The Community Eligibility Provision: Food Insecurity in Durham Public Schools

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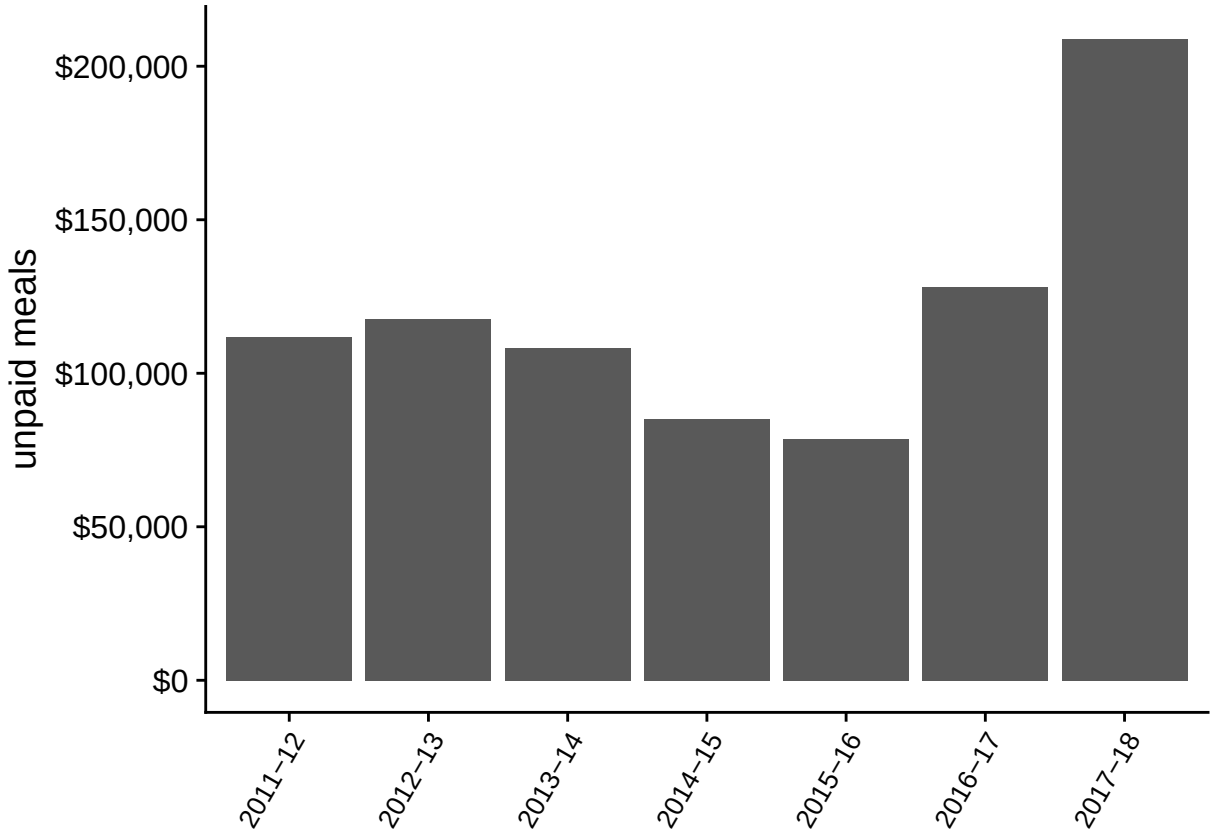
11/2/2018

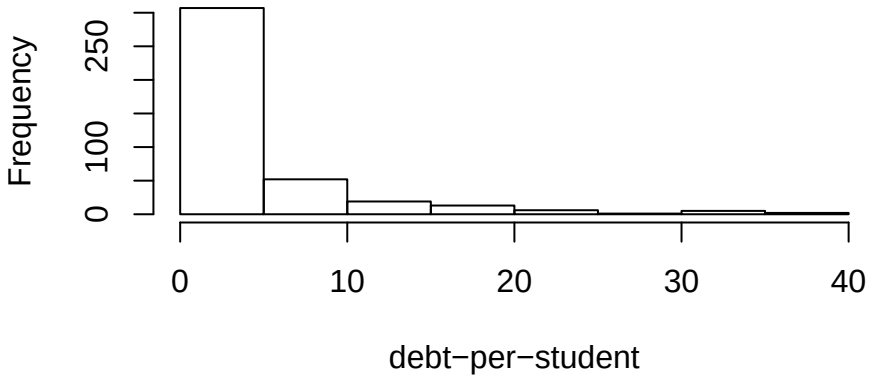
Exploratory Data Analysis

```
## # A tibble: 8 x 4
##   year    total_debt mean_debt_per_student fullprice_lunches
##   <fct>        <dbl>                 <dbl>             <dbl>
## 1 2010-11    204692.                  7.34            70584.
## 2 2011-12    111567.                  4.53            38472.
## 3 2012-13    117526.                  4.54            40526.
## 4 2013-14    108231.                  3.76            37321.
## 5 2014-15     85093.                  2.51            29342.
## 6 2015-16     78428.                  2.25            27044.
## 7 2016-17    127940.                  3.38            44117.
## 8 2017-18    209022.                  5.10            72076.
```



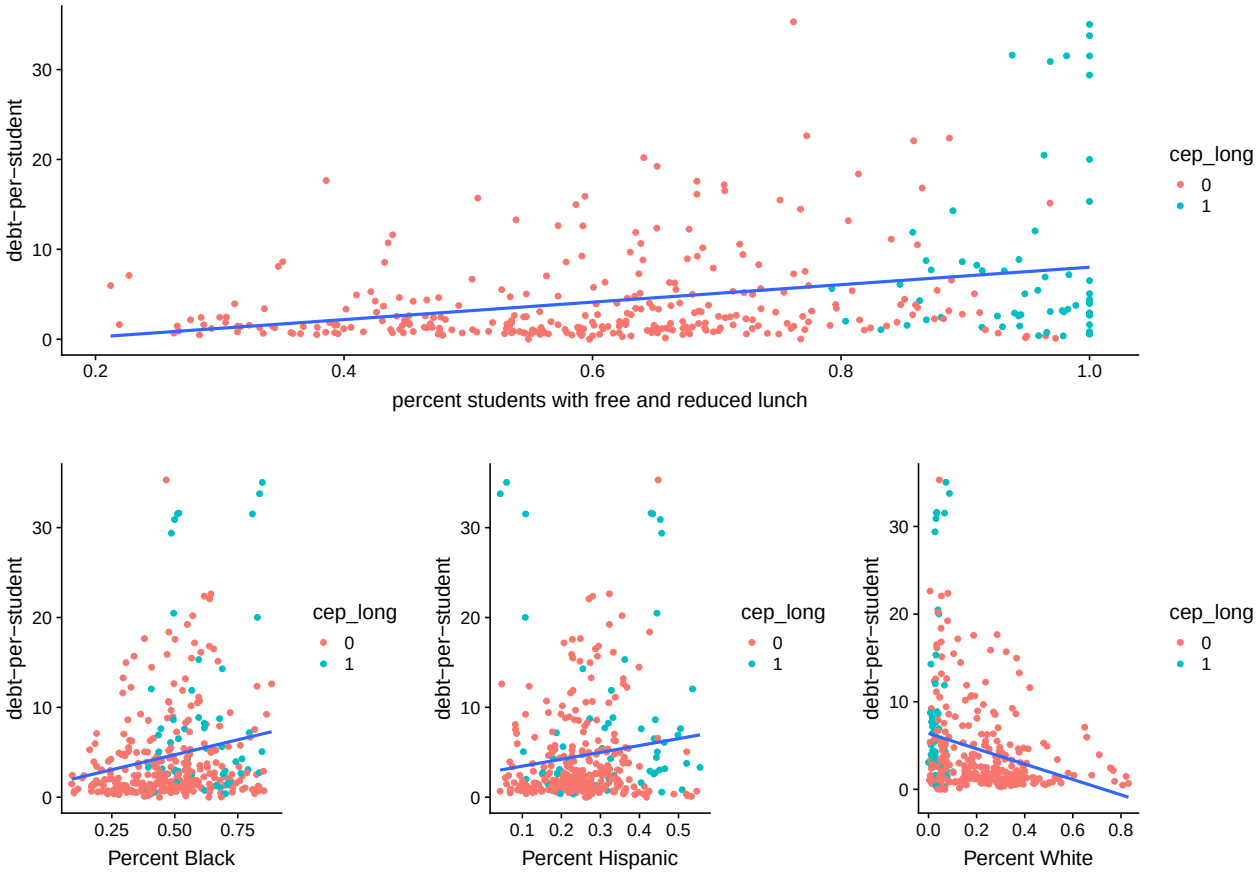

```
## [1] 2.036936
```

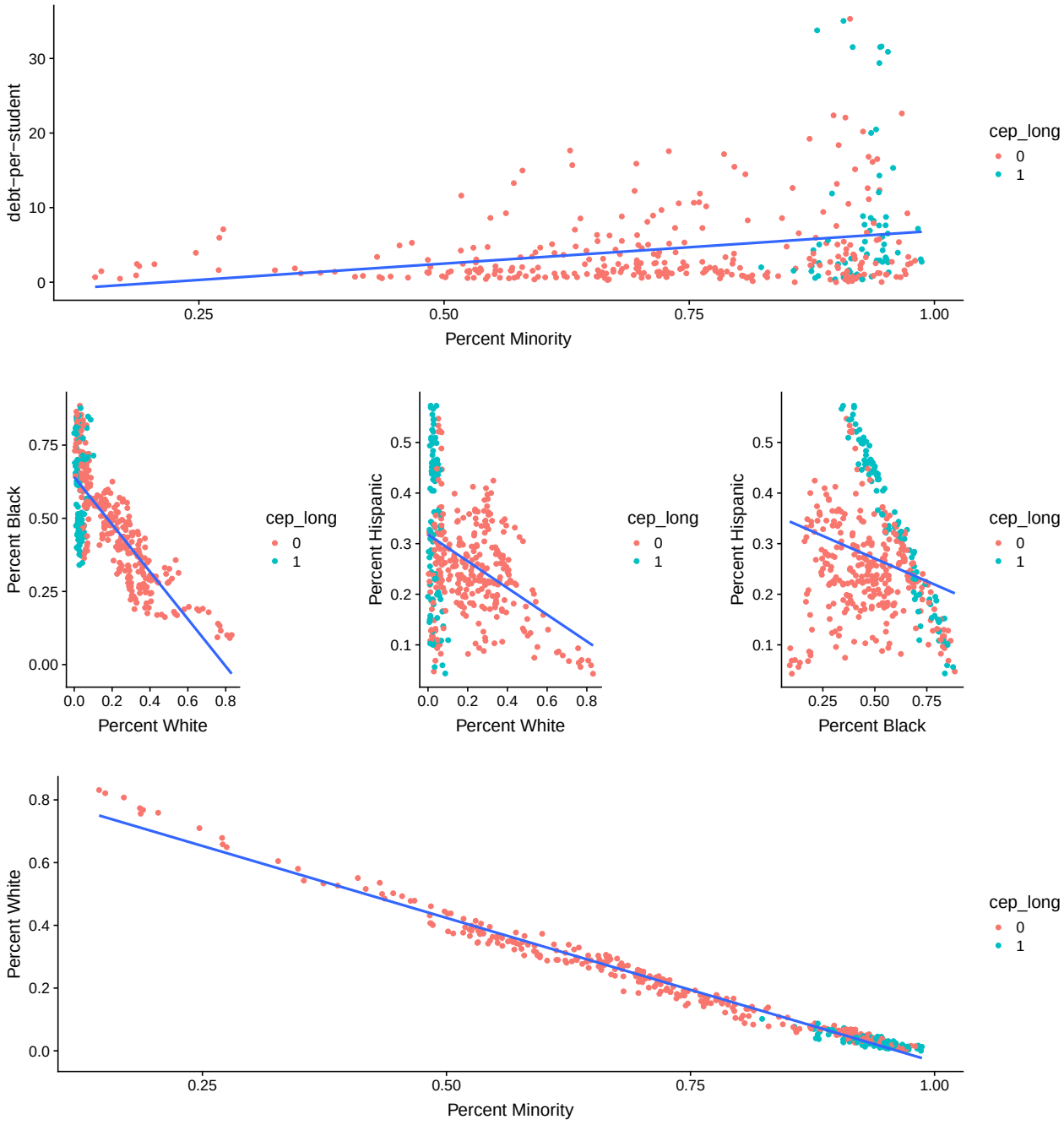
At the end of the 2017-18 academic year, DPS had over $211,000 in school lunch debt. That's over 72,000 unpaid lunches, with an average of $5.10 of debt per student. It's also the most debt the school district has seen in the past eight years.



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.

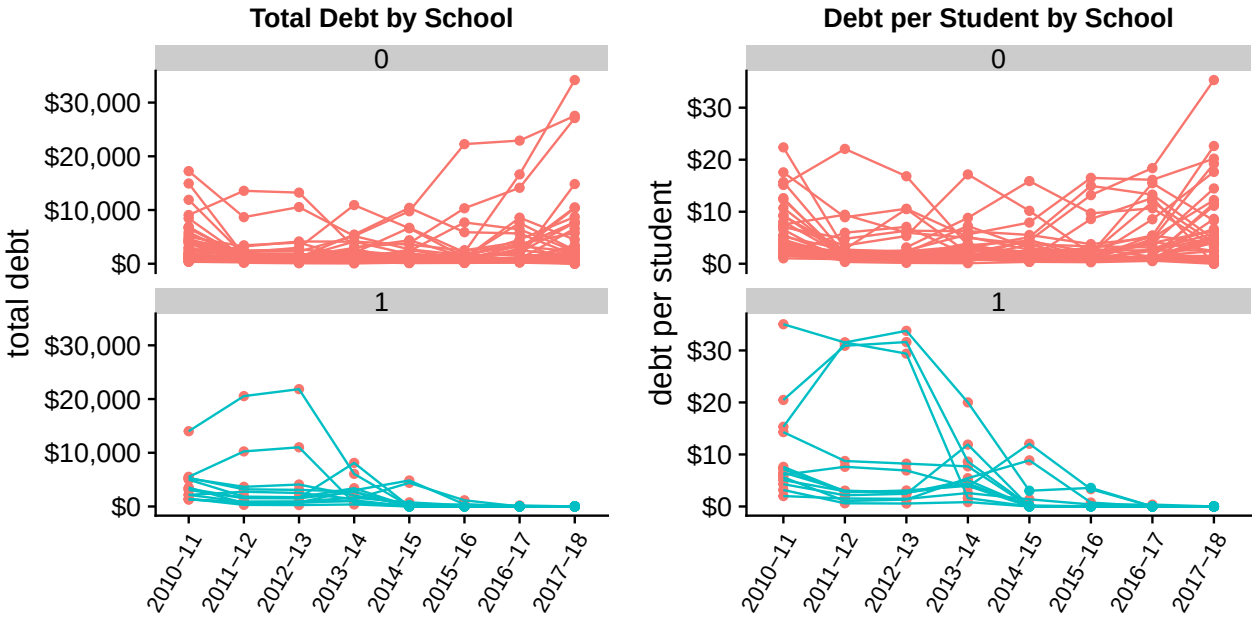
Debt and Demographics





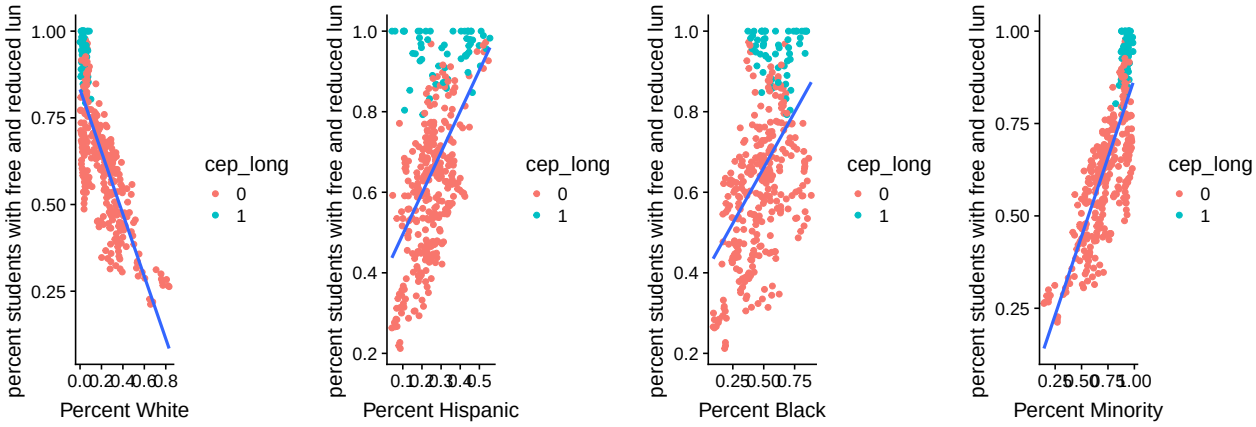
There is a weak positive correlation between the percentage of students who have free and reduced price lunch and the debt-per-student at each school. It looks like schools with CEP status generally have a higher percentage of students on free/reduced lunch. As for demographics, there is also a weak 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



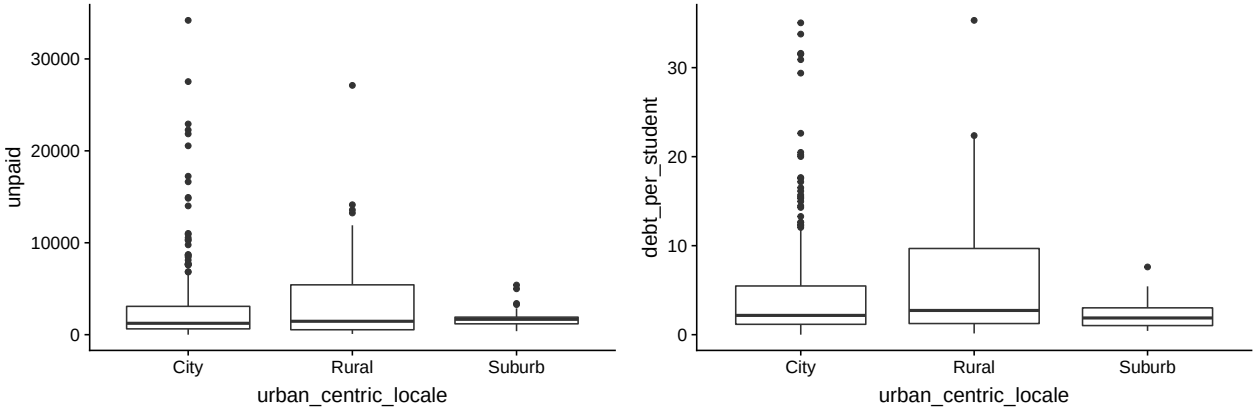
Schools with CEP status generally had a large amount of debt until the 2014-15 school year, when they gained CEP status. That being said, other schools with similar amounts of debt did not gain CEP status.

Demographics and need

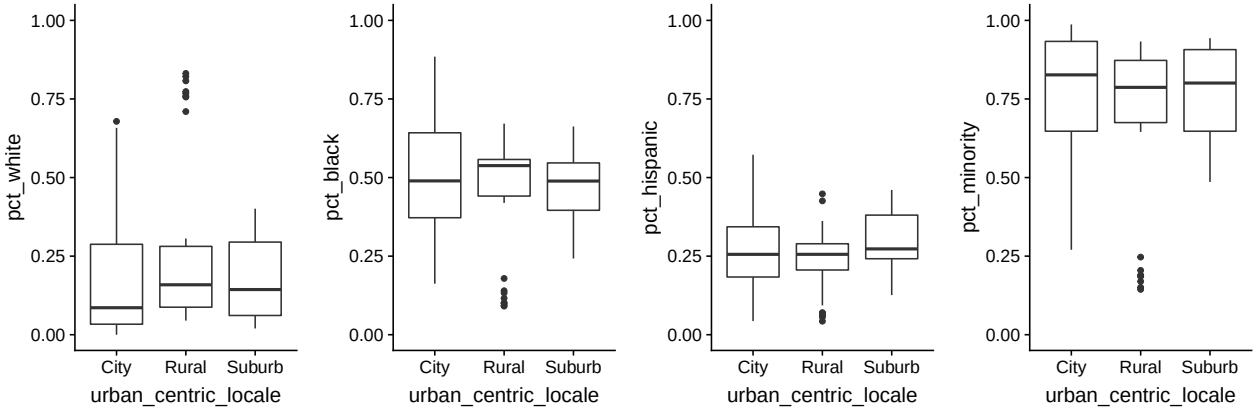


We can also see that race is a proxy for need. The percentage of black and hispanic schools have a strong, positive correlation with the percentage of students on free and reduced price lunch. For white students, this relationship is strong and negative.

Locale and debt, race



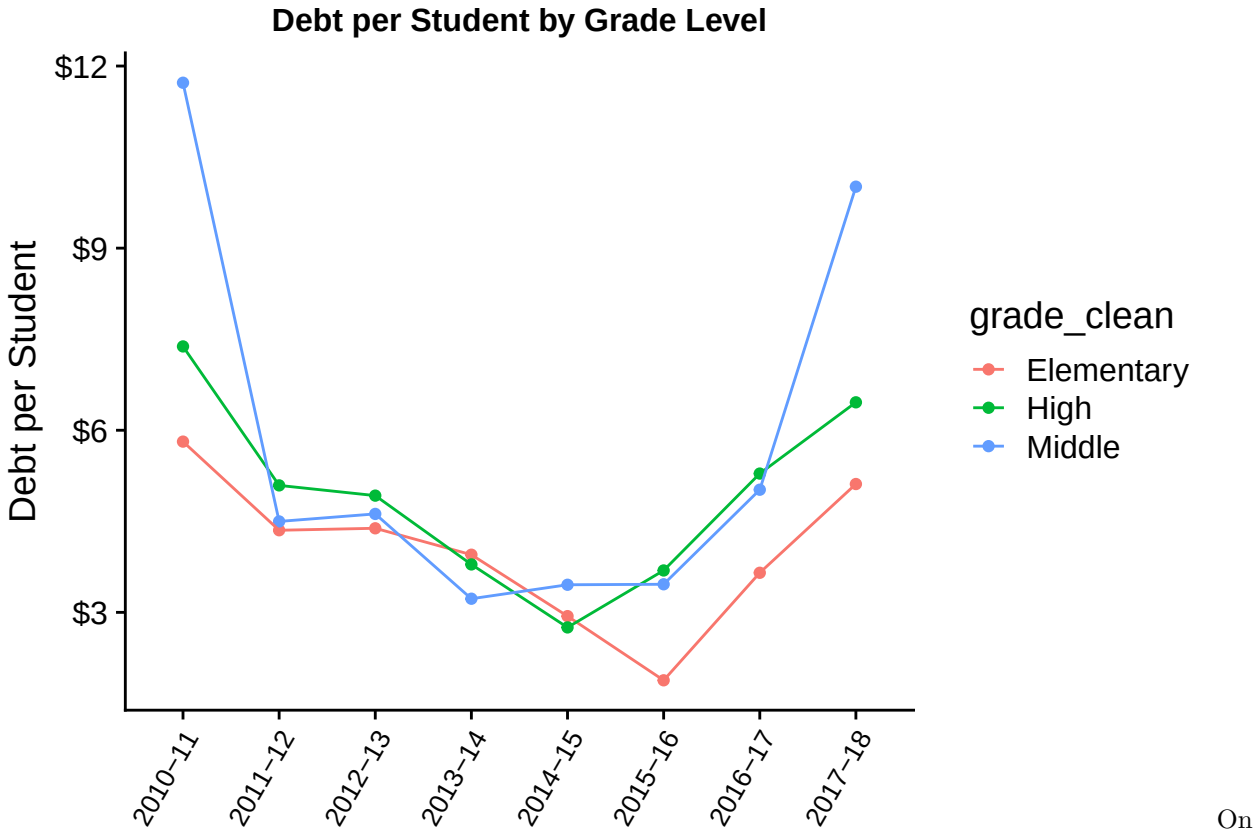
There don't seem to be major differences in debt by location.



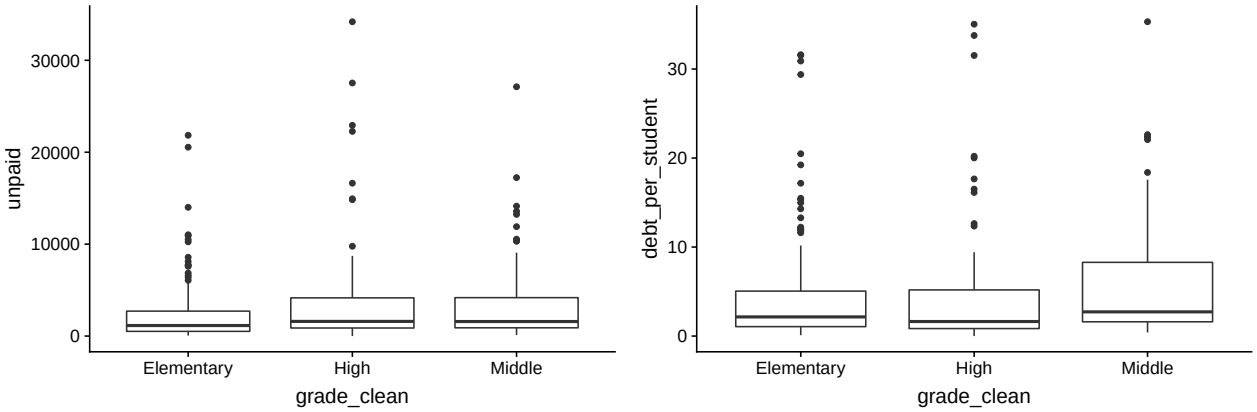
On average, we also don't see any major differences in race by locale. However, there is a subset of rural schools that seem to primarily be white.

Debt and grade

```
## # A tibble: 3 x 3
##   grade_clean mean_debt mean_dps
##   <fct>           <dbl>    <dbl>
## 1 Elementary      2181.     4.10
## 2 High            4016.     4.94
## 3 Middle          3541.     5.70
```



On average, high schools have the most total debt. However, middle schools, on average, have the most debt per student.



CEP Schools

In this section, I explore the differences between schools that gained CEP status and schools that did not.

Eligibility

```
##   eligible participating
## 1      105            35
```

Eligible but non-participating CEP schools

```
## # A tibble: 3 x 7
## # Groups:   eligible [?]
##   eligible participating     n  unpaid mean_dps avg_free_reduced
##      <int>         <int> <int>   <dbl>    <dbl>            <dbl>
## 1        0             0    26 1.29e+5     5.28             0.51
## 2        1             0    12 7.97e+4    10.3              0.75
## 3        1             1    13 8.00e-1     0                1
## # ... with 1 more variable: avg_pct_minority <dbl>
```

```
## [1] 0.3811623
```

Last year, debt was concentrated in schools that were not eligible to participate in the CEP program. However, eligible but non-participating CEP schools accounted for nearly 40 percent of all debt in Durham county.

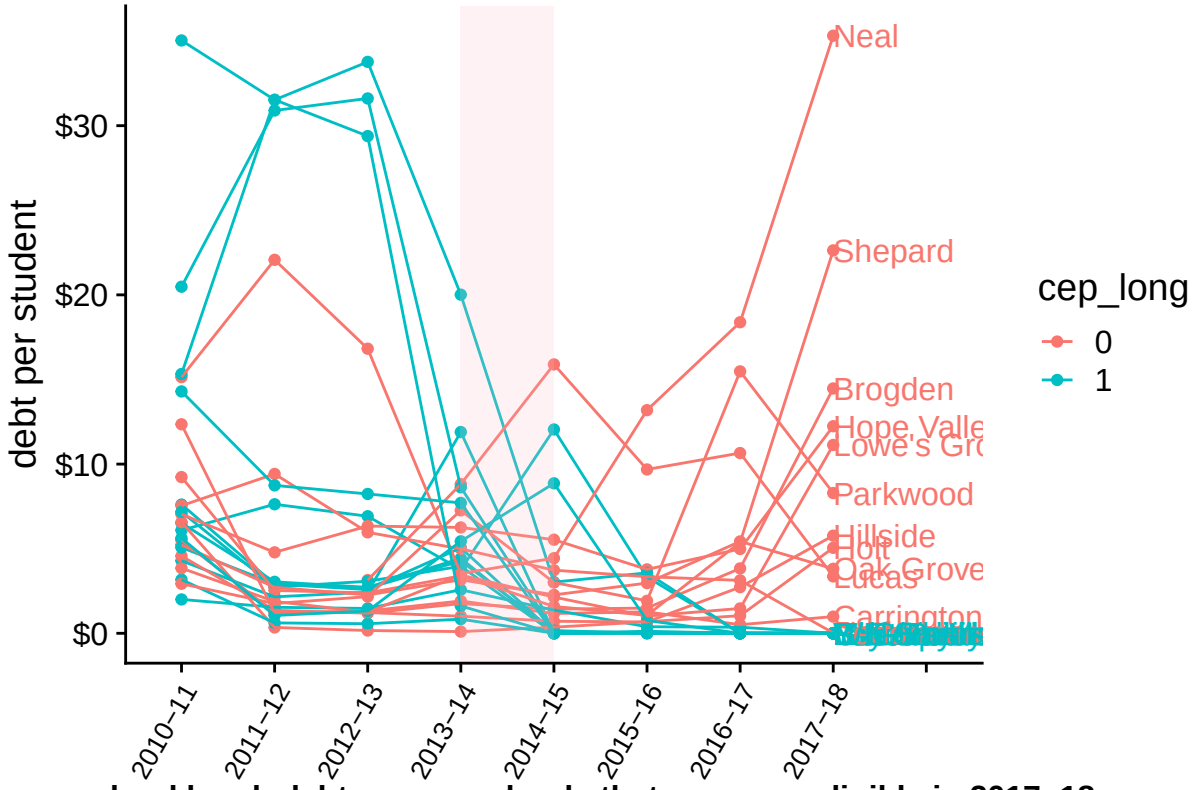
CEP Status and Grade Level

```
## # A tibble: 8 x 6
## # Groups:   grade_clean, eligible [6]
##   grade_clean eligible participating     n  unpaid mean_dps
##   <fct>          <int>         <int> <int>   <dbl>    <dbl>
## 1 Middle             1             0     6 54097.     14.6
## 2 High               0             0     7 86544.      7.48
## 3 Elementary         1             0     4 17983.      7.35
## 4 Elementary         0             0    14 30607.      4.48
## 5 Middle             0             0     5 12199.      4.45
## 6 High               1             0     2  7591.      2.9
## 7 Elementary         1             1    12     0.8     0
## 8 High               1             1     1     0       0
```

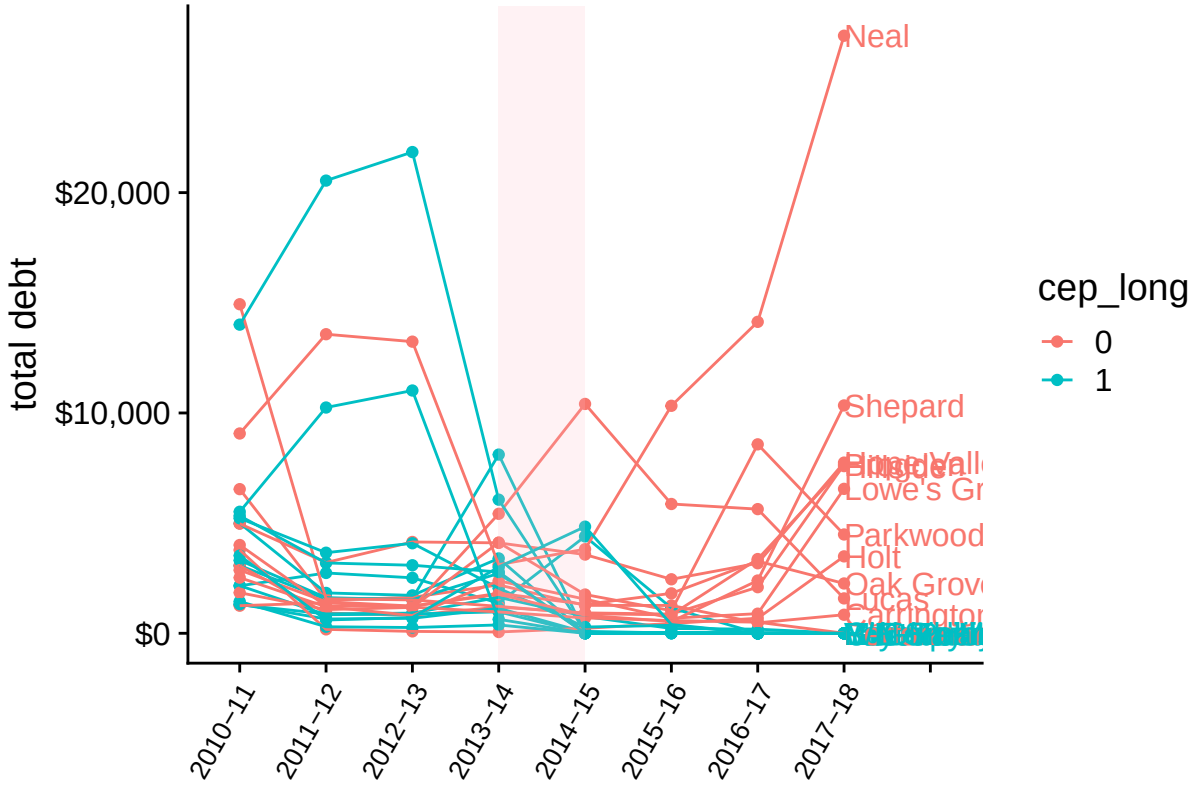
```
## # A tibble: 8 x 6
## # Groups:   grade_clean, eligible [6]
##   grade_clean eligible participating     n  unpaid mean_dps
##   <fct>          <int>         <int> <int>   <dbl>    <dbl>
## 1 High               0             0     7 86544.      7.48
## 2 Middle             1             0     6 54097.     14.6
## 3 Elementary         0             0    14 30607.      4.48
## 4 Elementary         1             0     4 17983.      7.35
## 5 Middle             0             0     5 12199.      4.45
## 6 High               1             0     2  7591.      2.9
## 7 Elementary         1             1    12     0.8     0
## 8 High               1             1     1     0       0
```

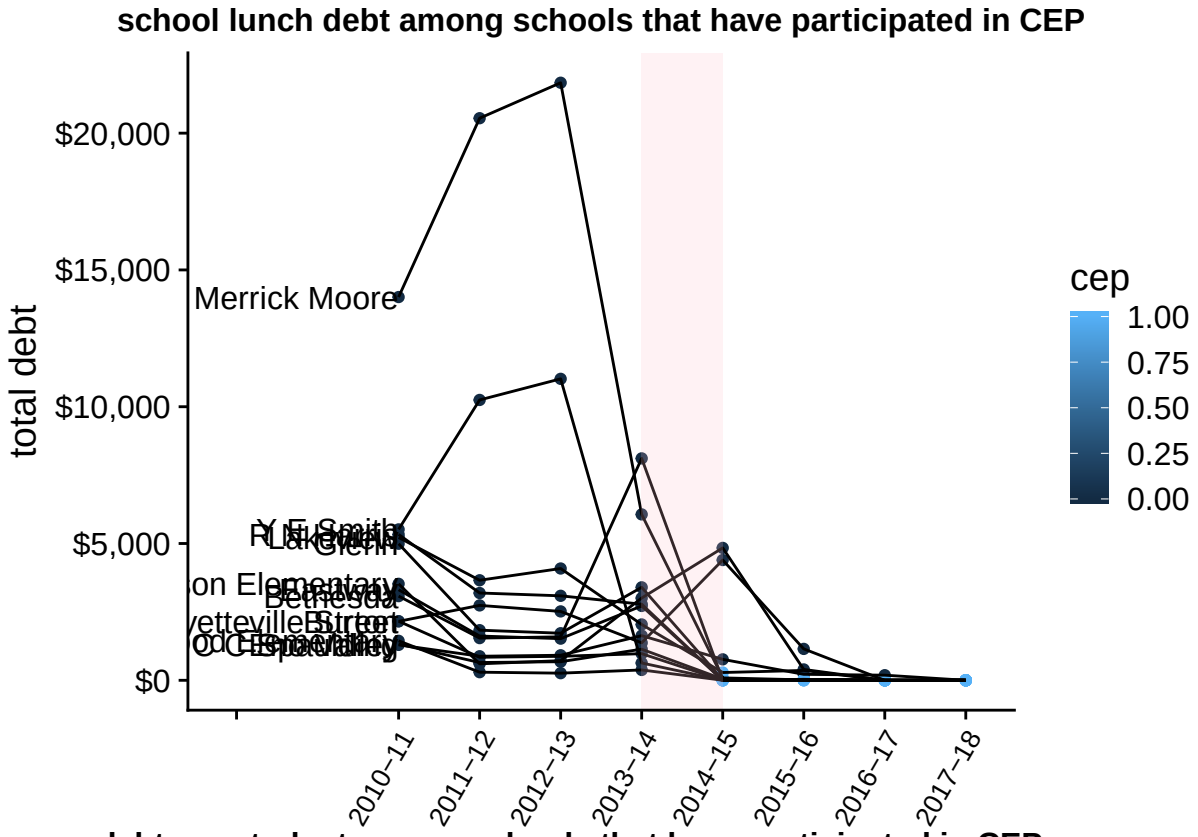
Last year, all but one of the CEP schools were elementary schools. We also see that no middle schools participated in the CEP program, but the six that were eligible & non-participating had the most debt per student–nearly twice that of eligible but non-participating elementary schools. Eligible and non-participating high-schools, however, had relatively low debt per student at just $2.90 of unpaid meals per student. The overall debt for those schools was also fairly low.

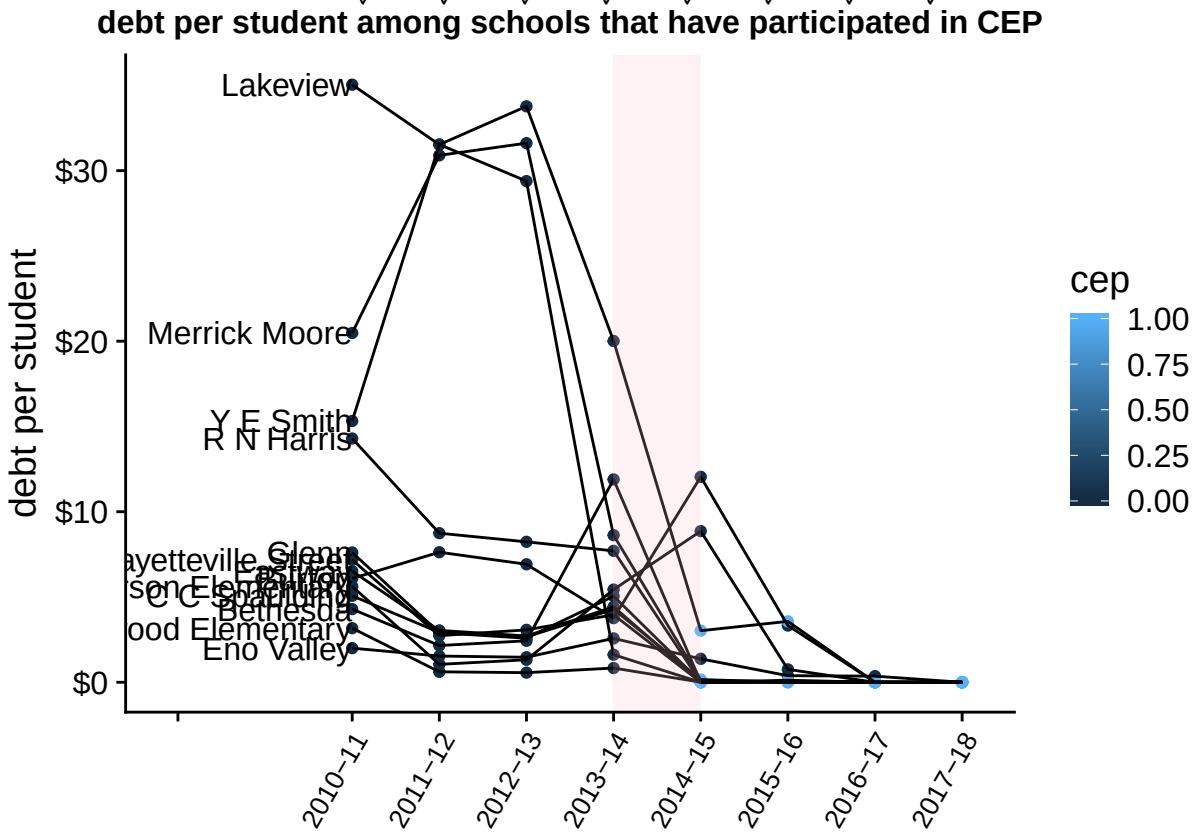
debt per student among schools that were cep eligible in 2017−18

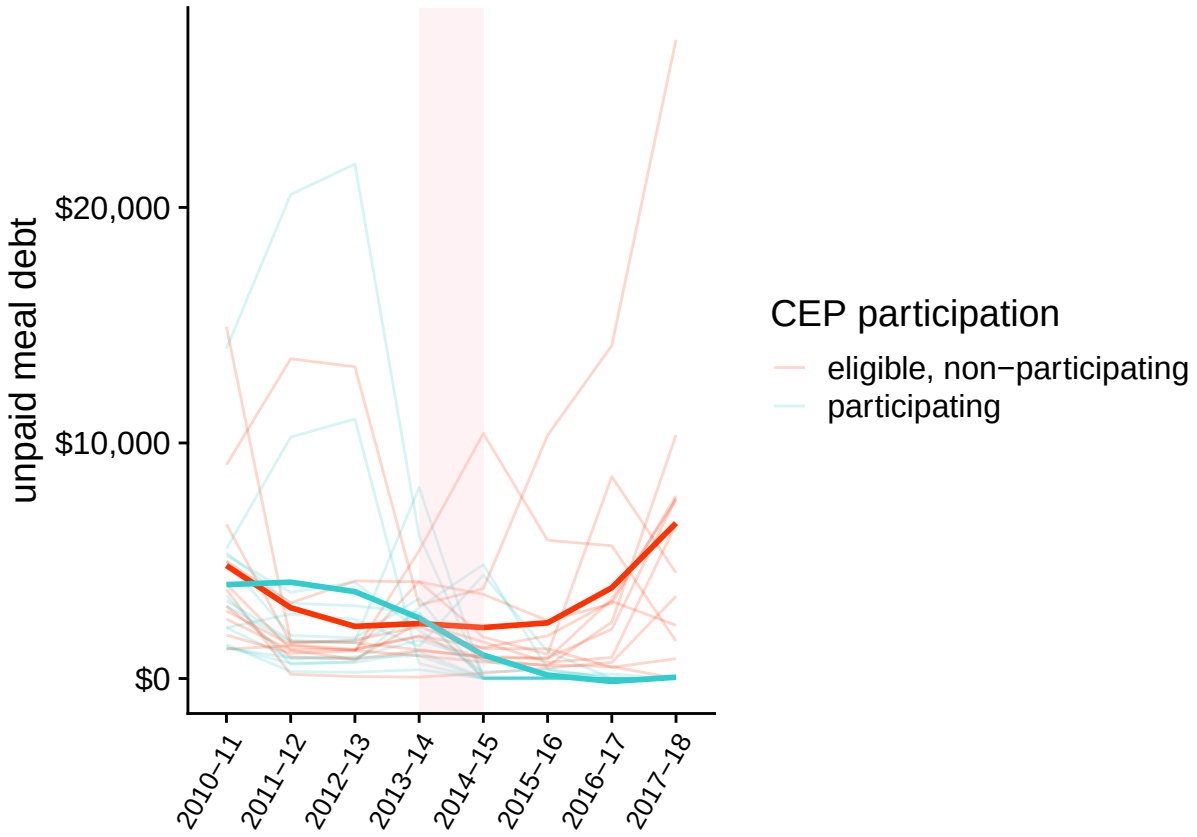


school lunch debt among schools that were cep eligible in 2017−18




school lunch debt among schools that have participated in CEP
total debt
$20,000
$15,000
$10,000
$5,000
$0
Merrick Moore
2010–11
2011–12
2012–13
2013–14
2014–15
2015–16
2016–17
2017–18
cep
1.00
0.75
0.50
0.25
0.00


debt per student among schools that have participated in CEP
debt per student
$30
$20
$10
$0
Lakeview
Merrick Moore
Y E Smith
R N Harris
Eno Valley
2010–11
2011–12
2012–13
2013–14
2014–15
2015–16
2016–17
2017–18
cep
1.00
0.75
0.50
0.25
0.00



Percent Minority

```
## # A tibble: 2 x 2
##   cep_long mean_minority
##   <fct>            <dbl>
## 1 0                0.712
## 2 1                0.931
```

CEP schools also have a higher concentration of minority students, on average.

Debt before CEP status

```
## # A tibble: 2 x 3
##   cep_long mean_dps mean_debt
##   <fct>       <dbl>     <dbl>
## 1 0            3.45     2297.
## 2 1            7.58     3039.
```

CEP schools also had, on average, higher debt and more debt per student than non-CEP schools prior to CEP assignments.

Individual school analysis

Neal Middle

```
##      year   unpaid debt_per_student
```

```
## 1 2010-11  9068.58        15.139533
## 2 2011-12 13574.29        22.072016
## 3 2012-13 13236.97        16.819530
## 4 2013-14  3114.71         3.531417
## 5 2014-15  3817.10         4.438488
## 6 2015-16 10325.43        13.187011
## 7 2016-17 14135.73        18.381964
## 8 2017-18 27121.24        35.314115
```

CEP vs. ISP comparison

Comparing Percentages

```
## # A tibble: 19 x 3
## # Groups:   school_name [19]
##    school_name                 school_no       diff
##    <fct>                           <int>      <dbl>
##  1 Sandy Ridge                       369  15.3
##  2 Hillside                          325   7.93
##  3 Brogden                           306   6.92
##  4 Performance Learning Center       322   4.27
##  5 Lucas                             343   4.20
##  6 Lowe's Grove                      346   3.29
##  7 Burton                            308   2.68
##  8 W G Pearson Elementary            388   2.24
##  9 Eno Valley                        315   2.02
## 10 Neal                              355   1.35
## 11 Githens                           366   0.000883
## 12 Southern                          368  -0.0757
## 13 Hope Valley                       327  -0.761
## 14 Hillandale                        324  -0.814
## 15 Carrington                        316  -0.849
## 16 Shepard                           338  -0.902
## 17 Parkwood                          362  -1.44
## 18 Holt                              328 -12.8
## 19 Oak Grove                         360 -14.5
```

```
##                    school_name pct_free_reduced    isp     isp_diff
## 1                      Brogden        0.7674858 0.5289  0.078754178
## 2                   Carrington        0.6913146 0.4063 -0.041234554
## 3  Performance Learning Center        0.7676056 0.4817  0.003114366
## 4                     Hillside        0.6007605 0.4148  0.062919544
## 5                  Hope Valley        0.6777251 0.4220 -0.002525118
## 6                         Holt        0.9073806 0.4844 -0.132340608
## 7                      Shepard        0.7724289 0.4801 -0.004268884
## 8                        Lucas        0.6390658 0.4216  0.035494183
## 9                  Lowe's Grove        0.8404075 0.5276  0.003752530
## 10                         Neal        0.7617188 0.4541 -0.035158750
## 11                    Oak Grove        0.8600337 0.4347 -0.164513727
## 12                     Parkwood        0.7338262 0.4483 -0.016546248
```

Banding

```
## [1] 1.0000 0.8508 0.7432 0.6223
```

```
## [1] 1.00 0.85 0.74 0.62
```

```
## [1] 15
```

```
## # A tibble: 4 x 2
##   orig_band       n
##   <fct>       <int>
## 1 (0,0.62]        8
## 2 (0.62,0.74]     8
## 3 (0.74,0.85]     5
## 4 (0.85,1]       10
```

```
## # A tibble: 4 x 2
##   orig_band       n
##   <fct>       <int>
## 1 (0,0.62]        8
## 2 (0.62,0.74]     8
## 3 (0.74,0.85]     5
## 4 (0.85,1]       10
```

```
##                        school_name total_alloc alloc_after    alloc_diff
## 1      George L Carrington Middle      279180    348821.6  6.964159e+04
## 2                    Lucas Middle      123740    147208.9  2.346888e+04
## 3          James E Shepard Middle      158860    174642.3  1.578235e+04
## 4             Parkwood Elementary      188000    200575.1  1.257511e+04
## 5                 Holt Elementary      285120    290698.7  5.578733e+03
## 6        Merrick-Moore Elementary      257280    257280.0  2.910383e-11
## 7              Eastway Elementary      284200    284200.0  0.000000e+00
## 8        C C Spaulding Elementary      159740    159740.0  0.000000e+00
## 9             Y E Smith Elementary      196980    196980.0  0.000000e+00
## 10               Glenn Elementary      303310    303310.0  0.000000e+00
## 11            Lakewood Elementary      189140    189140.0  0.000000e+00
## 12              Burton Elementary      165620    165620.0  0.000000e+00
## 13         W G Pearson Elementary      216580    216580.0  0.000000e+00
## 14            Bethesda Elementary      299390    299390.0  0.000000e+00
## 15          Hillandale Elementary      199280    199280.0  0.000000e+00
## 16         Sandy Ridge Elementary      175310    175310.0  0.000000e+00
## 17        Sherwood Githens Middle      262200    262200.0  0.000000e+00
## 18         Forest View Elementary      215740    215740.0  0.000000e+00
## 19       Spring Valley Elementary      172500    172500.0  0.000000e+00
## 20      Club Boulevard Elementary      132940    132940.0  0.000000e+00
## 21           Southwest Elementary      157780    157780.0  0.000000e+00
## 22            E K Powe Elementary      112700    112700.0  0.000000e+00
## 23           Creekside Elementary      168360    168360.0  0.000000e+00
## 24          R N Harris Elementary      120320    120320.0 -1.455192e-11
## 25 Fayetteville Street Elementary      143570    143570.0 -2.910383e-11
## 26          Eno Valley Elementary      224420    224420.0 -2.910383e-11
## 27         Hope Valley Elementary      209150    204469.9 -4.680110e+03
## 28                Brogden Middle      206400    201362.8 -5.037205e+03
## 29           Oak Grove Elementary      229830    206126.5 -2.370355e+04
## 30           Lowe's Grove Middle      246720    203859.4 -4.286059e+04
## 31                   Neal Middle      301440    236885.9 -6.455406e+04
```

Dr. Danner, director of federal programs for Durham Public Schools, said Title I banding changes every year, but the banding has been the same for the past two school years (2017-18 and 2018-19), which is where data is available.

2020 Eligibility

```
##   eligible
## 1       31
```