

Urban and Rural Poverty and Student Achievement in Massachusetts

No. 86
April
2012

A Pioneer Institute White Paper

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PIONEER INSTITUTE
PUBLIC POLICY RESEARCH

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Urban and Rural Poverty and Student Achievement in Massachusetts

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Executive Summary

Despite being a relatively wealthy state, Massachusetts still has a significant share of its population living in poverty – approximately 600,000 people in the Bay State live below the poverty line. While low-income families are often concentrated in urban areas, rural areas also have deep pockets of poverty.

This paper explores the extent and distribution of poverty in Massachusetts's schools and then examines the performance of low-income-students in urban and rural areas.

Key Findings:

- Despite being a relatively high-income state, there are school districts with 40 percent of children living below the poverty line and 90 percent of students eligible for free or reduced price lunches.
- As expected, low-income students score lower on the MCAS than their higher-income peers.
- The achievement gap between high and low-income students is roughly the same size in urban and rural areas.
- Students of all incomes have improved their performance in the past 10 years, but the income gap has not narrowed significantly.
- Low-income rural students generally outperform low-income urban students, perhaps because urban students are poorer and more likely to speak languages other than English.
- The stronger performance of low-income rural students is a change from 10 years ago when poor rural students were further behind than poor urban students. In the past 10 years, low-income rural students have improved faster than low-

income urban students, both as measured with MCAS scores and rising graduation rates.

Introduction

Low-income students generally perform lower than students from higher-income families on a variety of measures of educational success. Hundreds of studies have documented the achievement gaps for low-income students, which exist in Massachusetts as well as the rest of the country.¹

Recent research has shown that the income gap has been growing for generations, and that low-income students begin school behind their higher-income peers and that the gap does not shrink as students move through school.² Other research has attempted to explain why poor students perform lower. Many studies have found that some of the potential causes for the gap are that schools in low-income areas have fewer resources, higher turnover, and less experienced teachers.³

When policymakers think about poverty and its effect on student achievement, they often focus on students living in urban areas. However, poverty is not exclusively an urban problem; some rural areas of Massachusetts also suffer from poverty. This paper begins by reviewing the extent of urban and rural poverty in Massachusetts; it then evaluates the impact of poverty in both areas on student performance and explores how the performance gap has changed over time.

Income and Poverty in Massachusetts

Massachusetts is a relatively wealthy state. Median household income in 2009 was \$59,400, roughly \$9,600 or 19 percent above the United States median and high enough

to rank 8th among the states.⁴ Massachusetts also has fewer low-income households than other states: approximately 20 percent of households in Massachusetts have income below \$25,000, compared to 24 percent of households nationwide.

Table 1: Household Income in Massachusetts, 2009

	Median Household Income	Households with income < \$25,000
Massachusetts	\$59,400	20%
United States	\$49,800	24%

The federal government defines poverty lines based on family size.⁵ The government uses these measures both to determine how many people live in poverty, and to determine eligibility for some federal programs.

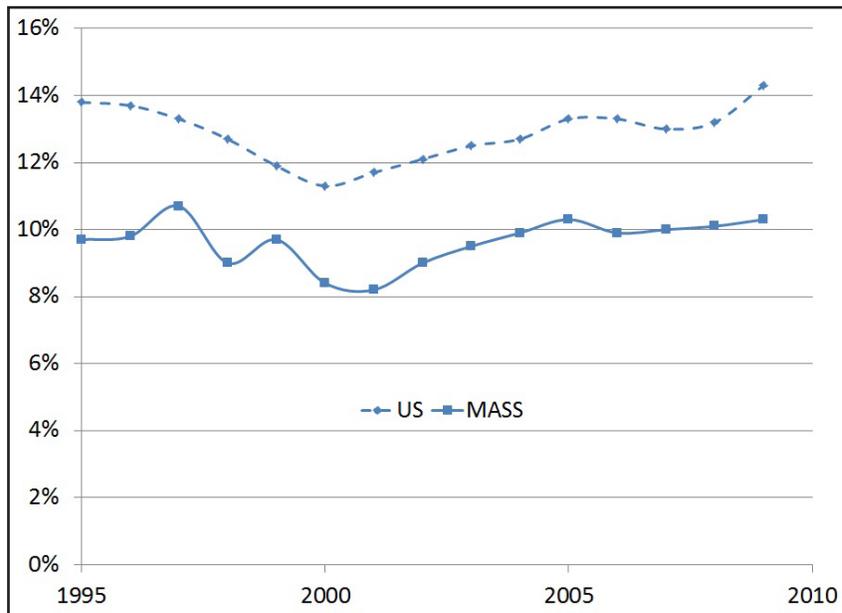
The United States Census Bureau gathers data on income and poverty in several surveys.⁷ The figures from these surveys differ somewhat, but all present similar

Table 2: 2009 Poverty Line⁶

Persons in Family	Income
1	\$10,830
2	14,570
3	18,310
4	22,050
For each additional person	3,740

pictures of poverty in Massachusetts. Despite Massachusetts' relatively high-income, a large number of people still live in poverty. According to the Census Bureau, roughly 10 percent of the Massachusetts population fell below the poverty line in 2009. In comparison, the nationwide average is 14 percent and only 10 states had a smaller percentage of people living in poverty than Massachusetts. As Figure 1 illustrates, the poverty rate in Massachusetts over the past 15 years has generally been about 3 percent to 4 percent percentage points below the poverty rate for the country.

Figure 1: Poverty Rates for Massachusetts and US, 1995 - 2009⁸



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Who Lives in Poverty in Massachusetts?

The poverty rate varies significantly depending on several characteristics:

- Single parent households are eight times as likely to fall below the poverty line as two parent households.
- Spanish speaking households are three times as likely to fall below the poverty line as English speaking households.
- Women are slightly more likely to live below the poverty line, in large part because they are more likely to head single parent households.
- Children are more likely to live in poverty than adults.

Poverty levels for children also vary significantly across the state. Table 3 shows the estimated poverty rates for all residents and also for school aged children between 5 and 17 years old, by county. The highest

poverty rates are in Suffolk and Hampden counties, home to Boston and Springfield, where roughly one out of four school-aged children is below the poverty line.

While the urban counties containing Boston and Springfield have the highest poverty rates, the county level data mask large variations in school districts within counties. For example, in Berkshire County the overall poverty among school age children is 15 percent, but the rate varies from only 2 percent in Richmond to over 30 percent in North Adams. Similarly, in Franklin County the 14 percent average includes rates that vary from 5 percent in Conway to 21 percent in Greenfield.

Figure 2 shows the percentage of children between 5 and 17 living in poverty in school districts across the state. While urban areas contain the highest shares of poor children,

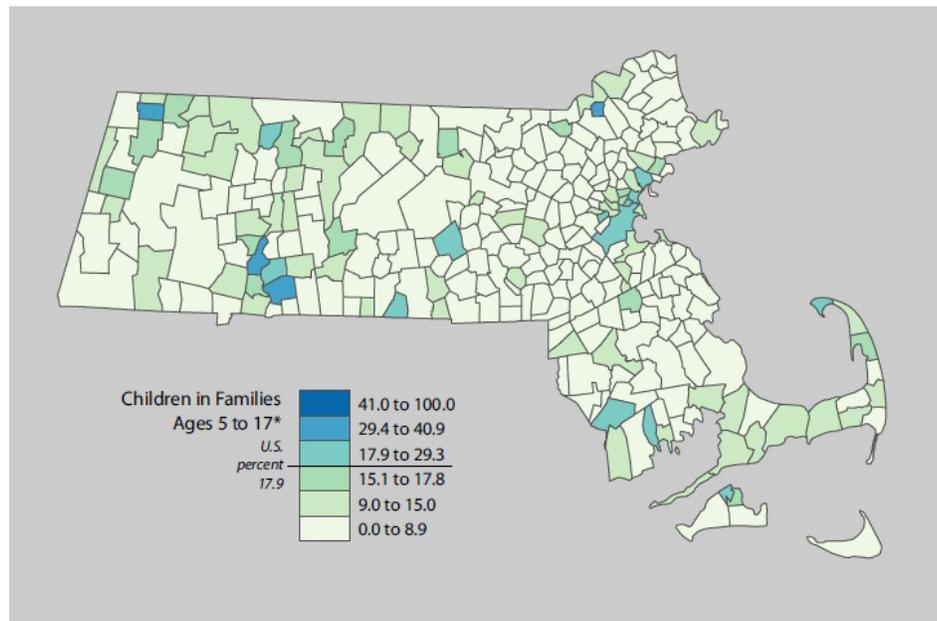
Table 3: Poverty by County, 2009

Area	All Residents	Children 5 to 17
Massachusetts	10%	12%
Barnstable	8%	12%
Berkshire	12%	15%
Bristol	11%	14%
Dukes	8%	11%
Essex	11%	13%
Franklin	13%	14%
Hampden	17%	23%
Hampshire	11%	10%
Middlesex	7%	7%
Nantucket	7%	6%
Norfolk	6%	6%
Plymouth	7%	8%
Suffolk	17%	25%
Worcester	9%	11%

Table 4: Max and Min Poverty by School District in Each County (Small Area Income and Poverty Estimates (SAIPE)), 2009

Area	Children 5 to 17 Years Old		
	County Total	Maximum	Minimum
Massachusetts	12%	39%	2%
Barnstable	12%	20%	5%
Berkshire	15%	31%	2%
Bristol	14%	26%	4%
Dukes	11%	18%	3%
Essex	13%	30%	2%
Franklin	14%	21%	5%
Hampden	23%	39%	3%
Hampshire	10%	16%	3%
Middlesex	7%	18%	2%
Nantucket	6%	NA	NA
Norfolk	6%	14%	2%
Plymouth	8%	15%	3%
Suffolk	25%	28%	11%
Worcester	11%	20%	2%

Figure 2: Children 5 to 17 in Poverty, by School District (SAIPE), 2009



there are also pockets of poverty in rural communities.

Counting Low-Income Students

The previous section explored measures of poverty among adults or children in a county, but this paper will explore the performance of low-income *students* in Massachusetts. There are two ways to estimate the number of low-income students in an area (as opposed to the number of low-income residents or families).

The most commonly used method is to focus on whether students are eligible for free or reduced price lunches (FRPL) at school. FRPL eligibility is based on family income: to be eligible for a free lunch students must live in a family with income below 130 percent of the poverty level, while for a reduced price lunch they must live in a family with income below 180 percent of the poverty level. An alternative to FRPL status is to use Census estimates of the number of school-aged children in poverty in each school district (the source for the data in the map above). The FRPL data have several important

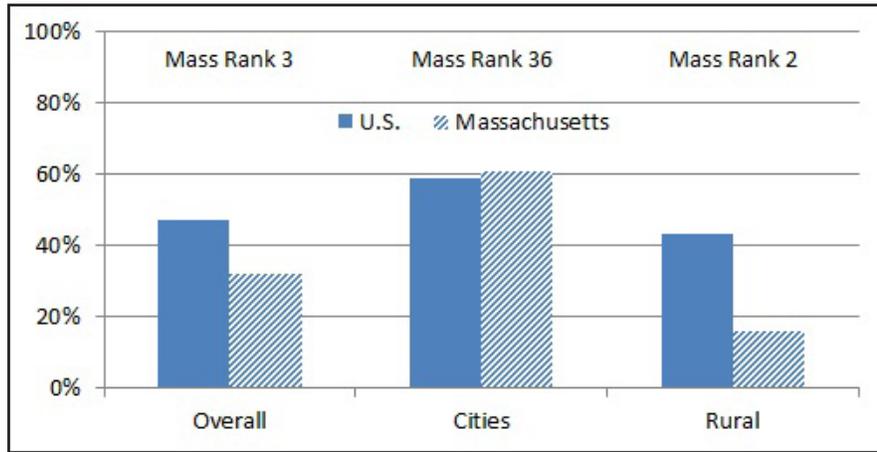
advantages and will be the primary measure used in this paper. However, the Census data can be used to check the accuracy of the FRPL data. The differences between the measures are explained in Appendix A.

How Does the Number of Low-Income Students in Massachusetts Compare to Other States?

As stated above, Massachusetts is a relatively high-income state. According to the National Center for Education Statistics, during the 2009 – 2010 school year 32 percent of preK – 12th grade students in Massachusetts qualified for free or reduced price lunches, which was the 3rd lowest rate in the country. The two states with the lowest percentages of students eligible for FRPL were also in New England, with New Hampshire having the lowest rate in the country (24 percent) and Connecticut the 2nd lowest (32 percent). The FRPL eligibility levels are slightly lower than we might have expected based on the Census poverty estimates, which showed that Massachusetts had the 8th lowest poverty rate in the country.

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Figure 3: FRPL Eligibility, Massachusetts and US



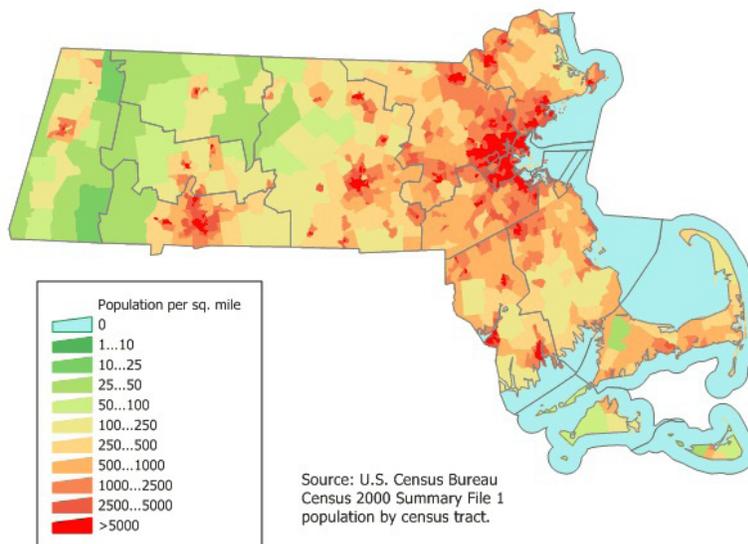
While Massachusetts has very low levels of FRPL eligibility compared to other states, the distribution of poverty within Massachusetts is different than in the rest of the country (Figure 3). Cities in Massachusetts have slightly higher than average shares of students receiving FRPL – the rate for cities in Massachusetts is higher than in 35 other states, including states such as California and Texas which are often considered to have poor urban areas. At the same time, rural areas in Massachusetts have much lower levels of poverty than rural areas in other parts of the country; the share of rural students eligible for FRPL in Massachusetts is the 2nd lowest in the country.

Poverty in Urban and Rural Areas

A central aim of this paper is to evaluate low-income student performance in urban and rural areas. Unfortunately there is no clear-cut definition of what constitutes an urban area or a rural area, and any distinction will be somewhat arbitrary.

Figure 4 shows the population density across Massachusetts. Comparing this to Figure 2 reinforces the point that while the largest clusters of poor students center around cities such as Boston and Springfield, there are also areas of high poverty in low density areas of central and western Massachusetts in Berkshire, Franklin, and northern Worcester counties.

Figure 4: Population Density



One approach to distinguishing between urban and rural areas could be to count all cities in Massachusetts as urban. However, the list of cities includes municipalities such as Greenfield and Newburyport that most people would not consider urban. Another approach would be to use more objective measures of factors such as population, population density, and how much commercial or industrial property there is in an area. Each of these measures is incomplete on its own – e.g. Arlington has a high population density but is almost entirely residential, and some of the areas with the highest percentage of commercial and industrial property in the state are small towns in Franklin County with fewer than 1,000 residents.

To segregate urban areas, this paper focuses on the top 20 cities on an index that combines population, population density, and the share of property value from commercial and industrial property. These cities each have their own school district, and the 20 districts classified as urban contain about 245,000 students – 26 percent of the state total. The cities that fall just below the cut-off are Woburn, Chicopee, and Holyoke.

The distinction between suburban and rural also poses a problem. This paper designates as rural the lowest density towns in the western counties of Berkshire, Franklin, Hampden, Hampshire, or Worcester. The resulting lists of urban and rural areas are listed in Appendix B. Many of these rural towns are part of regional districts, and in total this categorization results in 87 rural districts serving 104,000 students, or 11 percent of the state total. The towns that fall just outside the cutoff (and are not classified as rural) are Northampton, Southbridge, and Westfield.

The remainder of this paper uses the urban/rural designation described above. As the tables below show, the two poverty measures paint similar pictures of urban and rural poverty in Massachusetts. The urban school districts have poverty levels about twice the state average and about three times as high as rural districts, regardless of which poverty measure is used. Rural areas have an average poverty rate almost the same as districts that fall into neither the urban or rural categories. This differs from other states, where rural areas often have many more low-income students than suburban areas.

Table 5: Rural and Urban School Poverty

Area	Poverty Among Children 5 to 17, Census	FRPL %	Enrollment	FRPL Students
Urban	22%	70%	245,000	171,000
Rural	8%	20%	104,000	21,000
Other	7%	20%	608,000	123,000
Total	12%	33%	957,000	315,000

In total, the state has about 315,000 students eligible for free and reduced price lunches. The 20 urban districts serve 26 percent of the students but have high poverty levels (70 percent FRPL) and contain 54 percent of all the students eligible for FRPL.⁹ The rural districts serve 11 percent of the students but only 7 percent of the low-income students.

According to the Census estimates, the district with the highest concentration of poor children is Holyoke with 39 percent of children living below the poverty line, and 74 percent of the students in Holyoke are eligible for FRPL. The Census data also show that 28 percent of the children in Chelsea are living

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below the poverty line, and it is the district with the highest share of students eligible for FRPL (with 91 percent).

Table 6: Extremes of Rural and Urban Poverty

Area	Poverty Among Children 5 to 17, Census		Free and Reduced Price Lunch	
	Min	Max	Min	Max
Urban	9%	32%	28%	91%
Rural	2%	31%	0.1%	62%
Other	2%	39%	1.5%	74%
State Total	2%	39%	0.1%	91%

Although rural and the “other” areas have similar average levels of poverty, even the poorest rural areas have lower numbers of FRPL students than urban or suburban areas. The rural districts with the highest poverty levels are listed in the table below. Even though Massachusetts rural areas have lower levels of poverty than rural areas in other states, the high percentages of students eligible for FRPL in these districts illustrates that poverty, at least as defined by FRPL status, is not only an urban phenomenon.

Table 7: Highest Poverty Rural Districts

District	FRPL Students
Greenfield	62.4%
North Adams	57.5%
Gill Montague	52.0%
Ware	51.3%
Orange	49.4%
Athol-Royalston	49.2%
Hawlemont	45.0%
Ralph C. Mahar	44.5%
Florida	43.5%
Winchendon	41.9%

Rural poverty differs in some respects from urban poverty. According to the Census data, poor families and children in urban areas are more likely to be immigrants and non-white than those in rural areas. Also, poor urban adults have lower levels of education than those in rural areas, while in rural communities a slightly larger share of the poor are over 65.

Urban districts not only have higher numbers of low-income and non-English speaking students than rural districts – they also face other challenges. According to DESE data, students in urban districts miss 50 percent more school days than rural students and are suspended twice as often.

Table 8: Average Absences and Suspensions, Urban vs. Rural

	Urban	Rural
Average Absences	12.1	8.5
Suspensions per student	0.14	0.07

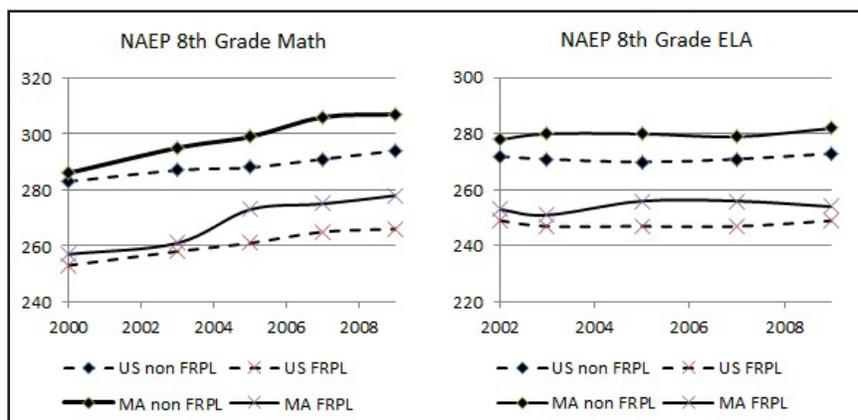
Student Performance: The Gap for Low-Income Students

As stated previously, low-income students generally perform worse than other students on a variety of achievement measures. The following sections examine the performance of low-income students on several measures of student achievement, and then turn to the question of whether urban and rural low-income students differ and how performance has changed over time.

The National Assessment of Educational Progress

Students from Massachusetts have performed extremely well on the National Assessment of Educational Progress (NAEP), outscoring their peers in every other state in both reading

Figure 5: NAEP Scores by FRPL Eligibility, 2000 - 2009



and math in both 4th and 8th grades in 2007 and again in 2009.

Figure 5 shows 8th grade NAEP math and reading scores over the past decade for Massachusetts and for the entire country (since 2000 for math and since 2002 for reading). The scores are reported separately by eligibility for free and reduced price lunches. The graphs illustrate several important points:¹⁰

1. Not surprisingly, low-income students perform worse than high-income students on both reading and math tests, and the size of the performance gap is roughly the same in Massachusetts as it is nationwide.
2. Massachusetts outperforms the rest of the country, both among low-income students and higher-income students.
3. Student performance has shown steady improvement on the NAEP math test but been relatively flat on the reading test. This is true in both Massachusetts and the rest of the country, although scores in Massachusetts have improved faster.
4. The performance gap for low-income students has not changed significantly in Massachusetts or the US as a whole.

The NAEP also provides data that measure whether rural poverty affects students differently than poverty in cities. In 2009, rural students across the country outscored students in cities. Low-income urban students performed slightly lower than low-income students in rural areas, both as measured directly (15 percent proficient vs. 19 percent) or when compared to their higher-income neighbors (a gap of 30 percent vs. a gap of 23 percent). The NAEP does not allow a breakdown of urban and rural performance for Massachusetts.

Table 9: NAEP 4th Grade Reading percent Proficient, by Income and Urban Status, 2009¹¹

	Low Income	Non-Low Income	Gap
City	15%	45%	30%
Suburb	19%	48%	29%
Town	17%	41%	24%
Rural	19%	42%	23%
Total	17%	45%	28%

MCAS

Table 10 presents data on MCAS performance for 2011. Just as in the NAEP, low-income students in Massachusetts scored below average on both reading (English Language

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Arts, or ELA) and math tests. The gap in 4th grade was slightly larger in ELA than in math, while by 8th grade the gap was larger in math. The reason that the gap shrank on the ELA test was that low-income students improved on the ELA test more than non-low-income students improved. The extremely large improvement on ELA exam between 4th and 8th grade, particularly for low-income students, shows up repeatedly in the MCAS data but does not show up in the NAEP data.

Table 10: MCAS Reading and Math Percent Proficient or Above, 2011

	Overall Average	Low Income	Non-Low Income	Gap
4th Grade Reading	53%	32%	65%	33%
4th Grade Math	47%	28%	58%	30%
8th Grade Reading	79%	62%	88%	26%
8th Grade Math	52%	30%	64%	34%

The large improvement on the MCAS ELA exams between 4th and 8th grade could potentially be caused by a lower bar for proficiency in 8th grade. Table 11 shows the percentage of students scoring advanced (rather than proficient or above). The improvement between 4th and 8th grade is much smaller on the ELA test (although it was larger on the math test), and the income gap on both exams was larger in 8th grade than in 4th grade. These results mirror the

Table 11: MCAS Reading and Math Percent Advanced, 2011

	Overall Average	Low Income	Non-Low Income	Gap
4th Grade Reading	10%	3%	14%	11%
4th Grade Math	15%	6%	20%	14%
8th Grade Reading	20%	7%	27%	20%
8th Grade Math	23%	9%	31%	22%

Table 12: MCAS Percent Proficient or Above, 2011, Urban vs. Rural

	Overall Average	Urban	Rural	Other
4th Grade Reading	53%	34%	53%	61%
4th Grade Math	48%	31%	47%	54%
8th Grade Reading	79%	63%	82%	85%
8th Grade Math	52%	33%	52%	59%

patterns in the entire country, where low-income students do not close the gap as they move through school.

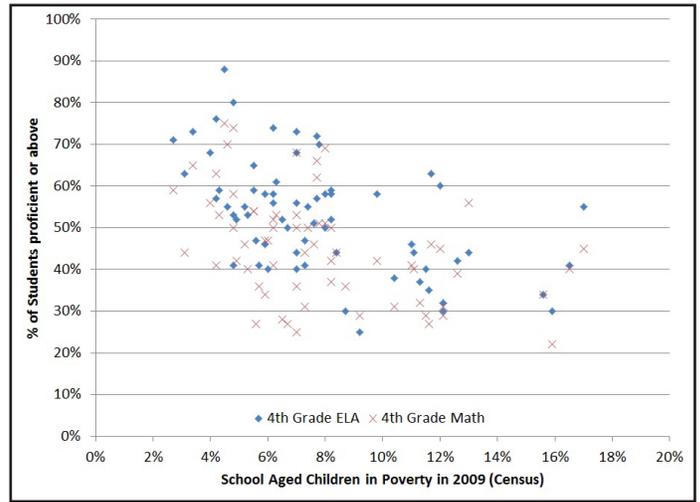
As Table 12 shows, students in urban areas scored below the state average, while rural students performed about as well as the statewide average. These results are broadly similar to those on the NAEP. Considering that rural areas in Massachusetts have lower shares of low-income students than the state as a whole, we might have expected stronger performance from rural students.

Low-Income Student Performance in Urban and Rural Areas

To this point, this paper has primarily compared the overall performance of low-income students with their peers, without distinguishing between urban and rural areas. We now explore whether the performance gap is the same in different areas.

According to the Census data reported in Table 6, the share of school-aged children living in poverty in the urban districts varies from 9 percent to 32 percent. Because the Census data only include the average estimated income for the district, we cannot directly examine the performance of low-income students. However, we can explore whether districts with a larger share of low-income students perform lower than wealthier districts.

Figure 7: Poverty vs. 4th Grade MCAS Scores in 2010, Rural Districts



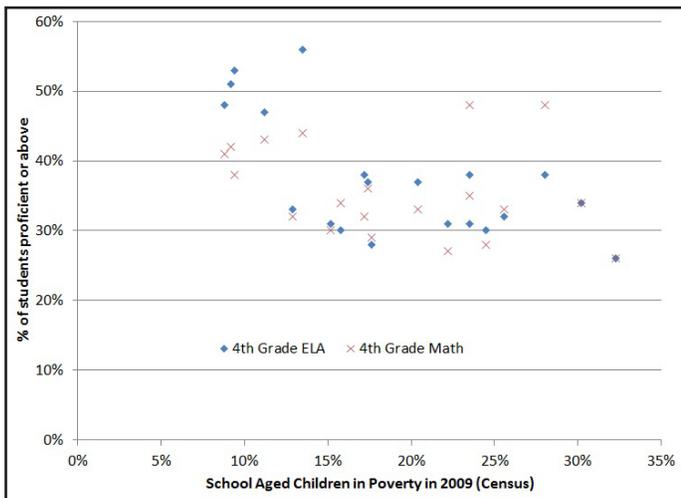
The scores in the two graphs above are for all students in the districts and are based on the United States Census poverty estimates. The FRPL has the important advantage that the Department of Elementary and Secondary Education reports scores separately for low-income students using FRPL eligibility, meaning that their performance can be directly analyzed. As Table 10 illustrated, low-income students were only half as likely to score at or above proficient on the MCAS as their higher-income counterparts.

The tables and graphs below break scores down by FRPL status for urban and rural areas. There are several ways to interpret the results, with some conflicting or ambiguous patterns.

Figure 8 illustrates the performance of low-income students and their higher-income peers in rural and urban districts, as well as the performance gap. In urban districts, the percentage of low-income students scoring proficient or above on the MCAS in 4th grade is 22 – 26 points less than the percentage of higher-income students who scored proficient or above. Meanwhile, low-income rural students were 22 – 25 percentage points

Figure 6 shows the percentage of students in each urban district who scored proficient or above on the 4th grade MCAS tests in 2010 compared to poverty in the district. If the district’s poverty were strongly related to test scores, we would expect to see the results clustered in a downward sloping pattern. For the ELA test higher-income districts tend to have somewhat higher scores, but there is less visible relationship on the math exam. A more rigorous test is to measure the correlation between test scores and poverty rates, which is strong for ELA scores (correlation of 0.7) and somewhat weaker for math scores (0.3).¹²

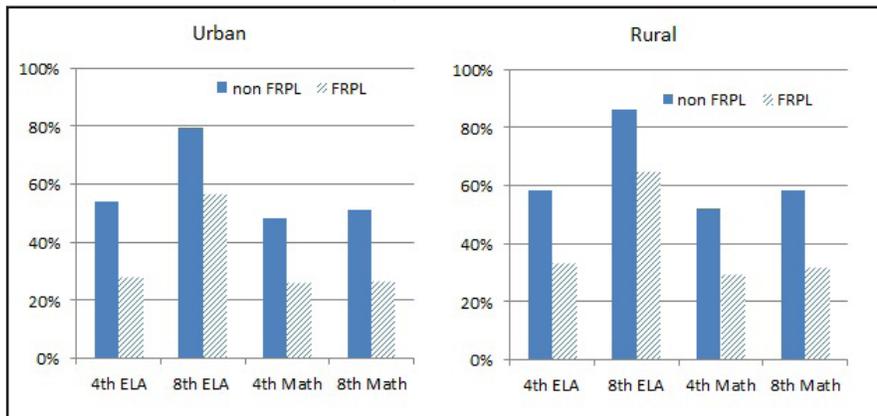
Figure 6: Poverty vs. 4th Grade MCAS Scores in 2010, Urban Districts



The connection between the number of school-aged children in poverty and student performance is illustrated by Figure 7. While the districts with the highest performance are low-poverty districts, high poverty districts appear to perform no worse than districts with moderate poverty rates. The correlation coefficient is lower in rural areas for ELA scores (0.5) but somewhat stronger for math scores (0.4).

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Figure 8: Percent Proficient or Above by FRPL Eligibility on 2011 MCAS, Urban and Rural¹³



behind their higher-income classmates; i.e. the performance gap in 4th grade was almost exactly the same for urban and rural students. While the gap is the same size, the higher-income students in urban areas scored slightly lower than those in rural areas.

By 8th grade the low-income students have reduced the gaps slightly on ELA exams but it has gotten bigger on math exams. Again, the pattern is almost the same in urban and rural areas.

Figure 9 illustrates the changes in the performance gap from 2001 to 2011. In urban areas, the gap grew on three out of the four MCAS tests – low-income urban students fell slightly farther behind their higher-income peers.

In contrast, in rural areas the gaps shrank on three out of four tests. The change on the 8th grade ELA test for rural areas was particularly dramatic and was caused by the large improvement in 8th grade scores that was discussed previously. Even if the results on the 8th grade ELA are excluded, the gap in rural areas shrank slightly in the past 10 years.

There are at least two potential explanations for the shrinking performance gap in rural areas: low-income students could have improved their performance, or the scores of higher-income students could have fallen. Figure 10 illustrates the changes in performance from 2001 to 2011 by income, in urban and rural areas.

Figure 9: Performance Gap 2001 to 2011, Urban and Rural

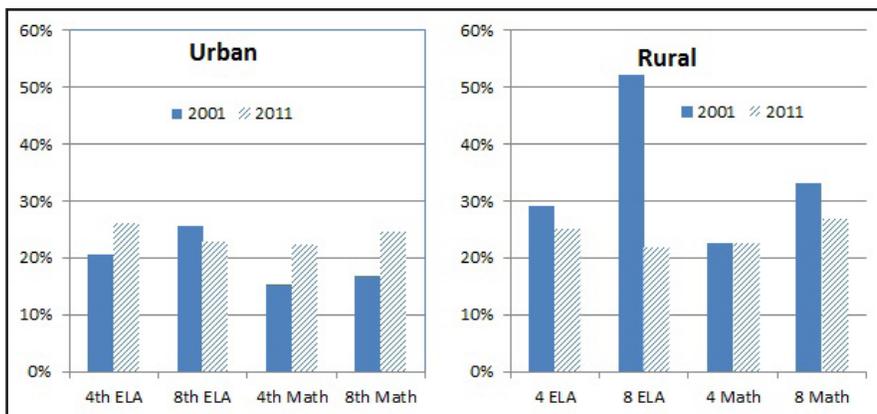
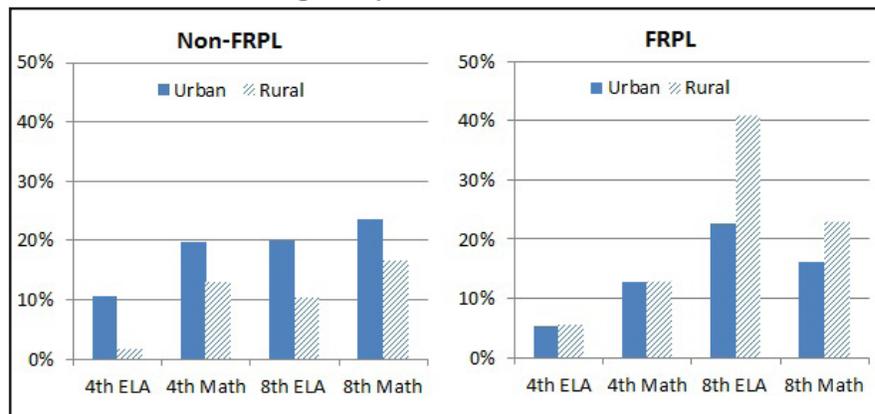


Figure 10: Changes in Performance 2001 to 2011 by FRPL Eligibility, Urban and Rural



The most notable takeaway from Figure 10 is that the performance of every group of students improved – both urban and rural, both low-income and higher-income. Another noticeable pattern is that higher-income urban students improved more than their rural counterparts on every exam. In contrast, low-income rural students improved more than low-income urban students (particularly in 8th grade), helped in part by the unusually large improvement on the ELA exam.

In contrast to the figures above, Table 13 directly compares low-income urban and rural students with each other instead of with higher-income students. It shows that low-income rural students outperformed their urban peers on every test in 2011. This is not surprising given that low-income rural families are not as poor as those in urban areas and are more likely to speak English.

Table 13: Percent of Low-Income Students Proficient or Above on 2011 MCAS

	Urban	Rural	Difference (rural – urban)
4th Grade ELA	28	33	5
4th Grade Math	26	30	4
8th Grade ELA	57	65	8
8th Grade Math	27	33	6

Overall in 2011, poor rural students performed slightly better than poor urban students, particularly on the ELA exams. At the same time, the gap between low-income and higher-income students was roughly the same in urban and rural areas because higher-income rural students performed better than higher-income urban students.

Table 14: Performance of Low-Income Students, Urban and Rural, 2001 to 2011

	Urban		Rural		Gap: Rural – Urban	
	2001	2011	2001	2011	2001	2011
4th Grade ELA	23	28	27	33	4	5
4th Grade Math	13	26	17	30	4	4
8th Grade ELA	34	57	24	65	-10	8
8th Grade Math	10	27	9	33	-1	6

The pattern was virtually identical for 4th grade students in 2001 (see Table 14) – low-income rural students scored slightly above urban students. However, on the 8th grade MCAS exams the low-income rural students started out behind in 2001 but had improved enough by 2011 to score better than urban students.

While low-income urban students seemed to be falling slightly behind their rural counterparts, it is worth repeating that the

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Table 15: Change in Graduation Rates for Low-Income Students, 2006 to 2010¹⁴

	Urban			Rural			Gap: Rural - Urban	
	2006	2010	Change	2006	2010	Change	2006	2010
Graduation Rate	59.2%	61.9%	2.7%	62.5%	69.2%	6.7%	3.3%	7.3%

overall performance of all low-income students – urban and rural – improved on all four MCAS exams.

Graduation Rates

The pattern with graduation rates is similar to the pattern of MCAS scores. As expected, low-income students across the state are less likely to finish high school, and rural students overall have higher graduation rates than urban students. Table 15 shows that low-income students in rural areas had only a slightly higher graduation rate than low-income urban students as recently as four years ago. Since then, low-income rural students improved more rapidly than urban students (just as they did on MCAS). This mirrors the pattern on the 8th grade MCAS; both groups improved, but the low-income rural students improved more than urban students.

Conclusion

While Massachusetts is a relatively wealthy state, it still has large numbers of people living in poverty. Poverty is often concentrated in urban areas, but it is not solely an urban problem. Rural areas in Massachusetts have less poverty than the cities and lower poverty rates than rural areas in the rest of the country. However, many rural towns in Massachusetts nevertheless have large numbers of poor students – more than 50 percent of students are eligible for free or reduced price lunches in several districts.

As expected, low-income students have lower test scores and graduation rates than non-low-income students, both in rural areas

and urban areas. In 2011 the performance gap by income was roughly the same in urban and rural areas.

When evaluating changes in MCAS scores over time, the most striking result is that scores have improved both for high and low-income students, and in both urban and rural areas.

One interesting pattern in the data is that low-income rural students have improved more rapidly than low-income urban students, both on the MCAS and with rising graduation rates. While all students (both high and low-income, both urban and rural) have improved their performance, low-income rural students have made slightly larger gains than low-income urban students and modestly reduced the performance gap.

The improvement among low-income rural students stands in contrast to recent research showing that the gap between rich and poor students in the United States has been growing. The performance of low-income students in urban areas of Massachusetts follows this trend – the achievement gap has grown slightly in the past ten years and does not appear to shrink between 4th and 8th grade. However, there is some evidence that low-income rural students have improved faster and may be narrowing the gap.

Appendix A: Comparison of Poverty Measures

As stated above, there are two sources for estimates on the number of low-income students in a district: the Census, and the free and reduced price lunch figures.

The two methods have several important differences. Most importantly, FRPL status is available for individual students, which means it can be used to separate the performance of low-income students from higher-income students. In contrast, the Census estimates are available only for school districts. The availability of extra detail is a large advantage to using FRPL data.

Another difference is that the two measures use different thresholds – the Census data measure the number of children below the poverty line, while the FRPL data measure the number below 180 percent of the poverty line. This would of course lead to larger estimates of the number of low-income students using the free lunch data. The Census does not provide estimates of the number of children who qualify for FRPL for each district, but we can use estimates of the share of children below the poverty line to predict the number who have income below 180 percent of the poverty line and would be eligible for FRPL. The number of children eligible for FRPL in any district should be roughly twice as high as the number below the poverty line (e.g. for every 100 children below the poverty line there should be roughly 200 eligible for FRPL).

A third difference is that the Census data provides poverty estimates for all school-aged children who live within a district's boundaries, but not necessarily for the students who actually attend school in the

district. In other words, if a large number of local children do not attend local schools, the figures will not match up. Because higher-income families are more likely to send their children to private schools, we might expect higher percentages of low-income students in public schools than the Census data would suggest.

A final difference is that data on family income is collected in different ways. The Census estimates rely on annual surveys and statistical modeling. An advantage of this method is that respondents presumably have little incentive to under or overstate their income. A disadvantage is that the figures are estimates with a margin of error, particularly in small areas. In contrast, the FRPL data relies on families applying to school districts. This means that the FRPL figures are complete counts rather than estimates.

FRPL data may overstate poverty because districts have incentive to ensure that as many students as possible are eligible for FRPL (because the FRPL program brings funding not only for food but also other types of aid to schools). Similarly, families may wish to understate their income to claim benefits. On the other hand, families may refuse to apply for FRPL if they feel that there is a stigma attached to children who receive free lunches, which would mean that the FRPL figures understate the number of poor children.

As stated above, based on Census figures for the distribution of income, the number of students eligible for FRPL should be approximately twice the share who are living in poverty. Census surveys show that about 12 percent of children between 5 and 17 years old lived in poverty in Massachusetts in 2009, meaning that roughly 25 percent of school-aged children should be eligible for a free

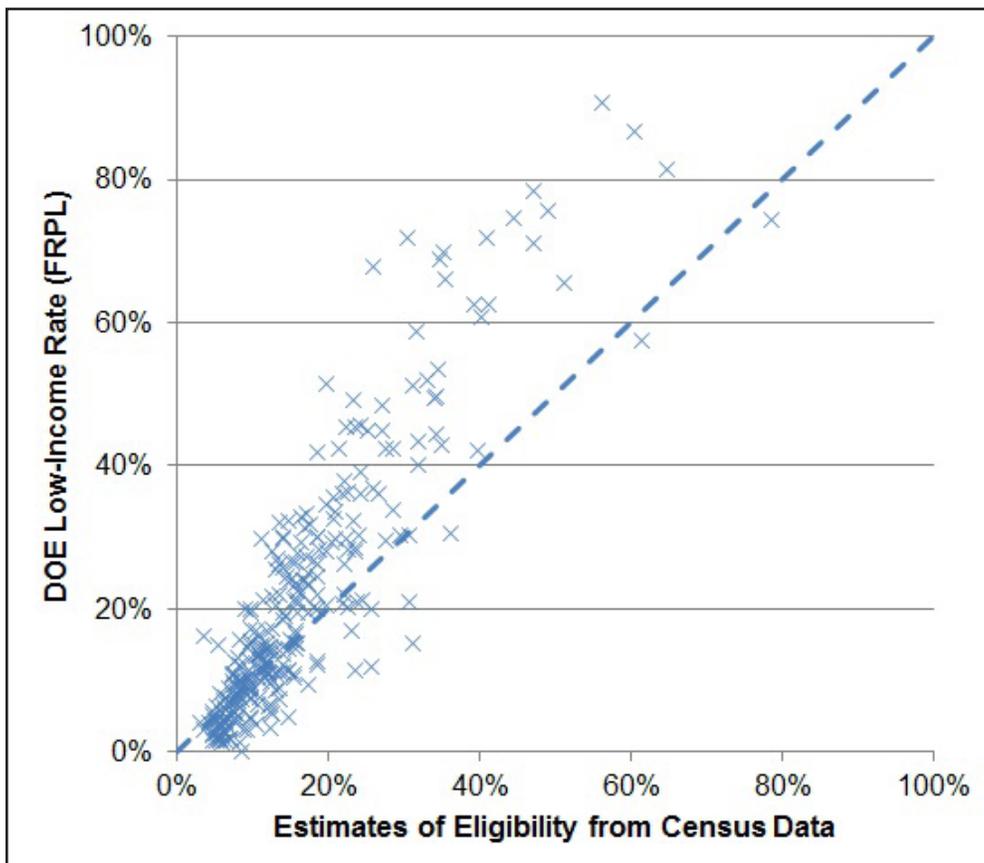
■ Urban and Rural Poverty and Student Achievement in Massachusetts

or reduced price lunch. According to DESE figures, almost 33 percent of public school students in Massachusetts qualify for free or reduced price lunches, approximately 1/3 more than the Census figures imply (almost 90,000 additional students statewide).

Figure 11 compares the estimates by district. The two measures are highly correlated (correlation of 0.89), but there are large differences in many school districts. In general, districts with high poverty tend to have a larger number of students receiving FRPL than suggested by the Census estimates, while low poverty districts often have fewer than expected students eligible for FRPL.

There are several outliers where the two measures differ dramatically. For example, the Census estimates show 13 percent of the children in Somerville live in poverty, which would suggest that about 25 percent of the students should be eligible for FRPL. Instead, almost 70 percent of the students in the district qualify. The same discrepancy shows up in some western towns such as Greenfield, where more than 60 percent of students qualify for FRPL. The opposite happens in districts such as Nahant and Harvard, where many fewer students receive free and reduced price lunches than we would expect from the Census poverty estimates.

Figure 11: Census and DESE Measures of Low-Income Students by District



**Table 16: Examples of Large Discrepancies
Between Census and DESE Measures**

District	Census Estimate ¹⁵	DESE Figure	Gap
Somerville	26%	68%	42%
Brockton	30%	72%	42%
Randolph	20%	52%	32%
Greenfield	41%	62%	21%
Harvard	8%	0%	-8%
Nahant	15%	5%	-10%
Lenox	23%	12%	-11%
Oak Bluffs	31%	15%	-16%

This paper will use both methods of identifying low-income students when possible to determine whether they provide similar pictures of student poverty; it is beyond the scope of the paper to determine why the figures differ in total or in particular districts.

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Appendix B: List of Urban and Rural Municipalities

Urban: Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Lynn, Malden, Medford, New Bedford, Peabody, Quincy, Revere, Salem, Somerville, Springfield, Waltham, Worcester

Rural: Adams, Alford, Ashburnham, Ashfield, Athol, Barre, Becket, Belchertown, Berlin, Bernardston, Blandford, Blackstone Millville, Bolton, Boylston, Brimfield, Brookfield, Buckland, Charlemont, Charlton, Cheshire, Chester, Chesterfield, Clarksburg, Colrain, Conway, Cummington, Dalton, Deerfield, Douglas, Dudley, East Brookfield, Egremont, Erving, Florida, Gill, Goshen, Grafton, Granby, Granville, Great Barrington, Greenfield, Hadley, Hampden, Hampden Wilbraham, Hancock, Hardwick, Harvard, Hatfield, Hawley, Heath, Hinsdale, Holden, Holland, Hubbardston, Huntington, Lancaster, Lanesborough, Lee, Leicester, Lenox, Leverett, Leyden, Ludlow, Lunenburg, Mendon, Middlefield, Millville, Monroe, Monson, Montague, Monterey, Montgomery, Mount Washington, New Ashford, New Braintree, New Marlborough, New Salem, North Adams, Northboro-Southboro, Northborough, Northbridge, North Brookfield, Northfield, Oakham, Orange, Otis, Oxford, Palmer, Paxton, Pelham, Peru, Petersham, Phillipston, Plainfield, Princeton, Richmond, Rowe, Royalston, Russell, Rutland, Sandisfield, Savoy, Sheffield, Shelburne, Shutesbury, Southborough, Southampton, Southwick, Spencer, Sterling, Stockbridge, Sturbridge, Sunderland, Sutton, Templeton, Tolland, Tyringham, Upton, Uxbridge, Wales, Ware, Warren, Warwick, Washington, Wendell, West Boylston, West Brookfield, West

Stockbridge, Westhampton, Westminster, Whately, Williamsburg, Williamstown, Winchendon, Windsor, Worthington

About the Author:

Ken Ardon received a Ph.D. in economics from the University of California at Santa Barbara in 1999, where he co-authored a book on school spending and student achievement. He taught economics at Pomona College before moving to Massachusetts, and, from 2000 to 2004, Dr. Ardon worked for the Commonwealth of Massachusetts in the Executive Office of Administration and Finance. Since 2004, he has been an assistant professor of economics at Salem State University. Dr. Ardon is a member of Pioneer Institute’s Center for School Reform Advisory Board.

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Endnotes

1. See for example “Stuck Schools Revisited: Beneath the Averages,” Ushomirsky, Natasha, April 27, 2011, Education Trust; and “Gauging the Gaps, A Deeper Look at Student Achievement,” Anna Habash Rowan, Daria Hall, and Kati Haycock, January 6, 2010, Education Trust.
2. “Whither Opportunity? Rising Inequality, Schools, and Children’s Life Chances,” The Russell Sage Foundation, 2011.
3. See for example “Not Prepared for Class: High-Poverty Schools Continue to Have Fewer In-Field Teachers,” Almy, Sarah, and Theokas, Christina, November 18, 2010, Education Trust; and “Teacher Turnover and Teacher Shortages: An Organizational Analysis,” Ingersoll, Richard M., American Educational Research Journal Vol. 38 No. 3, Fall 2001.
4. U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements, table H-8.
5. The Census Bureau publishes poverty *thresholds*. The Department of Health and Human Services publishes the poverty *guidelines* which are a slightly simplified but very similar measure. For an explanation, see <http://aspe.hhs.gov/poverty/11poverty.shtml>.
6. HHS *guidelines*, available at <http://aspe.hhs.gov/poverty/09poverty.shtml>. The guidelines are different for Alaska and Hawaii. As stated above, the Census *thresholds* are slightly different.
7. The Current Population Survey, American Community Survey, and the decennial census. Additionally, the Small Area Income and Poverty Estimates (SAIPE) includes estimates for school districts. All the figures are estimates based on surveys and statistical projections, with a larger margin of error for smaller areas.
8. SAIPE annual estimates.
9. The urban FRPL measure differs from that reported by NCES primarily because of differences in what counts as an urban area.
10. Performance on 4th grade NAEP tests follows similar patterns.
11. Feister, 2010, “Early Warning! Why Reading by the End of Third Grade Matters,” Annie E. Casey Foundation
12. The relationship between poverty and ELA scores may in part be caused by the fact that families in poverty are more likely to speak a language other than English. This may also explain why the relationship is weaker with math scores (which are less likely to be correlated with English language skills) and why it is weaker for ELA in rural areas where there are fewer non-English speaking households.
13. As noted earlier, there is a particularly large jump between 4th and 8th grade on the ELA tests. However, regardless of whether the performance standard in 8th grade is as rigorous as in 4th grade,

the same standard applies to all students and the changes in performance between groups of students should be informative.

14. This is the 4-year graduation rate published by the Department of Elementary and Secondary Education.

15. Because the Census data do not provide direct estimates of the number of children eligible for FRPL, these figures are twice the estimated percentage of children 5 to 17 living below the poverty line.

