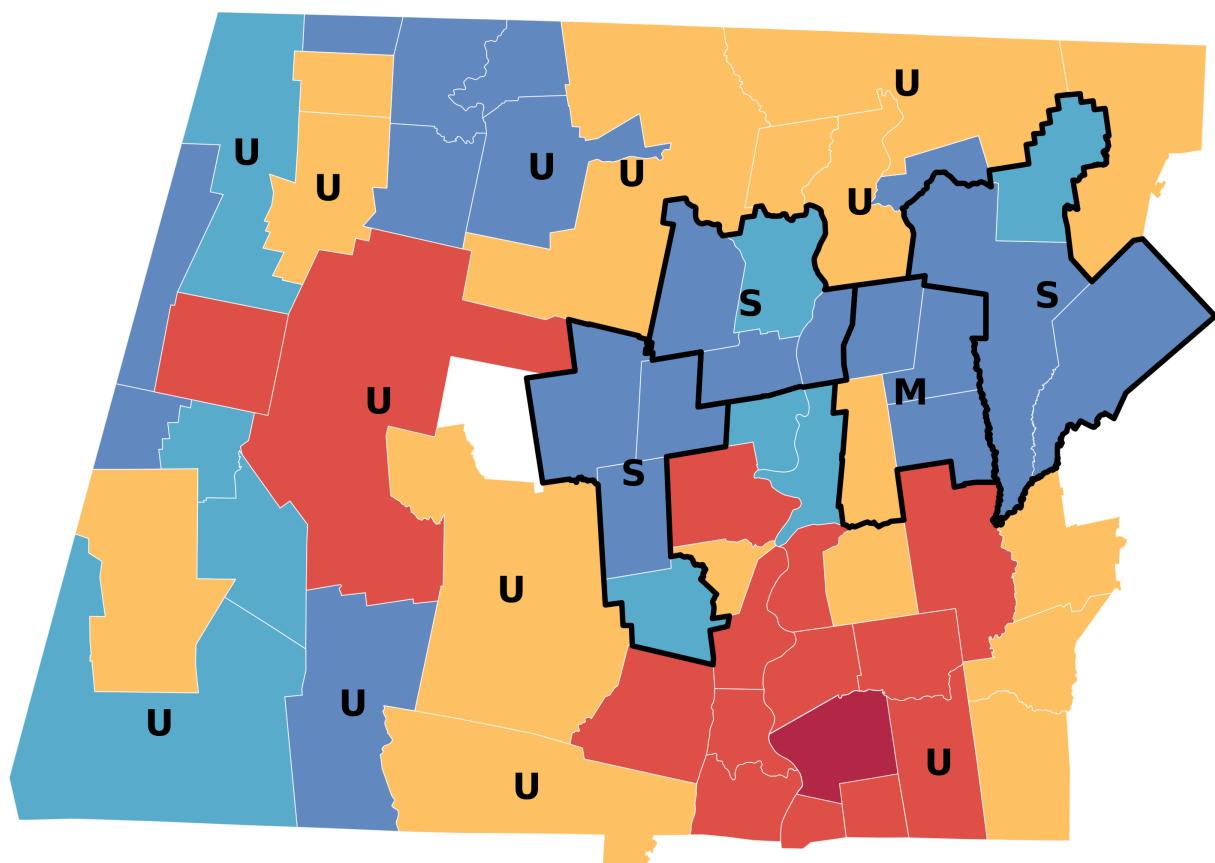


Figure 31

This scatterplot shows the relationship between district enrollment (x-axis) and per-pupil expenditure (y-axis) for Western Massachusetts traditional districts in 2014. Each point represents one district, colored by enrollment cohort. Horizontal lines show quartile boundaries used to define cohorts.

Appendix D. Additional Visualizations (continued)

Geographic map showing district locations and enrollment cohorts (2014)



Enrollment Cohorts - 2014

- | | |
|---|---|
| ■ | Tiny (0-200 FTE): 20 district(s) |
| ■ | Small (201-800 FTE): 12 district(s) |
| ■ | Medium (801-1600 FTE): 17 district(s) |
| ■ | Large (1601-10K FTE): 14 district(s) |
| ■ | Outliers (Springfield >10K FTE): 1 district(s) |
| ■ | Secondary regional (black border) Cohort: T, S, M, L, XL |
| ■ | U = Unified regional district (PK-12) |

Figure 32

This map situates the districts within their geographic context in Western Massachusetts. Districts are shaded according to their enrollment cohort: Tiny (blue), Small (light blue), Medium (yellow), Large (orange). Elementary and PK-12 districts that are associated with a single town appear as solid filled areas. PK-12 unified regional districts (marked with 'U') span across multiple towns. Secondary regional districts are bounded by a thick black border with a cohort letter indicator (T = Tiny, S = Small, M = Medium, L = Large) showing the enrollment cohort of the secondary regional district. Note a secondary regional district's underlying member districts may belong to different enrollment cohorts.

Appendix D. Additional Visualizations (continued)

Scatterplot of enrollment vs. per-pupil expenditure with quartile boundaries (2009)

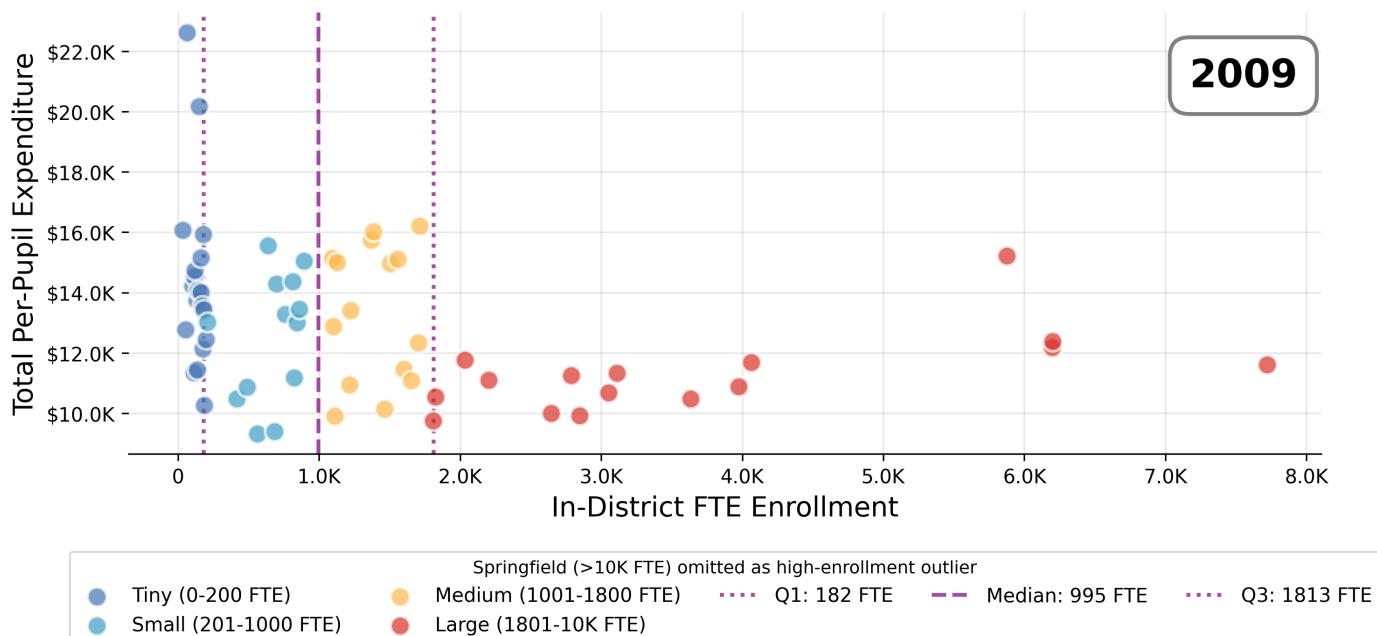
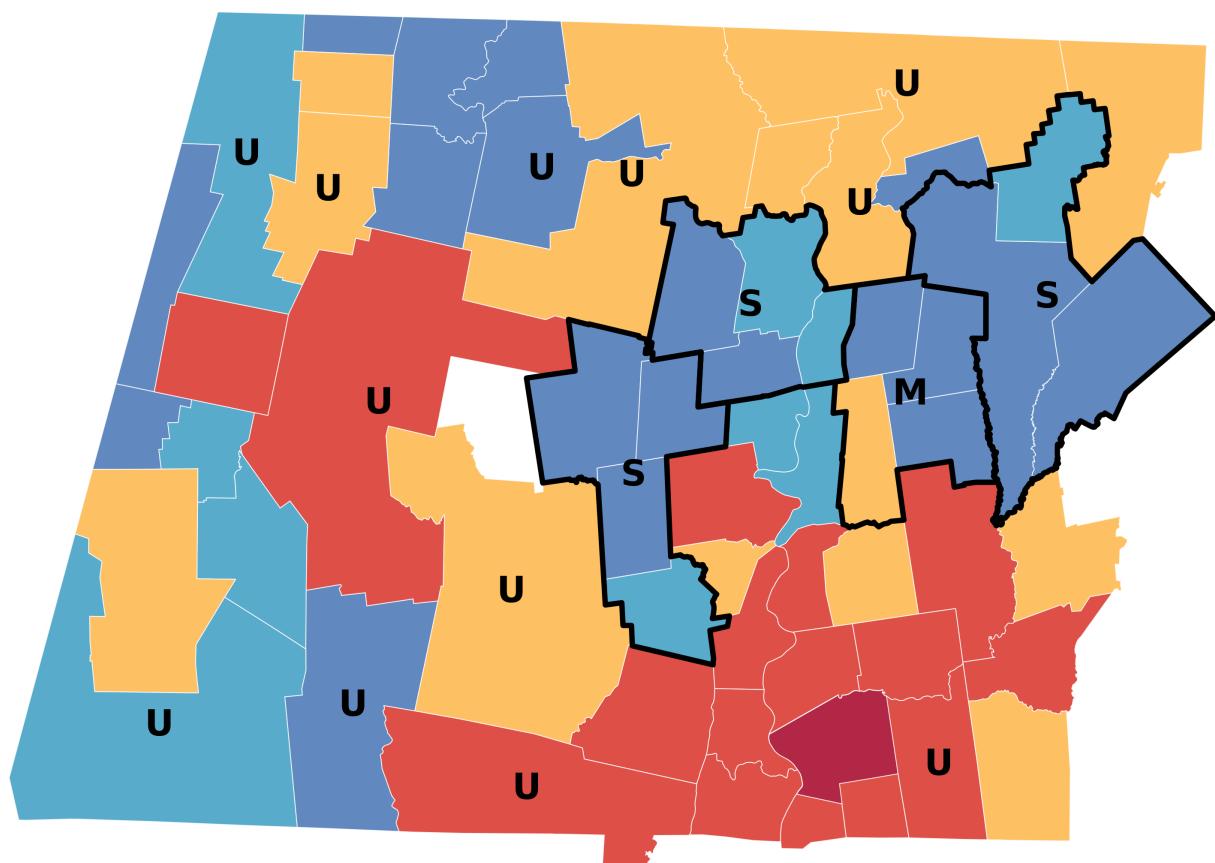


Figure 33

This scatterplot shows the relationship between district enrollment (x-axis) and per-pupil expenditure (y-axis) for Western Massachusetts traditional districts in 2009. Each point represents one district, colored by enrollment cohort. Horizontal lines show quartile boundaries used to define cohorts.

Appendix D. Additional Visualizations (continued)

Geographic map showing district locations and enrollment cohorts (2009)



Enrollment Cohorts - 2009

- | | |
|--|---|
| Tiny (0-200 FTE): 19 district(s) | Secondary regional (black border) Cohort: T, S, M, L, XL |
| Small (201-800 FTE): 13 district(s) | U = Unified regional district (PK-12) |
| Medium (801-1600 FTE): 15 district(s) | |
| Large (1601-10K FTE): 16 district(s) | |
| Outliers (Springfield >10K FTE): 1 district(s) | |

Figure 34

This map situates the districts within their geographic context in Western Massachusetts. Districts are shaded according to their enrollment cohort: Tiny (blue), Small (light blue), Medium (yellow), Large (orange). Elementary and PK-12 districts that are associated with a single town appear as solid filled areas. PK-12 unified regional districts (marked with 'U') span across multiple towns. Secondary regional districts are bounded by a thick black border with a cohort letter indicator (T = Tiny, S = Small, M = Medium, L = Large) showing the enrollment cohort of the secondary regional district. Note a secondary regional district's underlying member districts may belong to different enrollment cohorts.