The Impact of Poverty and School Size on the 2015-16 Kansas State Assessment Results

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Summary

Schools with higher percentages of students in poverty have lower student assessment results on the 2015-16 Kansas Math and ELA assessments, and larger schools have lower student achievement results than smaller schools. In addition, higher poverty schools are likely to have larger gaps in performance based on special education status and possibly school lunch eligibility when it comes to performing at grade level or above, but can be expected to have smaller gaps in performance based on special education status, lunch eligibility, and ELL program participation when it comes to performing at college/career ready or above. Finally, larger schools are likely to have larger gaps in performance based on lunch eligibility, ELL program participation, and possibly special education stats when it comes to performing at grade level or above, and can be expected to have smaller gaps based on special education status but larger gaps based on lunch status when it comes to performing at college/career ready or above.

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Methods

This report presents the results of a statistical analysis to determine the extent to which a school's enrollment size and the percent of students eligible for free or reduced-price lunch predict student performance on the 2015-16 Kansas State Assessments.

School-level assessment data was used to see how the assessment results, consisting of the percent performing "at grade level or above" (levels 2, 3, and 4) and performing at "college or career ready" (levels 3 and 4) for Math and English Language Arts (ELA) for students in the all, free and reduced lunch, self-paid lunch, ELL, Non-ELL, with disabilities, and without disabilities groups could be predicted based on a) the school's total student enrollment, and b) poverty as measured by the percent of students eligible for free or reduced-price lunch. Accountability data was used (rather than report card data), and the analysis focused on the overall school results rather than grade-level-specific results.

For the 2015-16 data, there were 1,374 schools included, 118 (8.588%) of which were private schools. Not every school was included in each analysis, as some schools did not have students in one or more of the student subgroups.

Assessment Results by Poverty and School Size

Two factors that have been shown to have an impact on student achievement are poverty[1] and school size[2]. In general, research has found that schools with more children in poverty and/or higher student enrollment have lower student achievement.

Simple linear regressions were used to determine whether the percent of free or reduced-price lunch eligible students in a school and/or the student headcount for the school were significant predictors of the percent of students at grade level (defined as the sum of the percent of students at Levels Two, Three, and Four) and the percent of students who were college ready (defined as the sum of the percents of students at Levels Three and Four) for the Math and ELA assessments.

Table One shows the means, Beta values from the regressions, and whether the results were statistically significant[3]. Beta values indicate the relative predictive power of the percent free/reduced and school size on the student outcomes. Larger values indicate more influence. The table also indicates the number of schools included in each comparison group.

Table One: Predictive Power of Percent Free/Reduced and School Size

Math

	At Grade Level						College Ready						# of Schools	
	Mean	Pct FRL		Size			Mean	Pct FRL		Size				
Student Group		Beta	Sig.	Beta	Sig.			Beta	Sig.	Beta	Sig.		Public	Private
All Students	74.95	(0.47)	*	(0.17)	*		35.53	(0.54)	*	(0.07)	*		1259	118
Free and Reduced Lunch	68.42	(0.33)	*	(0.26)	*		25.76	(0.32)	*	(0.17)	*		1200	76
Self-Paid Lunch	81.97	(0.30)	*	(0.18)	*		43.91	(0.36)	*	(0.08)	*		1179	116
ELL	64.46	(0.42)	*	(0.46)	*		22.14	(0.47)	*	(0.29)	*		443	19
Non-ELL	75.84	(0.44)	*	(0.16)	*		36.63	(0.51)	*	(0.06)	*		1251	118
Special Education	42.88	(0.45)	*	(0.28)	*		13.15	(0.39)	*	(0.19)	*		972	13
Non-Special Education	80.26	(0.43)	*	(0.22)	*		39.11	(0.52)	*	(0.09)	*		1241	111

ELA

	At Grade Level						College Ready						# of Schools	
	Mean	Pct FRL		Size			Mean	Pct FRL		Size				
Student Group		Beta	Sig.	Beta	Sig.			Beta	Sig.	Beta	Sig.		Public	Private
All Students	78.08	(0.63)	*	(0.11)	*		42.65	(0.63)	*	(0.09)	*		1256	118
Free and Reduced Lunch	71.20	(0.47)	*	(0.19)	*		32.24	(0.43)	*	(0.19)	*		1201	77
Self-Paid Lunch	85.31	(0.39)	*	(0.10)	*		52.17	(0.39)	*	(0.09)	*		1185	116
ELL	64.01	(0.48)	*	(0.38)	*		24.02	(0.44)	*	(0.34)	*		454	21
Non-ELL	79.28	(0.58)	*	(0.08)	*		44.20	(0.58)	*	(0.07)	*		1254	118
Special Education	45.32	(0.53)	*	(0.24)	*		16.74	(0.45)	*	(0.17)	*		970	13
Non-Special Education	83.34	(0.59)	*	(0.16)	*		46.70	(0.60)	*	(0.12)	*		1241	111

As the table shows, for every student group on both the Math and ELA exams, the percent of the school's population eligible for free or reduced-price lunch and the school's total enrollment were

[1] http://kasbresearch.blogspot.com/2017/02/poverty-and-student-outcomes-review-of.html

[2] https://scholar.google.com/scholar?hl=en&q=school+size+and+student+achievement&btnG=&as_sdt=1%2C5&as_sdtp=&oq=school+size

[3] At or below p = .01

significant predictors of the percent of students at grade level and the percent of students at college or career ready.

The fact that all Beta values were negative indicate that as the percent free/reduced and/or the total number of students increases, performance on the state assessments decreases. Further, apart from the percent of ELL students at grade level, the percent of students eligible for free/reduced lunches was a stronger predictor of student achievement than overall school size. In other words, both overall student poverty and school size impact the school's state assessment results, but student poverty has a larger impact than school size.

Digging Deeper

Because the percent of students at grade level and at college and career ready are aggregate measures combining performance categories on the State Assessments, it might help to look at the differences in those individual categories themselves between public and private schools. Therefore, the analysis was repeated, this time using the actual performance levels (One through Four).

Table Two shows the betas from the regressions for the influence of percent free/reduced and school size on the percents at each level, and which were significant predictors[4].

Table Two: Predictive Power of Percent Free/Reduced and School Size 2

	Math								Math							
	Level One				Level Two				Level Three				Level Four			
Student Group	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.
All Students	0.47	*	0.17	*	0.24	*	(0.17)	*	(0.48)	*	(0.14)	*	(0.51)	*	0.02	
Free and Reduced Lunch	0.33	*	0.26	*	(0.09)	*	(0.19)	*	(0.30)	*	(0.19)	*	(0.27)	*	(0.09)	*
Self-Paid Lunch	0.30	*	0.18	*	0.23	*	(0.11)	*	(0.29)	*	(0.15)	*	(0.33)	*	0.02	
ELL	0.42	*	0.46	*	(0.03)		(0.33)	*	(0.40)	*	(0.30)	*	(0.40)	*	(0.17)	*
Non-ELL	0.44	*	0.16	*	0.23	*	(0.15)	*	(0.44)	*	(0.13)	*	(0.48)	*	0.02	
Special Education	0.45	*	0.28	*	(0.33)	*	(0.26)	*	(0.34)	*	(0.19)	*	(0.32)	*	(0.11)	*
Non-Special Education	0.43	*	0.22	*	0.32	*	(0.16)	*	(0.45)	*	(0.17)	*	(0.49)	*	0.01	
	ELA								ELA							
	Level One				Level Two				Level Three				Level Four			
Student Group	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.
All Students	0.63	*	0.11	*	0.29	*	-		(0.58)	*	(0.10)	*	(0.53)	*	(0.04)	
Free and Reduced Lunch	0.47	*	0.19	*	0.02		0.02		(0.40)	*	(0.19)	*	(0.31)	*	(0.12)	*
Self-Paid Lunch	0.39	*	0.10	*	0.20	*	0.04		(0.30)	*	(0.09)	*	(0.31)	*	(0.05)	
ELL	0.48	*	0.38	*	(0.11)		(0.11)		(0.39)	*	(0.32)	*	(0.35)	*	(0.22)	*
Non-ELL	0.58	*	0.08	*	0.27	*	0.01		(0.52)	*	(0.08)	*	(0.48)	*	(0.04)	
Special Education	0.53	*	0.24	*	(0.36)	*	(0.21)	*	(0.39)	*	(0.18)	*	(0.35)	*	(0.06)	
Non-Special Education	0.59	*	0.16	*	0.35	*	0.01		(0.54)	*	(0.14)	*	(0.50)	*	(0.06)	

Whereas the comparison based on the aggregate performance groups indicated that as the percent of low income children and/or the size of the school increases, performance on the state assessments decreased, this analysis indicates that the relationship between student poverty, school size, and student assessment results is complex and not consistent across subgroups and assessment subjects.

For both reading and math, the percent of students eligible for free or reduced-price lunch and school size were significant predictors of the percent of students at Level One; with higher percents of low income students and larger schools predicting higher Level One percents.

At Level Two, the percent free/reduced was a significant predictor in all but one of the student groups for Math (ELL), but for All Students, Self-Paid Lunch, Non-ELL, and Non-Special Ed, higher percents of free/reduced students predicted higher percents at Level Two, while for Free and Reduced Lunch and Special Education, higher percents of free/reduced students predicted lower percents at Level Two. For Math, school size was a significant predictor across all groups, with larger schools predicting lower

[4] At or below p = .01

percents at Level Two, but for ELA, school size was only a significant predictor for Special Education students, with larger schools predicting lower percents at Level Two.

At Level Three, for all student groups and both subjects, higher percents of free/reduced students and larger schools predicted lower percents at Level Three.

At Level Four, for all student groups and both subjects, higher percents of free/reduced students predicted lower percents at Level Four, but school size was only a significant predictor for the Free and Reduced Lunch, ELL, and Special Education groups in Math and the Free and Reduced Lunch and ELL groups in ELA, with larger schools predicting lower percents at Level Four.

Achievement Gaps

Another key indicator for student performance is the achievement gap between student groups; namely the gap in achievement between students eligible for free or reduced-price lunch and those not eligible, students eligible for ELL services and those not eligible for ELL services, and students receiving special education services and those not eligible for special education services.

Table Three shows the relationship between the percent of free or reduced-price lunch eligible students, total school size, the percent at grade level or above and the percent at college or career ready or above, and where the comparisons were significant[5].

Table Three: Gaps by Percent Free/Reduced and School Size

Math

	At Grade Level				College Ready			
	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.
Lunch	(0.05)		0.17	*	(0.18)	*	0.08	*
ELL	(0.09)		0.26	*	(0.37)	*	0.07	
SpEd	0.10	*	0.03		(0.45)	*	(0.09)	*

ELA

	At Grade Level				College Ready			
	Pct FRL	Sig.	Size	Sig.	Pct FRL	Sig.	Size	Sig.
Lunch	0.12	*	0.16	*	(0.05)		0.10	*
ELL	(0.11)		0.19	*	(0.31)	*	0.01	
SpEd	0.16	*	0.13	*	(0.43)	*	(0.12)	*

For the gap in performance based on school lunch eligibility status, the percent eligible for free/reduced lunch was a significant predictor for the percent at grade level for ELA but not for Math (with higher percents predicting larger gaps), and for the percent at college/career ready for Math but not for ELA (with lower percents predicting larger gaps). School size was a significant predictor for both exam types at both levels, with larger schools predicting a larger gap in performance.

For the gap in performance based on ELL status, the percent eligible for free/reduced lunch was a significant predictor for the percent at college/career ready for both Math and ELA (with higher percents predicting smaller gaps). School size was a significant predictor for the percent at or above grade level (with larger schools predicting larger gaps).

For the gap in performance based on special education status, the percent eligible for free/reduced lunch was a significant predictor for both subjects and both levels, but higher percents eligible predicted larger gaps for the percent at grade level or above, and smaller gaps for the percent at college/career ready. School size was a significant predictor for the percent at grade level for ELA (with larger schools predicting larger gaps), and was a significant predictor for the percent at college/career ready (with larger schools predicting smaller gaps).

[5] At or below p = .01

This data indicates the relationship between school size, school poverty, and student outcomes is not a simple one. In general, it seems to suggest that:

- Higher poverty schools are likely to have larger gaps in performance based on special education status and possibly school lunch eligibility when it comes to performing at grade level or above, but can be expected to have smaller gaps in performance based on special education status, lunch eligibility, and ELL program participation when it comes to performing at college/career ready or above.
- Larger schools are likely to have larger gaps in performance based on lunch eligibility, ELL program participation, and possibly special education stats when it comes to performing at grade level or above, and can be expected to have smaller gaps based on special education status but larger gaps based on lunch status when it comes to performing at college/career ready or above.

Charts

Chart One shows a scatterplot of the Percent Free/Reduced Eligible Students and the Total Student Enrollment by school. Orange marks indicate public schools, while blue marks show private schools. As is shown, private schools tend to be smaller and have fewer free/reduced eligible students on average than public schools.

Chart One: Free/Reduced Eligible and Student Enrollment

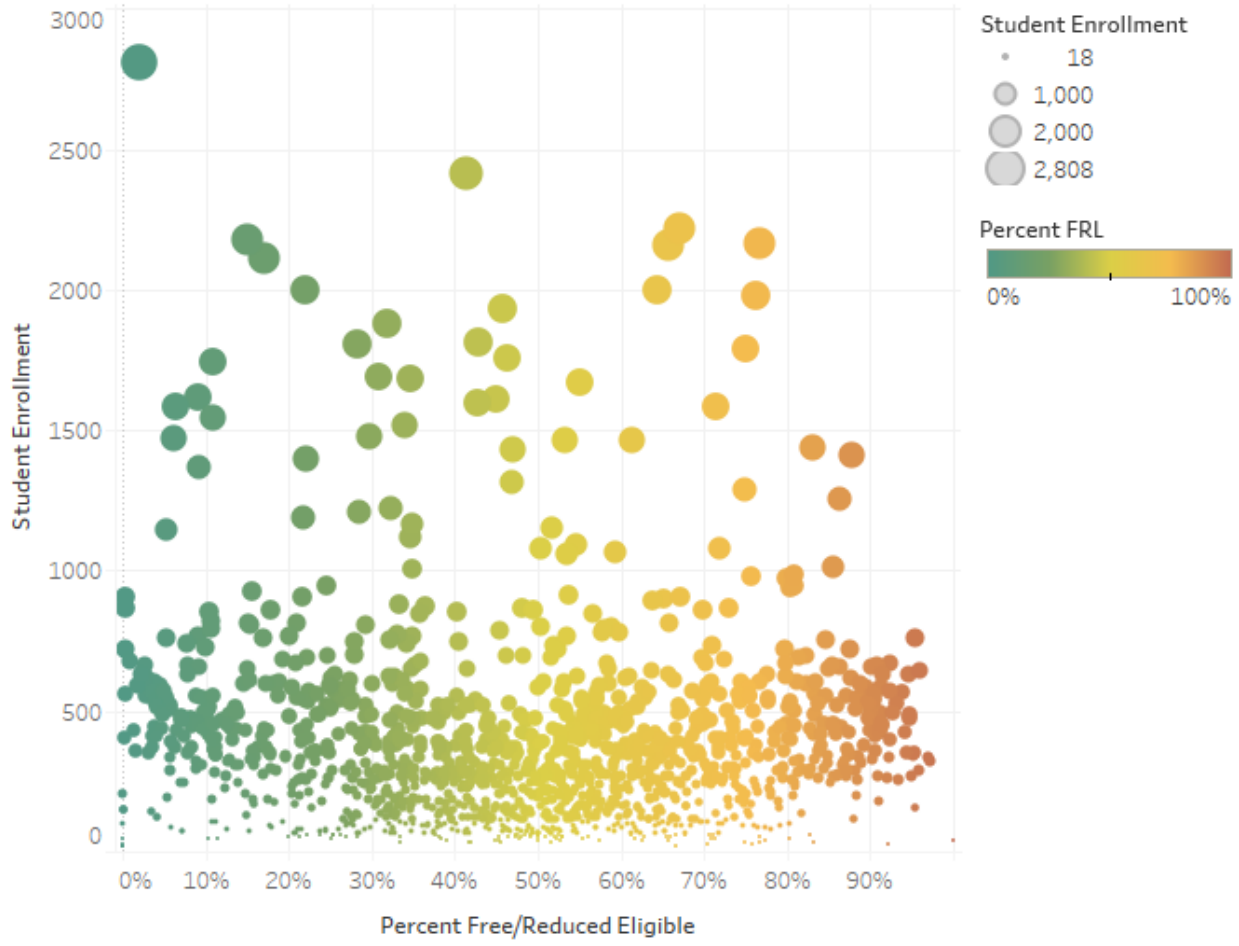


Chart Two shows a scatterplot of the Percent Free/Reduced Eligible Students and the percent performing at Grade Level or above. As can be seen, the percent performing at grade level or above has a negative relationship with the percent of students eligible for free or reduced-price lunch. Further, most of the private schools are clustered around the top left corner, indicating high percents at grade-level and low percents of free/reduced lunch students.

Chart Two: Free/Reduced Eligible and Percent at Grade Level

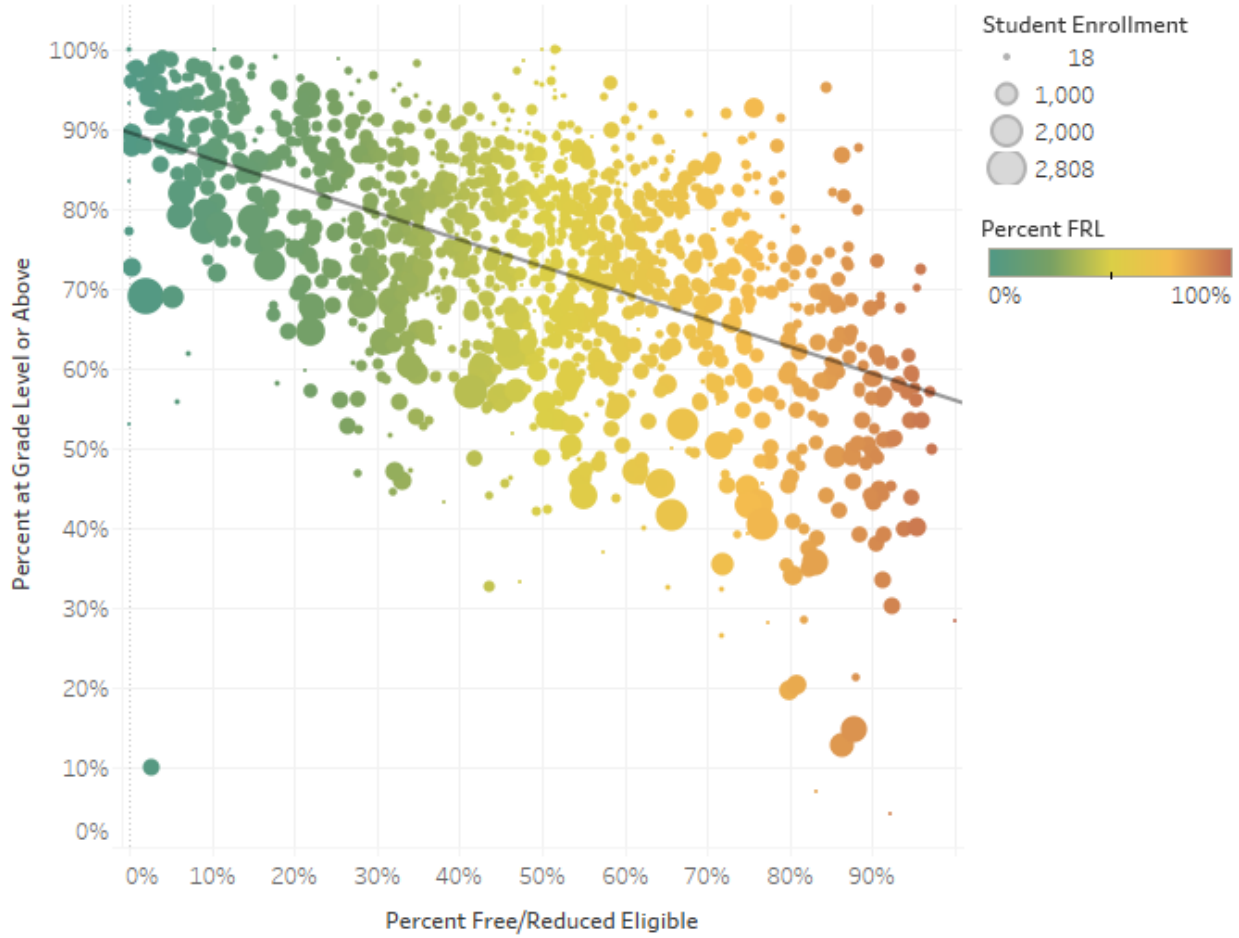


Chart Three shows a scatterplot of the Percent Free/Reduced Eligible Students and the percent performing at College or Career Ready or above. As can be seen, the percent performing at college/career ready decreases as the percent of free/reduced eligible students increases. Further, the private schools are not as closely clustered at the top of the College/Career Ready scale as they are for At Grade Level.

Chart Three: Free/Reduced Eligible and College/Career Ready

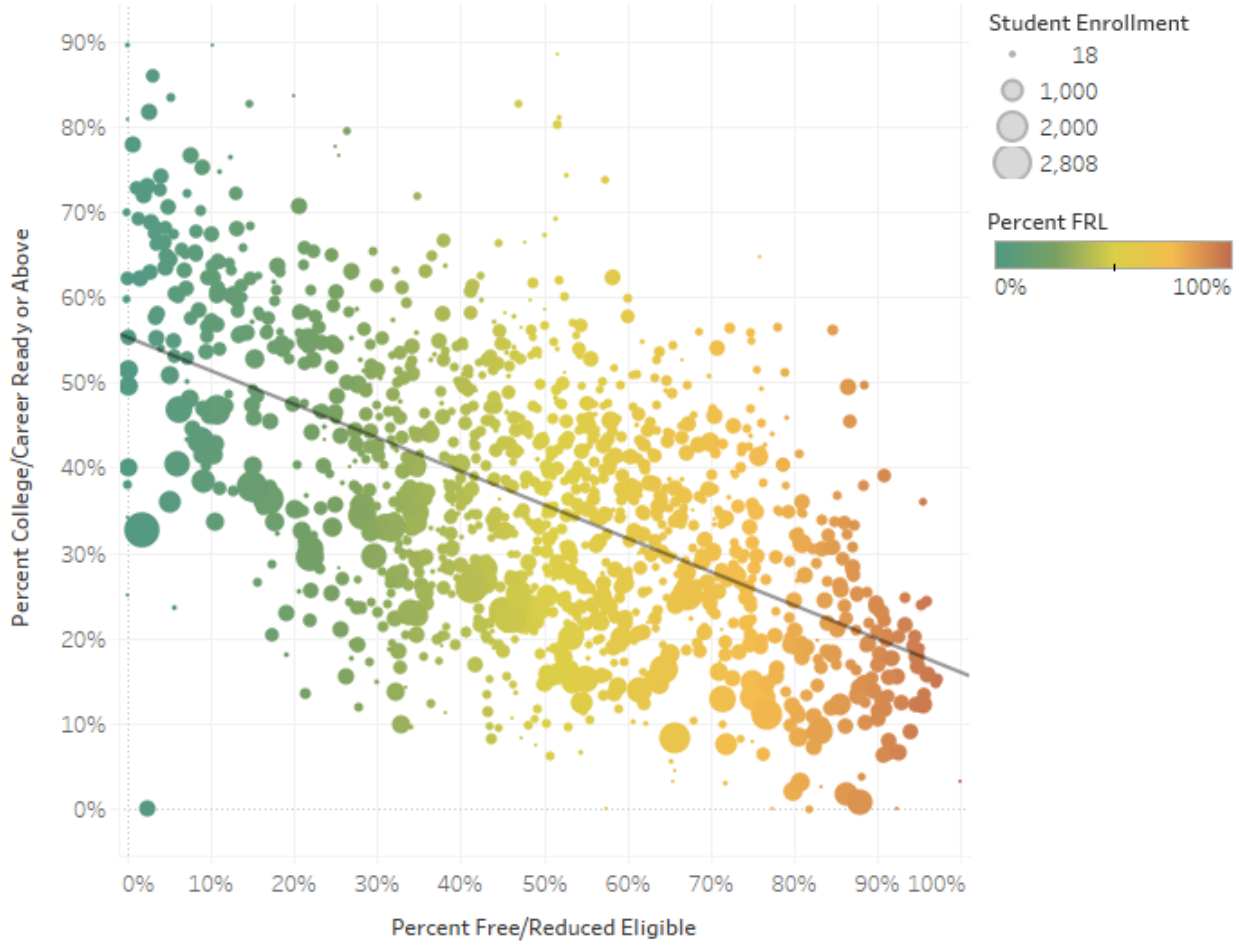


Chart Four shows a scatterplot of the number of students enrolled and the percent performing at Grade Level or above. As can be seen, the percent performing at grade level or above has a negative relationship with the total school enrollment. Further, most of the private schools are clustered around the top left corner, indicating high percents at grade-level and low student enrollments.

Chart Four: Student Enrollment and At Grade Level

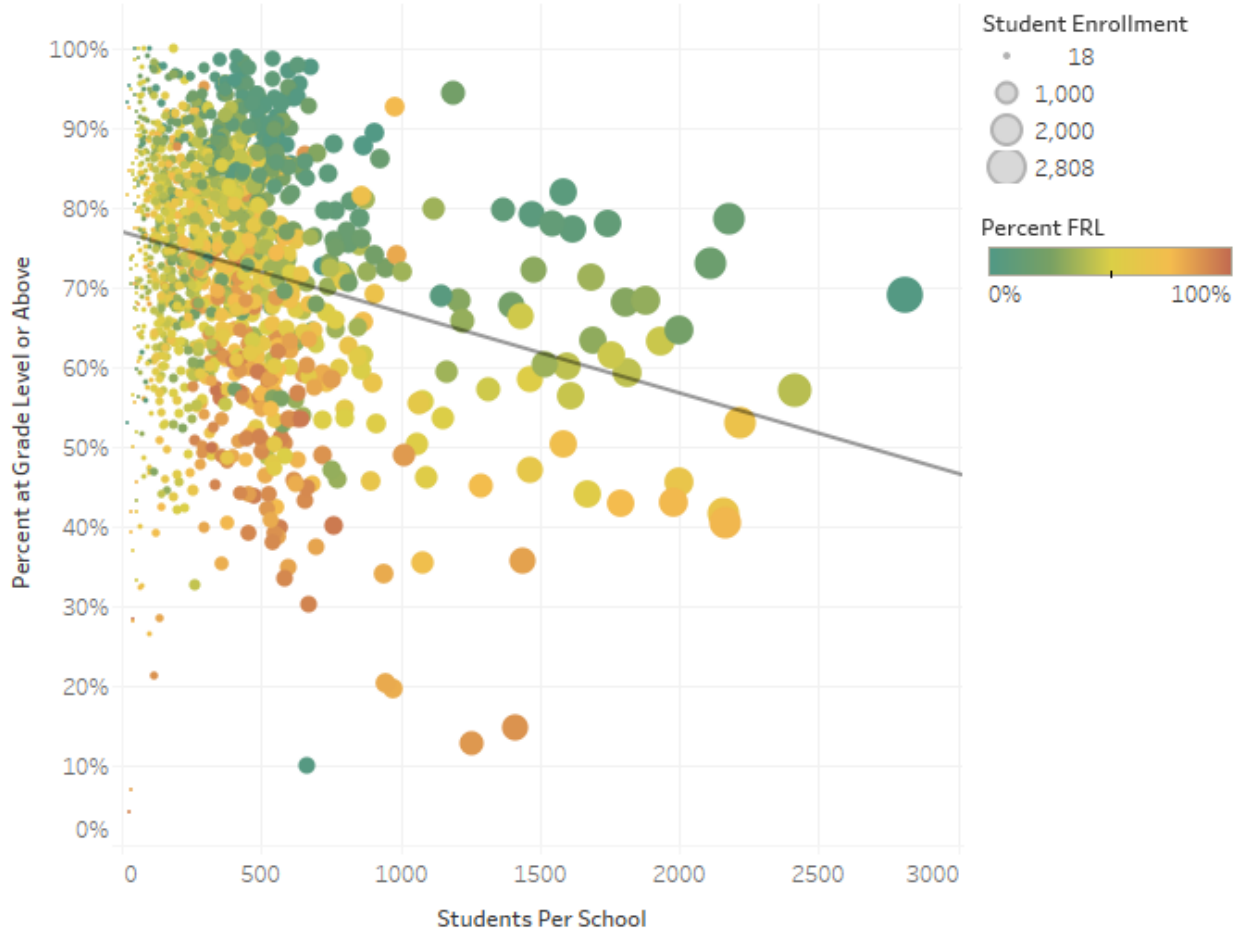
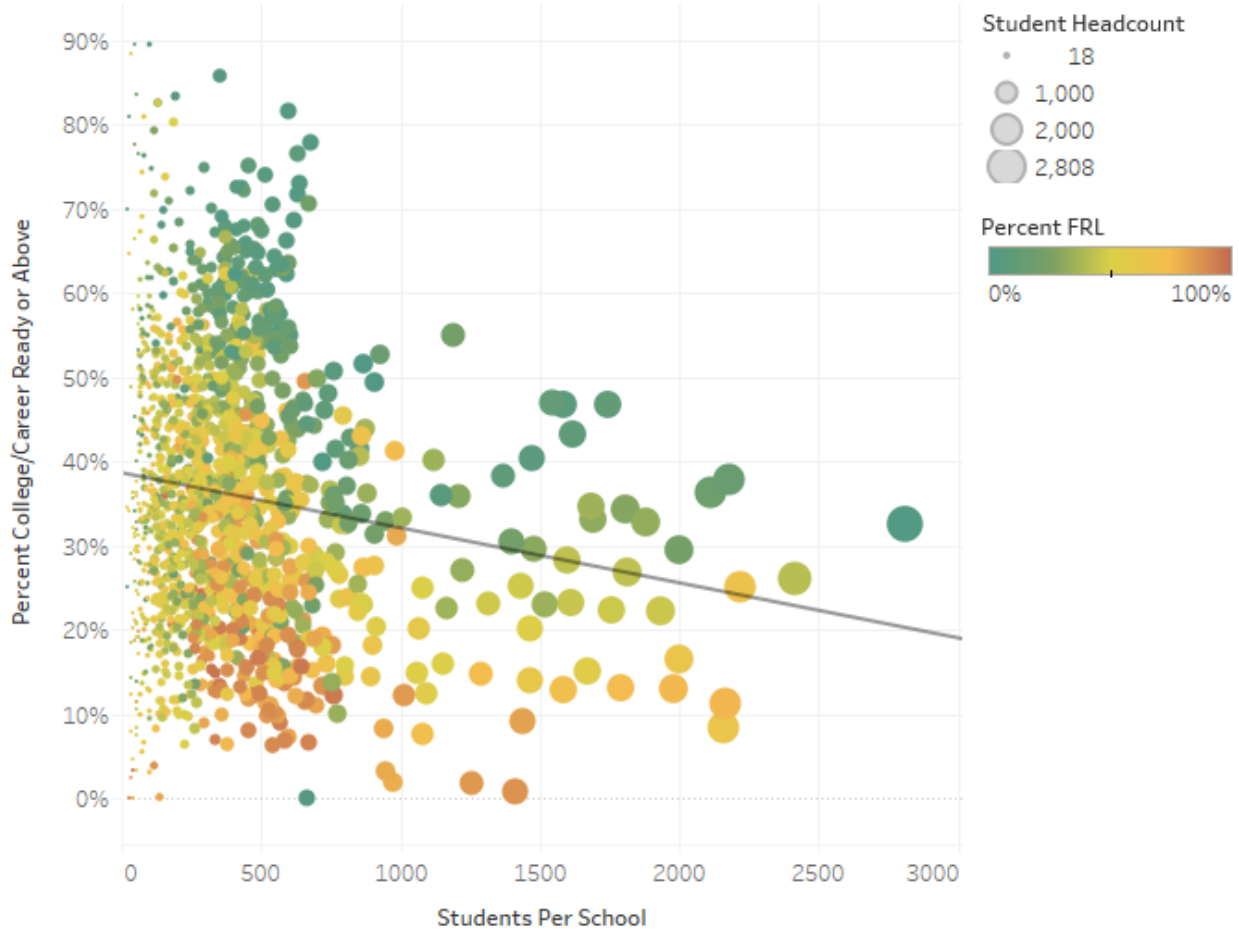


Chart Five shows a scatterplot of the number of students enrolled and the percent performing at College or Career Ready or above. As can be seen, the percent performing at college/career ready decreases as the number of students in a school increases. Further, the private schools are not as closely clustered at the top of the College/Career Ready scale as they are for At Grade Level.

Chart Five: Student Enrollment and College/Career Ready



Conclusions

Based on the analysis described above, the following can be said:

- Schools with higher percents of students in poverty have lower student assessment results.
- Larger schools have lower student achievement results than smaller schools.
- For both reading and math, the percent of students eligible for free or reduced-price lunch and school size were significant predictors of the percent of students at Level One; with higher percents of low income students and larger schools predicting higher Level One percents.
- The percent free/reduced was a significant predictor in all but one of the student groups for Math (ELL), but for All Students, Self-Paid Lunch, Non-ELL, and Non-Special Ed, higher percents of free/reduced students predicted higher percents at Level Two, while for Free and Reduced Lunch and Special Education, higher percents of free/reduced students predicted lower percents at Level Two.
- For Math, school size was a significant predictor across all groups, with larger schools predicting lower percents at Level Two, but for ELA, school size was only a significant predictor for Special Education students, with larger schools predicting lower percents at Level Two.
- At Level Three, for all student groups and both subjects, higher percents of free/reduced students and larger schools predicted lower percents at Level Three.
- At Level Four, for all student groups and both subjects, higher percents of free/reduced students predicted lower percents at Level Four, but school size was only a significant predictor for the Free and Reduced Lunch, ELL, and Special Education groups in Math and the Free and Reduced Lunch and ELL groups in ELA, with larger schools predicting lower percents at Level Four.
- Higher poverty schools are likely to have larger gaps in performance based on special education status and possibly school lunch eligibility when it comes to performing at grade level or above, but can be expected to have smaller gaps in performance based on special education status, lunch eligibility, and ELL program participation when it comes to performing at college/career ready or above.
- Larger schools are likely to have larger gaps in performance based on lunch eligibility, ELL program participation, and possibly special education stats when it comes to performing at grade level or above, and can be expected to have smaller gaps based on special education status but larger gaps based on lunch status when it comes to performing at college/career ready or above.

Discussion

Student Poverty

David Berliner, Regents' Professor of Education Emeritus at Arizona State University, in a recent blog post[6], stated the following:

> …on the mathematics portion of the 2012 Programme for International Student Assessment (PISA) to test, poor students (among those from lowest quartile in family income), who attended schools that served the poorest families (a school in the highest quartile of those receiving free and reduced lunch), attained a mean score of 425. But wealthy students (in the highest quartile of family income), who attended schools that served the wealthiest families (schools in the lowest quartile of students receiving free and reduced lunch), scored a mean of 528. That's a one-hundred point difference!

In addition, KASB recently summarized the research we have done over the past three years to demonstrate that multiple analysis from multiple data support the notion that poverty has a negative impact on student outcomes[7].

The results of this analysis indicate this trend is also apparent in the results for the 2015-16 Kansas State Assessments. For the 2015-16 school year, in terms of differences by student groups:

- 85.31 percent of students paying full price for lunch performed at grade level or above on the English Language Assessment, compared to only 71.20 percent of students eligible for free or reduced-price lunch. The numbers for the Mathematics Assessment were 81.97 percent and 68.42 percent respectively.
- 52.17 percent of students paying full price for lunch performed at college or career ready on the English Language Assessment, compared to only 32.24 percent of students eligible for free or reduced-price lunch. The numbers for the Mathematics Assessment were 43.91 percent and 25.76 percent respectively.

This means that whether an individual student was eligible for free or reduced-price lunch had an impact on how well he or she did on the Kansas State Assessments.

Further, this analysis shows that across student groups, schools with higher poverty have lower percents of students at grade level and at college/career ready. This means that regardless of an individual student's characteristics, the fact that they are in a school with higher poverty means they are less likely to succeed.

This evidence is important to consider when looking at school funding formulas, and how to allocate funding based on poverty. Some have criticized the previous funding formula which allowed districts to utilize some funding based on poverty levels for students who were not identified as in poverty. This

[6] http://www.niusileadscape.org/bl/the-purported-failure-of-americas-schools-and-ways-to-make-them-better-by-david-c-berliner/

[7] http://kasbresearch.blogspot.com/2017/02/poverty-and-student-outcomes-review-of.html

research would suggest that this is appropriate, as all students in a school are impacted by the poverty level of that school.

School Size

This research also shows that total school enrollment has an impact on student performance on the 2015-16 Kansas State Assessments, with smaller schools seeing better student outcomes. Though school size does not seem to have as much of an impact as student poverty, it does reliably predict better assessment results for students in all groups coming from smaller schools.

Previous KASB research indicated that smaller schools predicted better graduation rates and ACT scores, but lower NAEP assessment results (when looking at state-level statistics)[8]. Other KASB research also indicated that Kansas has one of the lowest average students per school of any state[9].

These results go counter to the notion that consolidating smaller schools into fewer large schools could not only reduce cost, but also improve outcomes.

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[8] https://www.kasb.org/assets/Publications/Research/Funding%20and%20Outcomes%20Part%20II%20-%202015-01-12%20Final.pdf
[9] https://www.kasb.org/assets/Advocacy/ReportCard2016/RCSupplement.pdf