Unpaid Lunch Debt in Durham, NC

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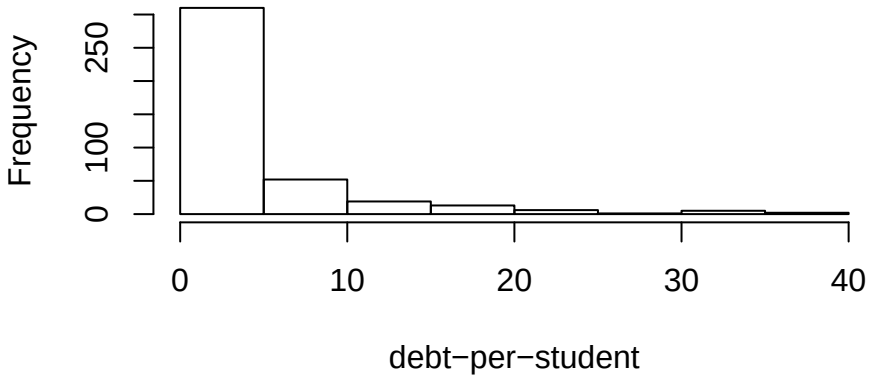
Introduction

When families can't afford to pay for student lunches, school districts foot the bill. But with major cuts to educational funding in North Carolina—where some schools don't even have enough funds to pay for students' textbooks—this means school districts can wrack up tens of thousands of dollars in debt. In Durham, students with five or more unpaid lunches only receive a juice and a sandwich instead of a hot lunch. This lends its way to "lunch shaming", where students who can't afford pay skip the meal altogether to avoid the embarrassment of eating a cold lunch. This is a major issue, since student performance in school is directly tied to access to quality food.

Data Sources

- End-of-Year unpaid meal data from James Keaton, director of child nutrition services at DPS.
- All free/reduced price lunch data was obtained from ncpublicschools.org
- 2010-11 through 2015-16 demographic data was obtained from the NCES ELSI table generator, code 91803
- 2017-18 ADM data from ncpublicschools.org's Average Daily Membership and Membership Last Day by School
- 2016-17, 2017-18 demographic data from Durham Public Schools

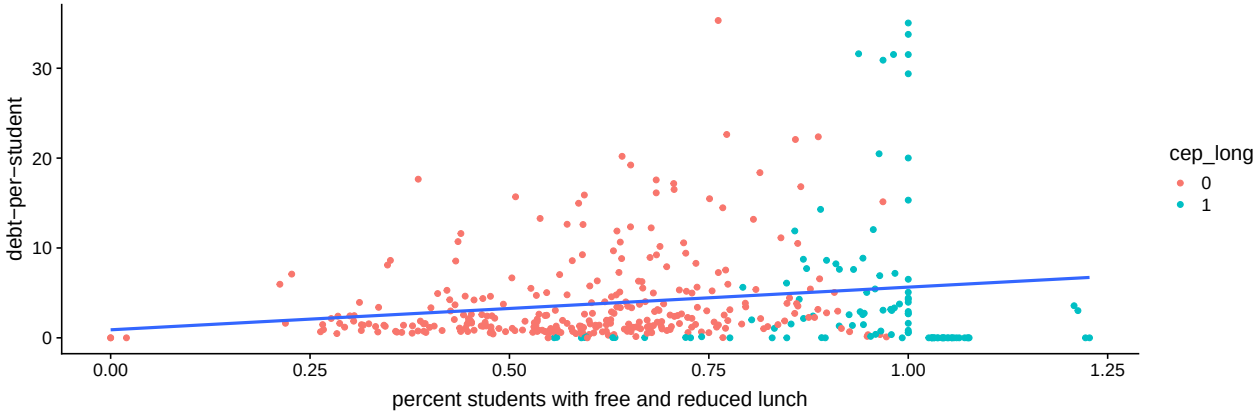
Exploratory Data Analysis

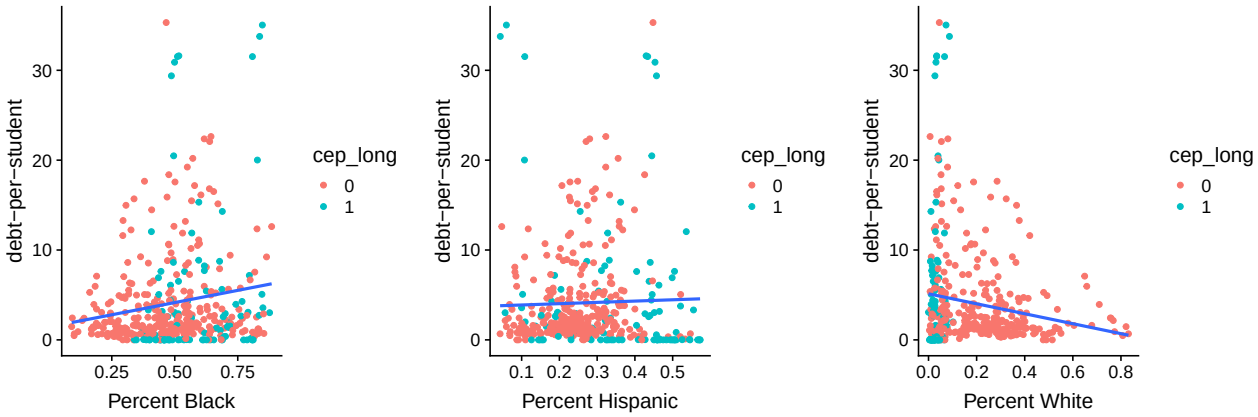


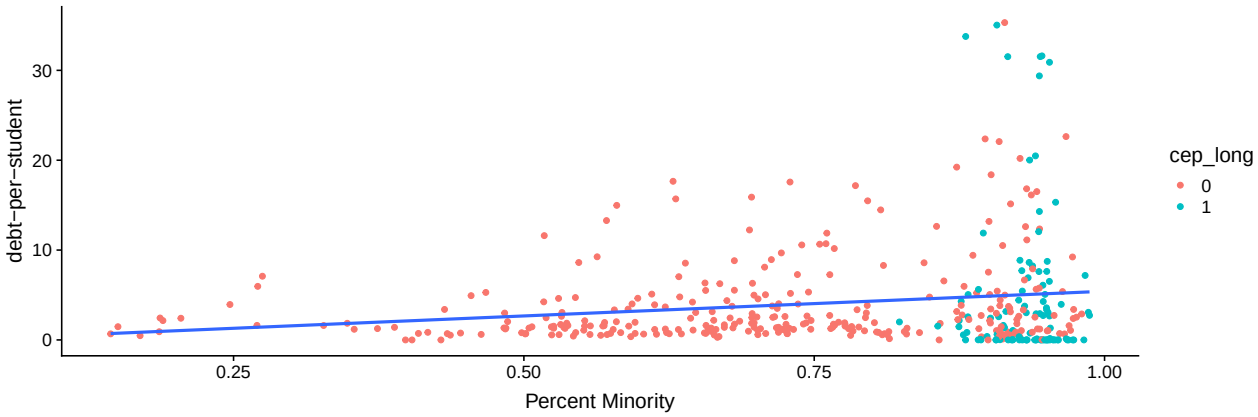
Most schools have less than $5 of lunch debt per student. In Durham, a full-priced lunch costs $2.90, and a reduced-price lunch cost $0.40, according to the Durham Public Schools website. That's about two unpaid full-priced lunches per student, or just over 12 unpaid reduced-price lunches per student. For the rest of my EDA, I'll delve into which schools have more debt and whether we can find systematic issues. I'll also be looking at schools that are part of the Community Eligibility Provision, which means all students receive free lunch.

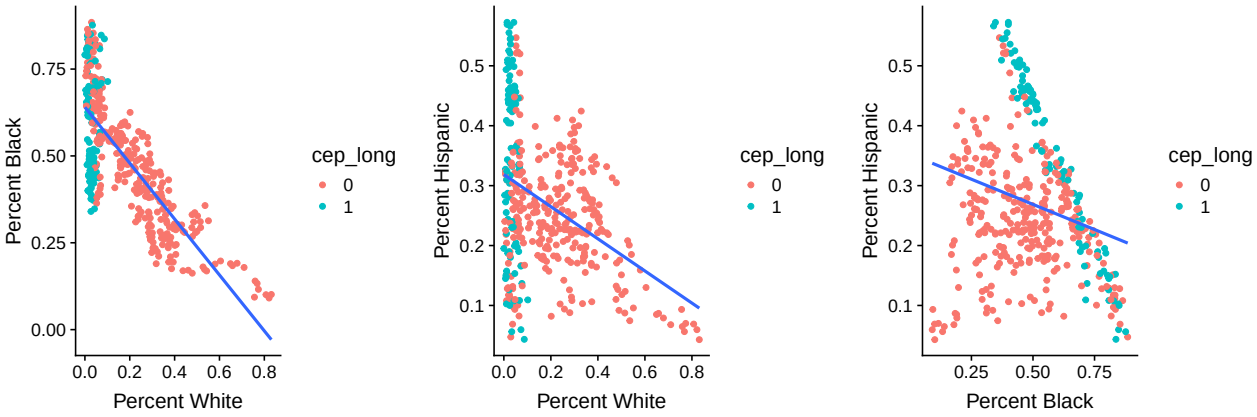
CEP Status

Debt and Demographics



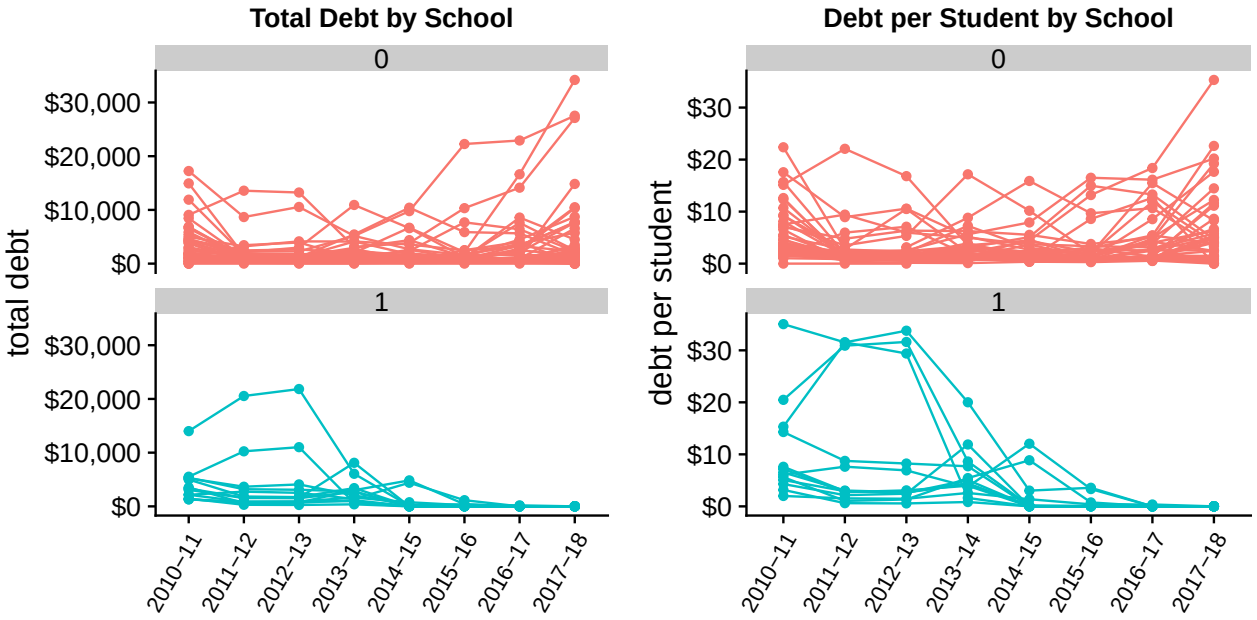






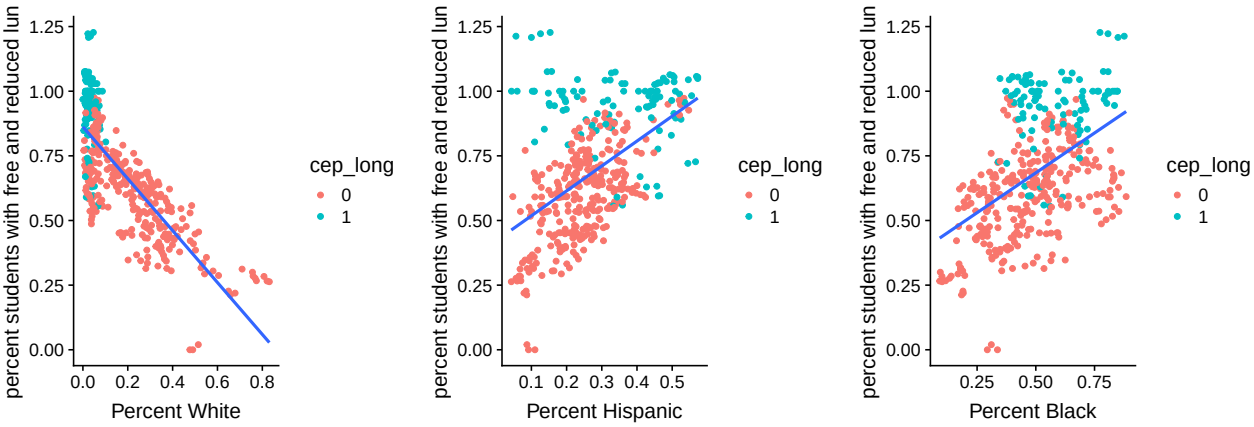
There is a weak positive correlation between the percentage of students who have free and reduced price lunch and the debt-per-student at each school. It looks like schools with CEP status generally have a higher percentage of students on free/reduced lunch. As for demographics, there is also a weak positive correlation between the percentage of black students and debt-per-student. Conversely, there is a weak negative correlation between the percent of white students and debt-per-student. There doesn't appear to be a much of a relationship between the percentage of hispanic students and debt-per-student. That being said, if we look at the total percentage of minority students — the percentage of black *and* hispanic students — there is a positive correlation with debt-per-student. Schools that CEP status are also starkly segregated, with very few white students and primarily black and hispanic students.

Debt over time



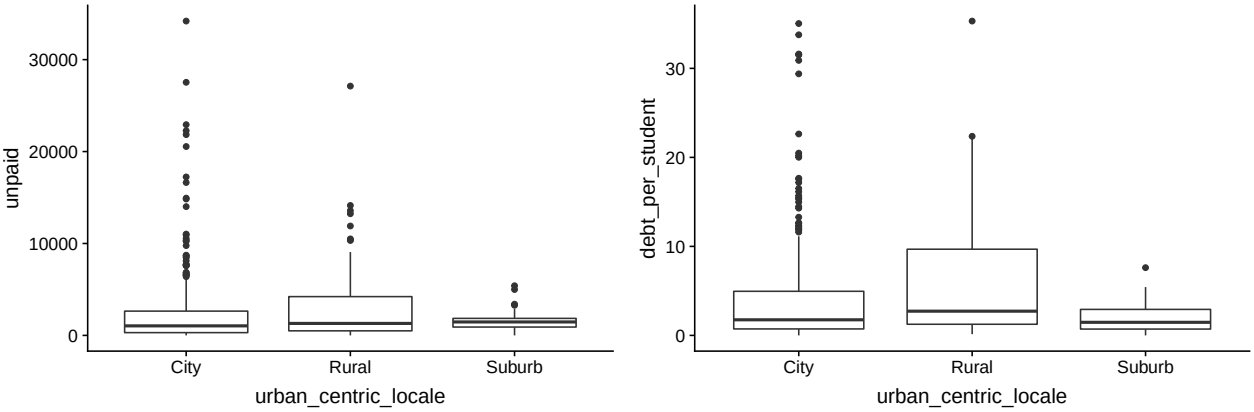
Schools with CEP status generally had a large amount of debt until the 2014-15 school year, when they gained CEP status. That being said, other schools with similar amounts of debt did not gain CEP status.

Demographics and need

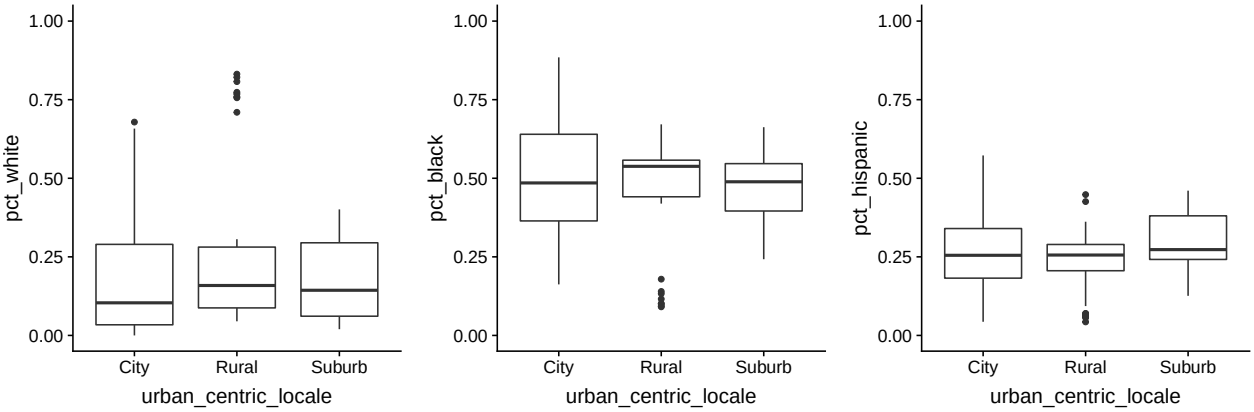


We can also see that race is a proxy for need. The percentage of black and hispanic schools have a strong, positive correlation with the percentage of students on free and reduced price lunch. For white students, this relationship is strong and negative.

Locale and debt, race



There don't seem to be major differences in debt by location.



On average, we also don't see any major differences in race by locale. However, there is a subset of rural schools that seem to primarily be white.

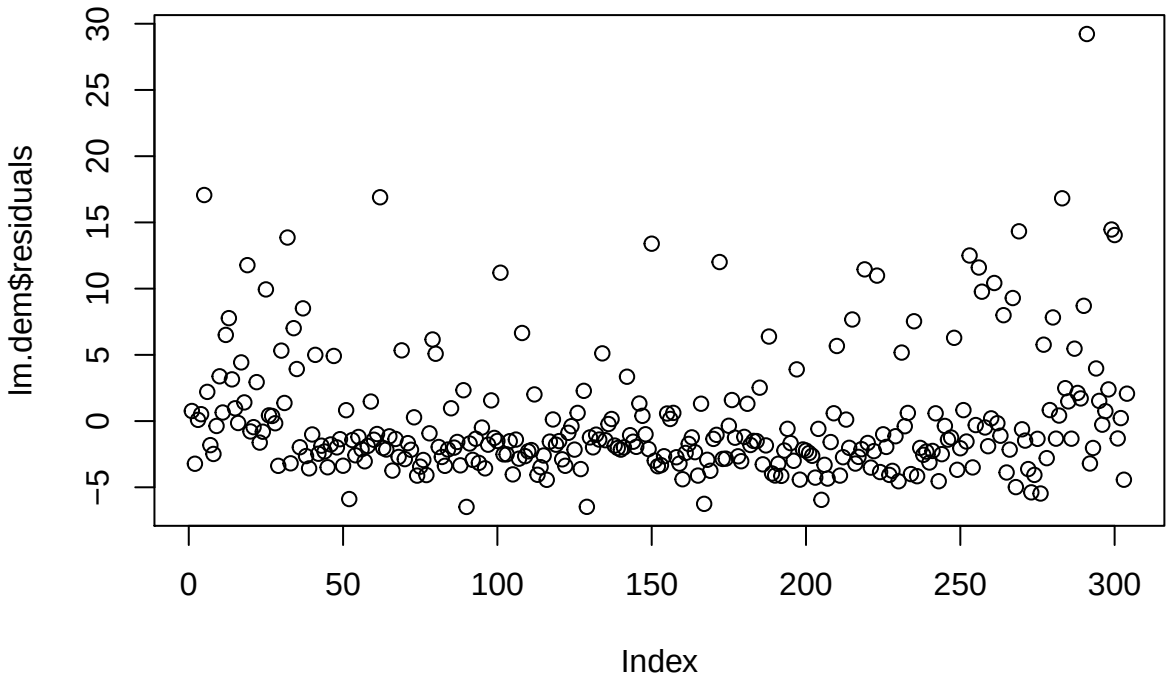
Debt and grade

Regression

Now, I'll try to predict total debt based on demographic factors and percent needy students. For this, I'll set schools with more than 100% free and reduced price lunch to just 100%, since those schools have completely free lunches.

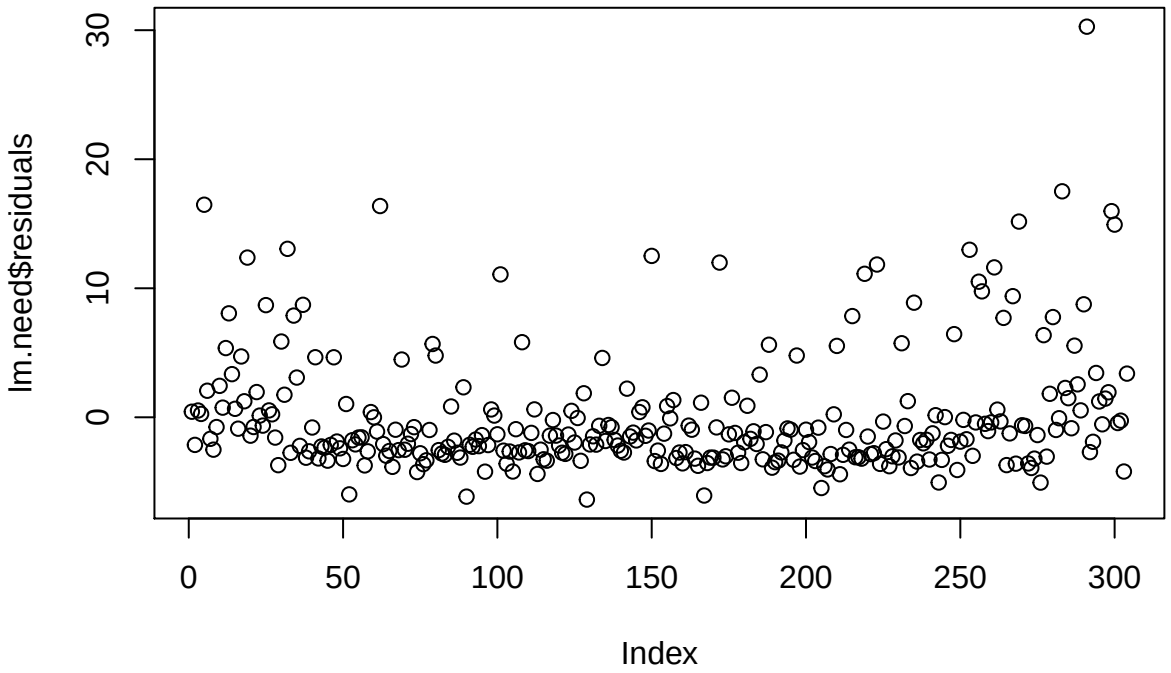
Predicting debt with demographics

```
##
## Call:
## lm(formula = debt_per_student ~ pct_white + pct_black + pct_hispanic,
##     data = df[df$cep_long == 0, ])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.4802 -2.7143 -1.5003  0.7763 29.2237
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -8.964     10.448  -0.858    0.392
## pct_white       8.852     11.614   0.762    0.447
## pct_black      13.471     10.869   1.239    0.216
## pct_hispanic   18.705     11.496   1.627    0.105
##
## Residual standard error: 4.747 on 300 degrees of freedom
##   (8 observations deleted due to missingness)
## Multiple R-squared:  0.06281,    Adjusted R-squared:  0.05344
## F-statistic: 6.702 on 3 and 300 DF,  p-value: 0.0002161
```



Predicting debt with need

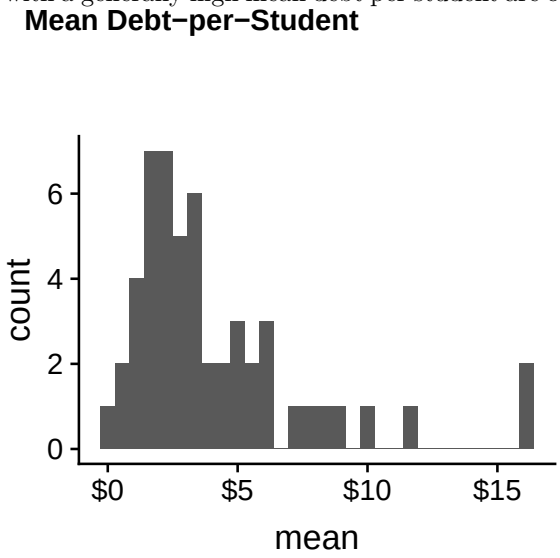
```
##
## Call:
## lm(formula = debt_per_student ~ pct_free_reduced, data = df[df$cep_long ==
##     0, ])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.3758 -2.7846 -1.4279  0.6241 30.2714
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)       -0.1336     0.9728  -0.137    0.891
## pct_free_reduced   6.7956     1.5764   4.311  2.2e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.743 on 302 degrees of freedom
##   (8 observations deleted due to missingness)
## Multiple R-squared:  0.05797,    Adjusted R-squared:  0.05485
## F-statistic: 18.58 on 1 and 302 DF,  p-value: 2.204e-05
```

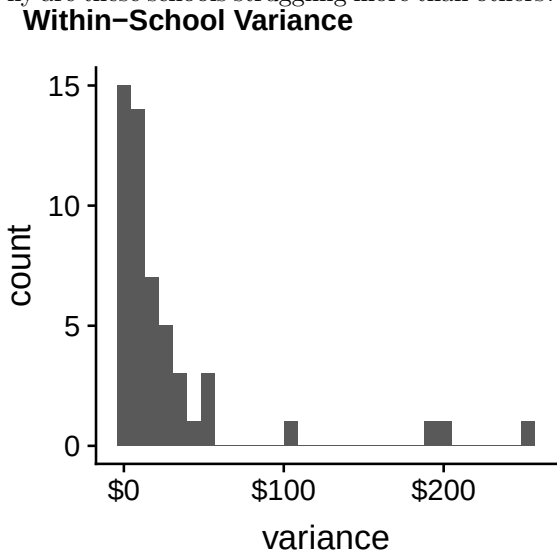


There's a lot of fluctuation in total debt and debt-per-student across all schools, so I'll try to find the "most extreme" schools using a few measures. But first, let's take a look at the spread of our data.

Mean and variance of debt within schools

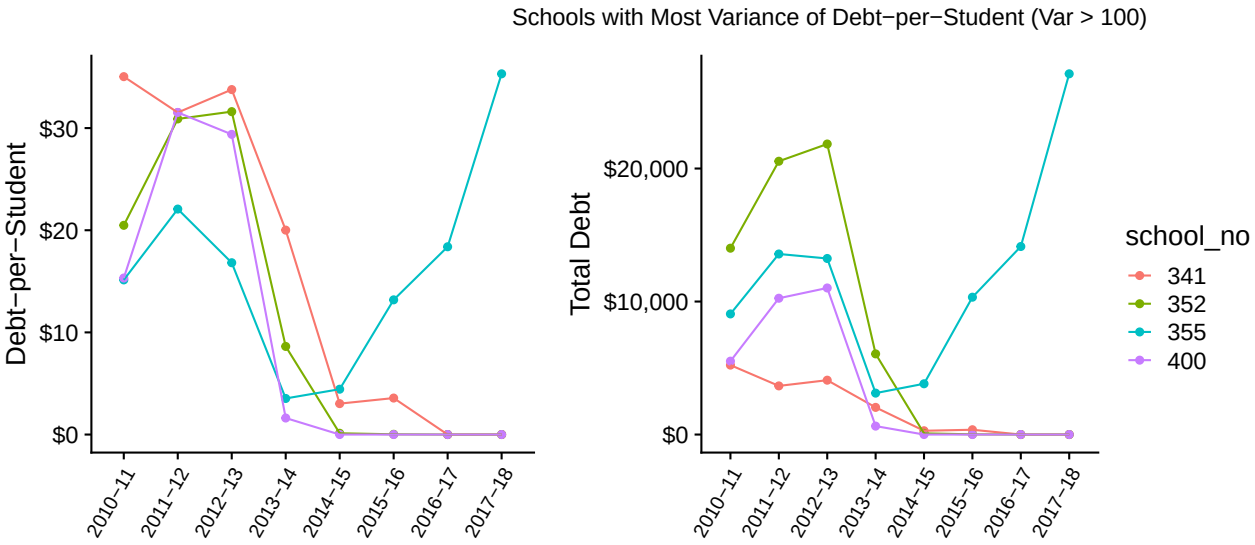
I also looked at the mean and variance of debt per student by school. This gives us a sense of *how* much debt per student fluctuates within in each school. Schools with a high variance should be looked into—perhaps fluctuations in debt are tied to CEP status? Or someone bailing a school out of debt? Similarly, schools with a generally high mean debt per student are of interest. Why are these schools struggling more than others?



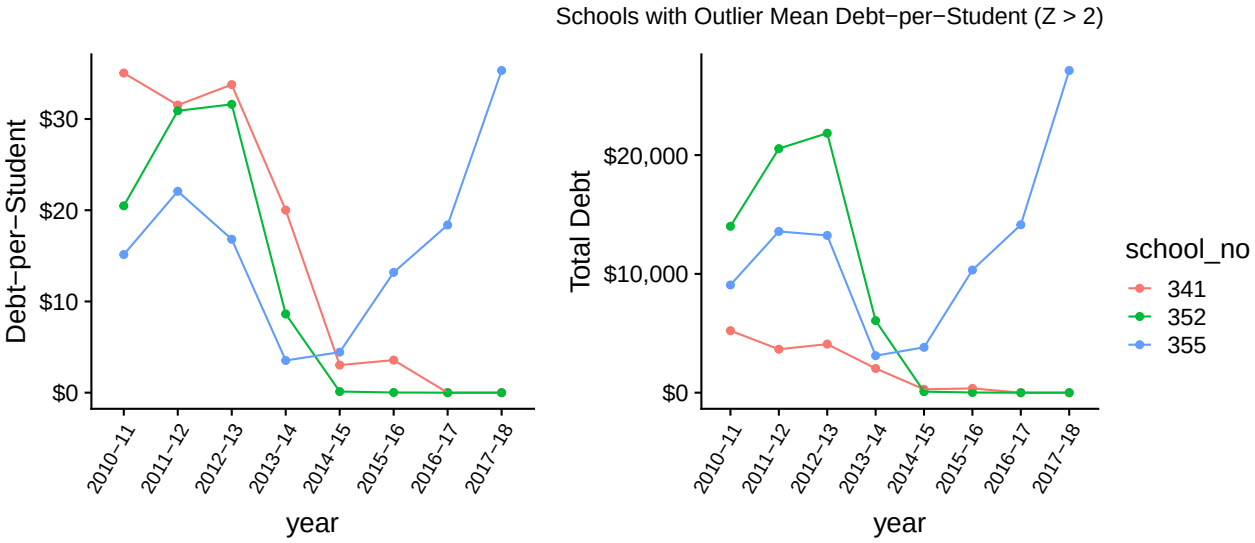


There are definitely some outliers in our data when it comes to variance of within-school debt per student and mean debt-per-student. Let's pull any schools that fall greater than 2 standard deviations from the mean (proper outliers) and see what their debt-per-student looks like longitudinally.

High variance schools



Schools with the most debt



NOTES:

- CEP provisions began in 2014-15 in NC
- data collected at different times so numbers won't match perfectly
- 353 is housed in Durham Tech, which complicates some of the data
- For the most part, aside from missing data, it seems like schools with no debt are CEP schools. We can't get CEP status starting in 2010-11, since those were pilot years.

DATA QUESTIONS: - schools with CEP 2017-18 have over 100% needy?

REPORTING QUESTIONS: - how do students get assigned to schools? any diversity initiatives? - does the district track when debt is payed off? - can a student graduate with debt? are they barred from anything? what are consequences besides food?