SATs and ACTs

Do states prepare students sufficiently for standardized tests?

Background

- States have different ways of allocating educational resource, leading to potentially different preparedness of students between states.
  - "For example, an eighth grader in Missouri would need the equivalent of a 311 on the national math test to be judged proficient. That is actually more rigorous than the national test. In Tennessee, however, a student can meet the state's proficiency standard with a 230, a score well below even the basic level on the national exam." (Source: https://www.nytimes.com/2007/06/08/education/08scores.html)
- Expectation: Expect a positive correlation between test scores from both ACT and SAT- the education system is doing well to serve the general population. Else, might point to other factors that determine whether a child is doing well- state education is not sufficient.

Problem Statement

- I am a Public Policy student attempting to understand the different states' ability to prepare students for tests.

- To see whether the education system in the state holistically provides for students to excel regardless- students from same states should do well in both ACT and SAT across the board.

Data received

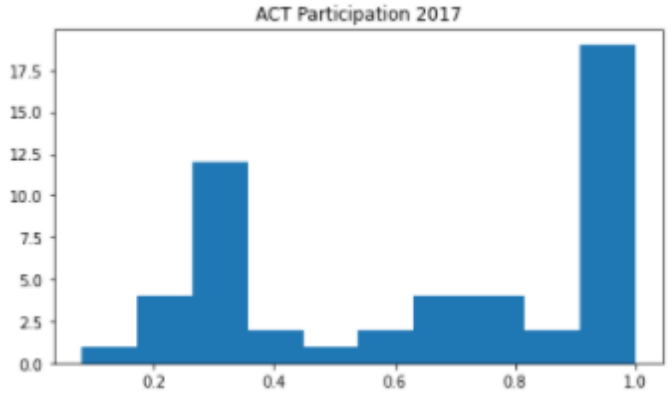
Data was received for 51 States for ACT and SAT in 2017 and 2018

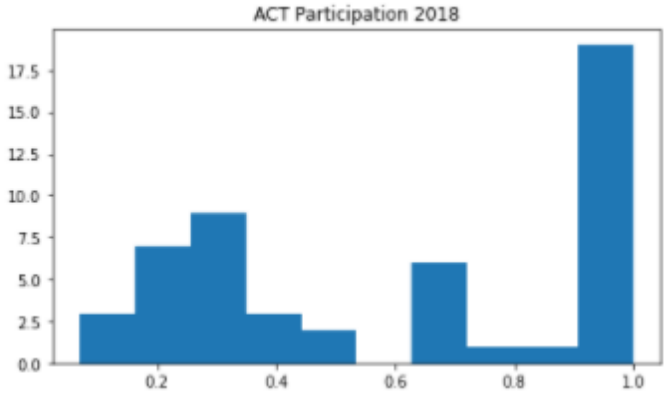
- 2017 ACT Scores by State
  - Contains State, Participation rates, English, Math, Reading, Science and Composite Scores
- 2018 ACT Scores by State (no subject scores)
  - Contains State, Participation rates, and Composite Scores
- 2017 SAT Scores by State
  - Contains State, Participation rates, and Total Scores
- 2018 SAT Scores by State
  - Contains State, Participation rates, and Total Score

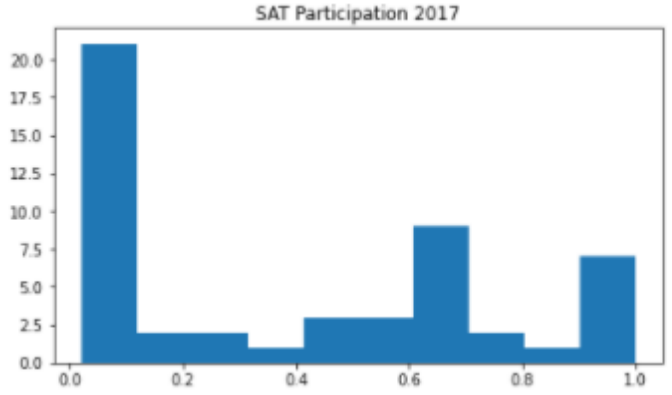
Cleaning of the data

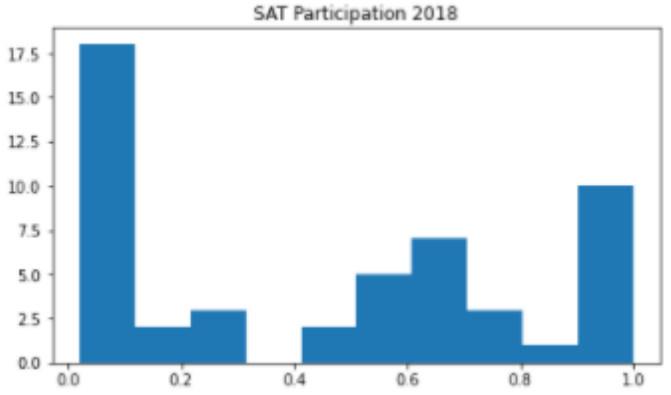
- Check for missing values
- Check whether values are within expected range (e.g. min and max for SAT total scores should be 0 and 1600)
- Changed percentages to decimal-placed values
  - For easier manipulation
- Ensured that all states are there and spelt correctly
  - Found several errors within the data that we cleaned up, such as District of Columbia being spelt differently across data sets, an additional row for the State Maine in 2018, amongst others.
- Merged all 4 data sets into one based on the common parameter: State

Exploring data sets – Participation Rates



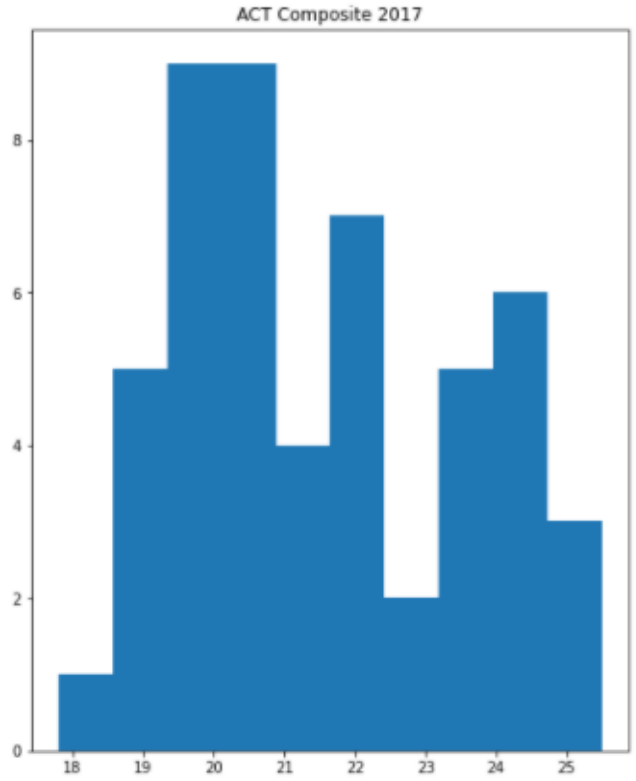


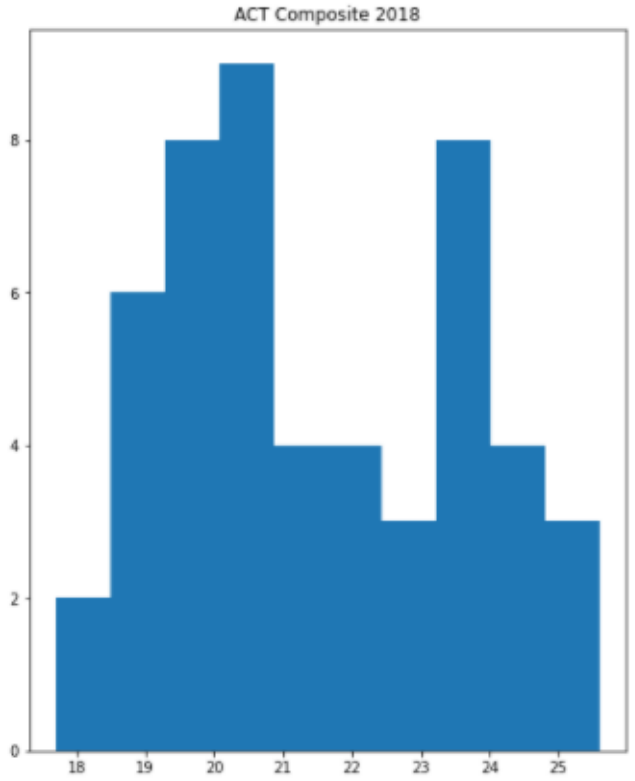




- The histograms appear to be somewhat bimodal.
- For ACT, there are quite a number of states that achieve 100% participation rates forming a peak there, and a cluster of states that have low participation rates.
- For SAT, conversely there are quite a number of states that achieve low participation rates.
- **A question for thought: is the relationship inverse in participation rates across tests?**

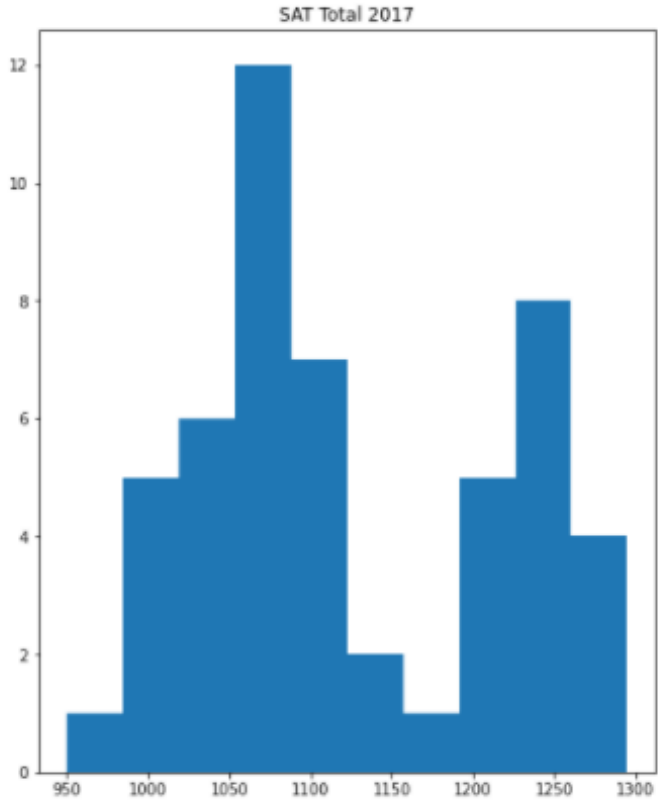
Exploring data sets – ACT Composite Scores

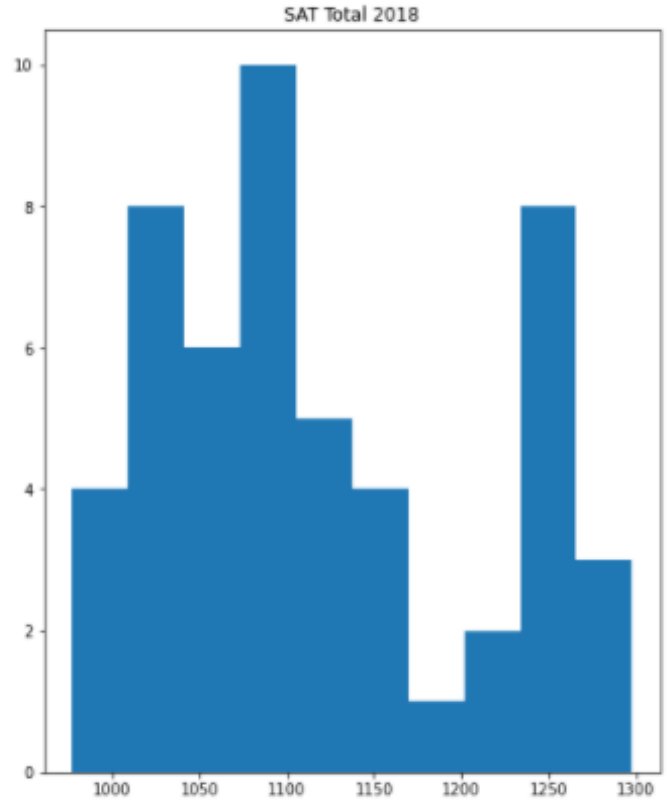




- The scores for ACT composite appear bimodal, with two peak, one on the lower end and one on the higher end of the scores. More students appear to score less as compared to the peak on the right.
- Overall, the shape of the two years seem to be similar.

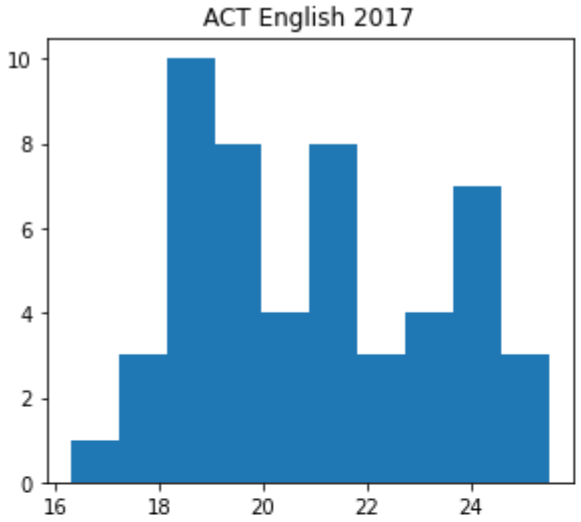
Exploring data sets – SAT Total Scores

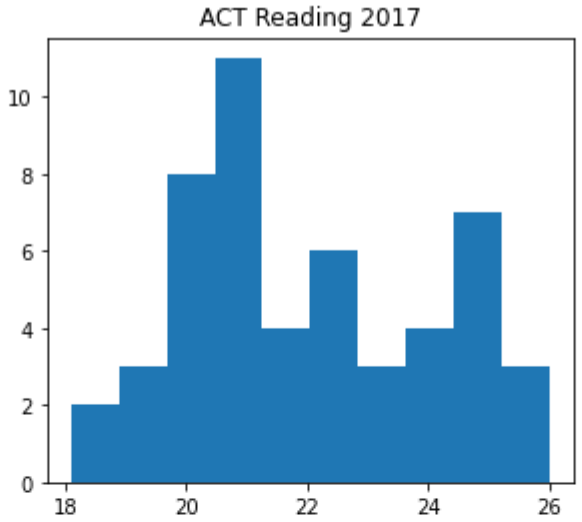


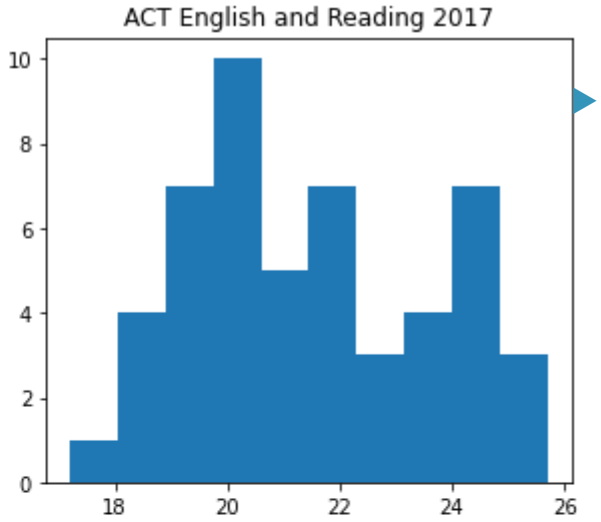


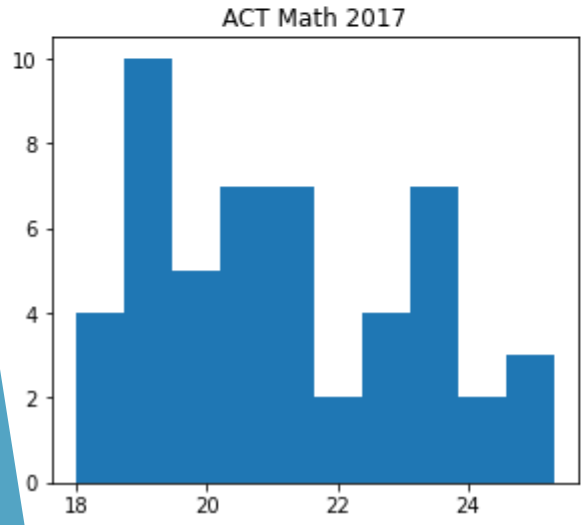
- Both are bimodal but slightly right skewed, with a higher peak around 1075 and more clustering there, and a shorter peak and less clustering around the score of 1250.
- The histograms for SAT total by year appear quite similar

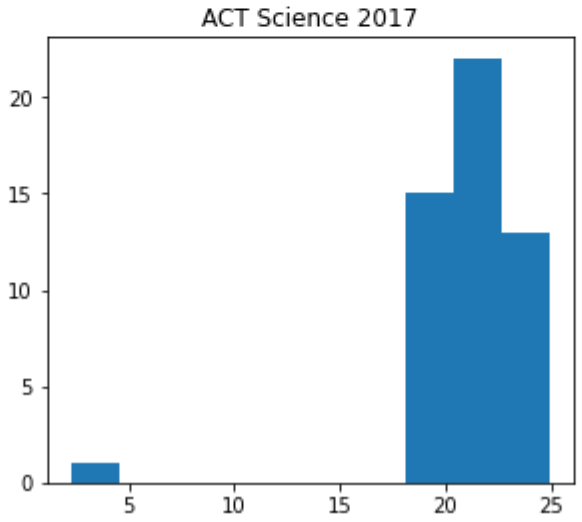
Exploring data sets – ACT Subjects Scores

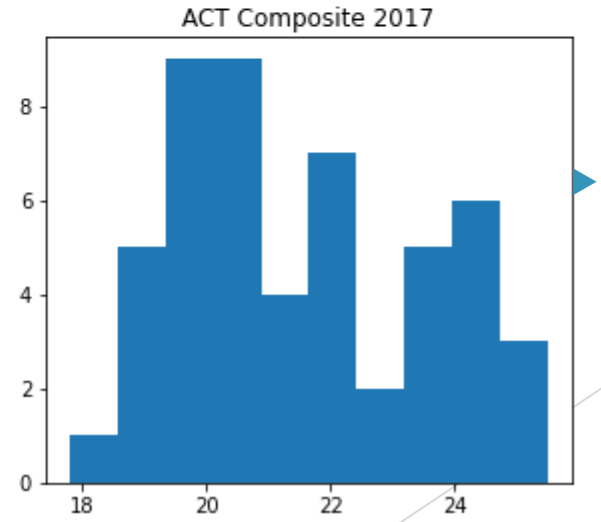






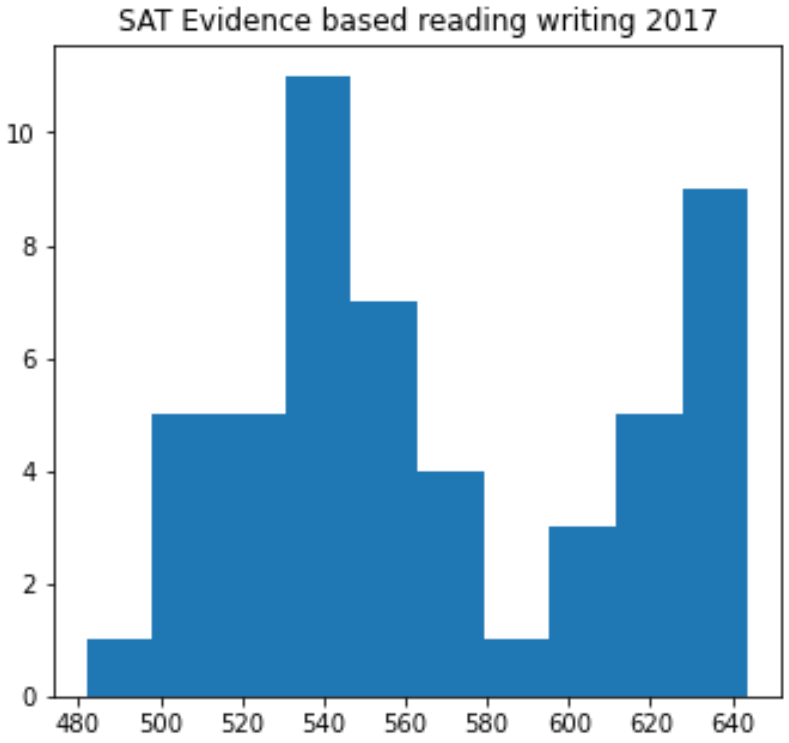


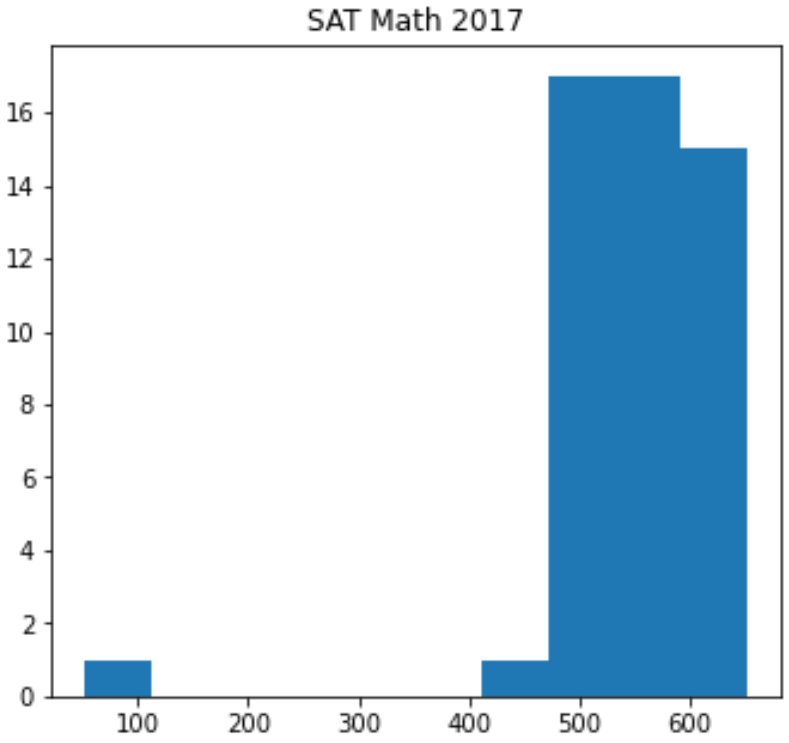




- The histograms for ACT subject scores appear be bi-modal or multi-modal, except for science which is uni-modal and left skewed. For most subjects, there are small peaks, but no clear representation of where the scores are more skewed to thought there is a slight right skew.
- For science 2017, a lot of students managed to score high scores close to or above 20. There is also an outlier that scored low.

Exploring data sets – SAT Subject Scores



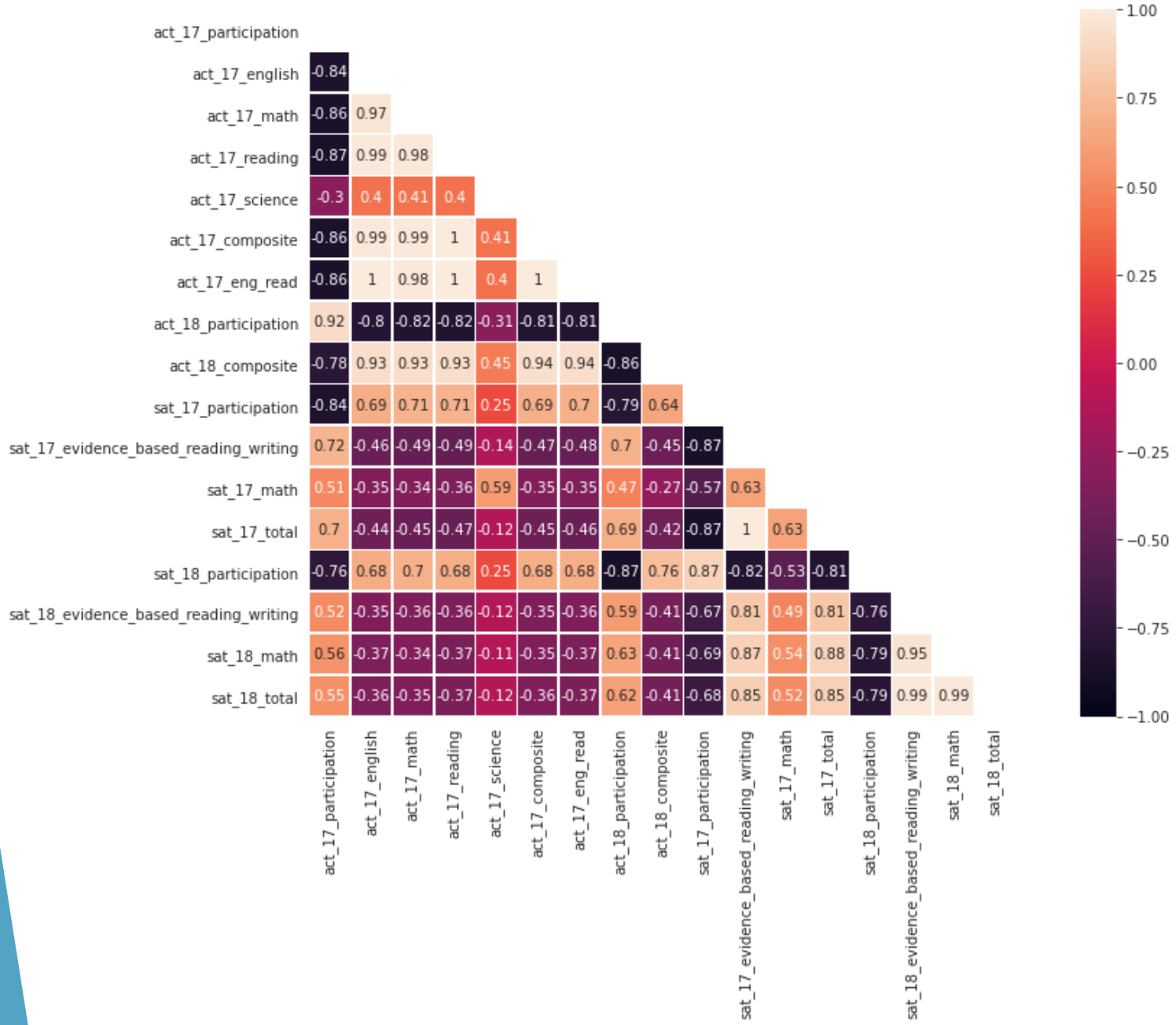


- The histogram for SAT subjects appear quite different, with Evidence based Reading and writing appearing to be bimodal and having a peak at the high score of around 640, and another at the score of around 540.
- For math, there is only one peak between 500 and 600, with most students scoring there. There is also a low scoring state that is an outlier.
- **Query: Will these scores be similar to that of ACT's?**

Analysis – Assumptions made

- 1) States have different ways of administering, running their education system and assessing their children, leading to widely different standards between states:
  - "For example, an eighth grader in Missouri would need the equivalent of a 311 on the national math test to be judged proficient. That is actually more rigorous than the national test. In Tennessee, however, a student can meet the state's proficiency standard with a 230, a score well below even the basic level on the national exam."

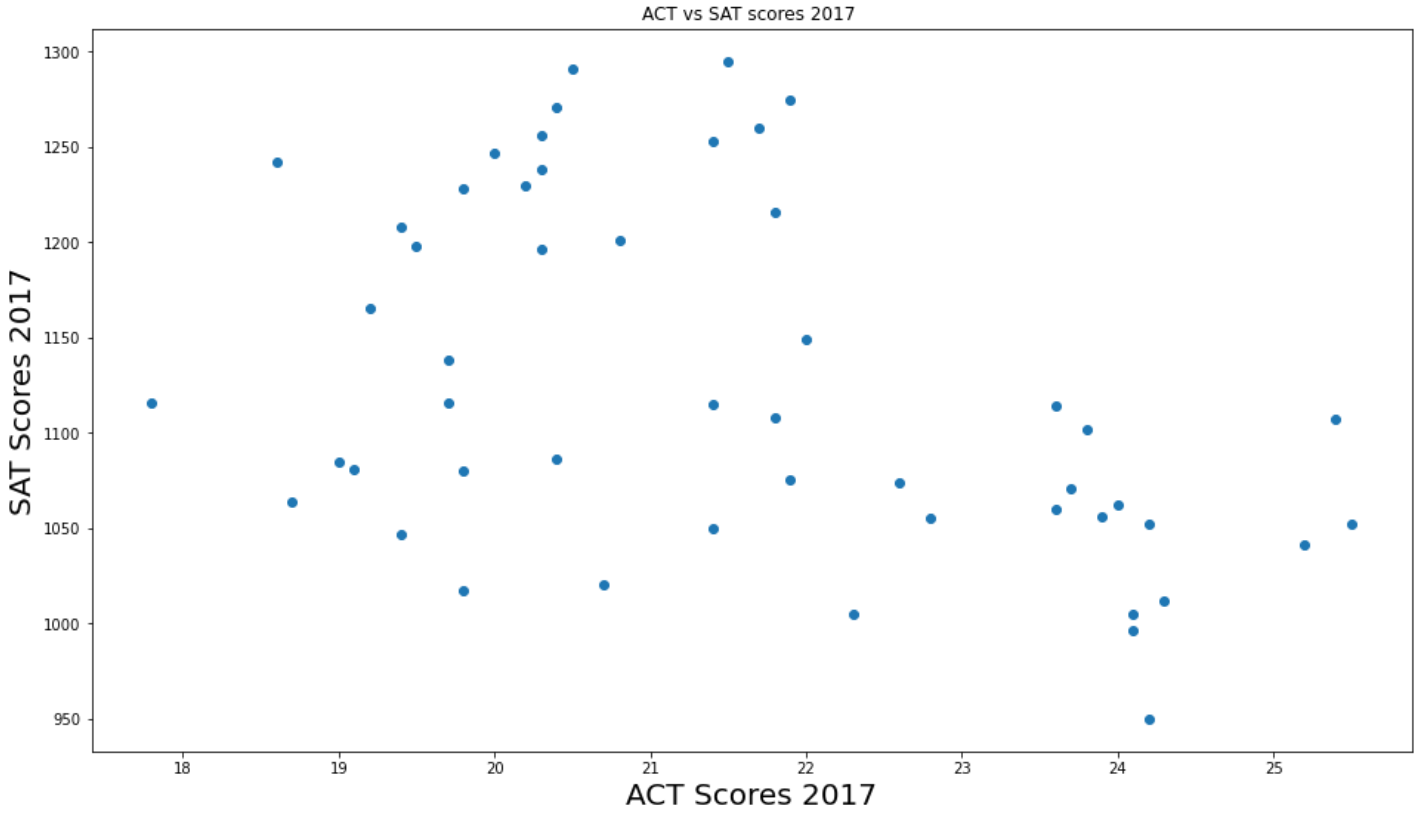
    Source: https://www.nytimes.com/2007/06/08/education/08scores.html
- 2) ACT has two papers that are related to the English language- an English paper and a Reading paper. We are attempting to see if both SAT and ACT can measure the student's English ability to the same extent, and therefore are comparing them with each other. To do so, we have took an average of the English and Reading paper of ACT to match against the the Evidence-based reading and writing of the SAT.



Analysis

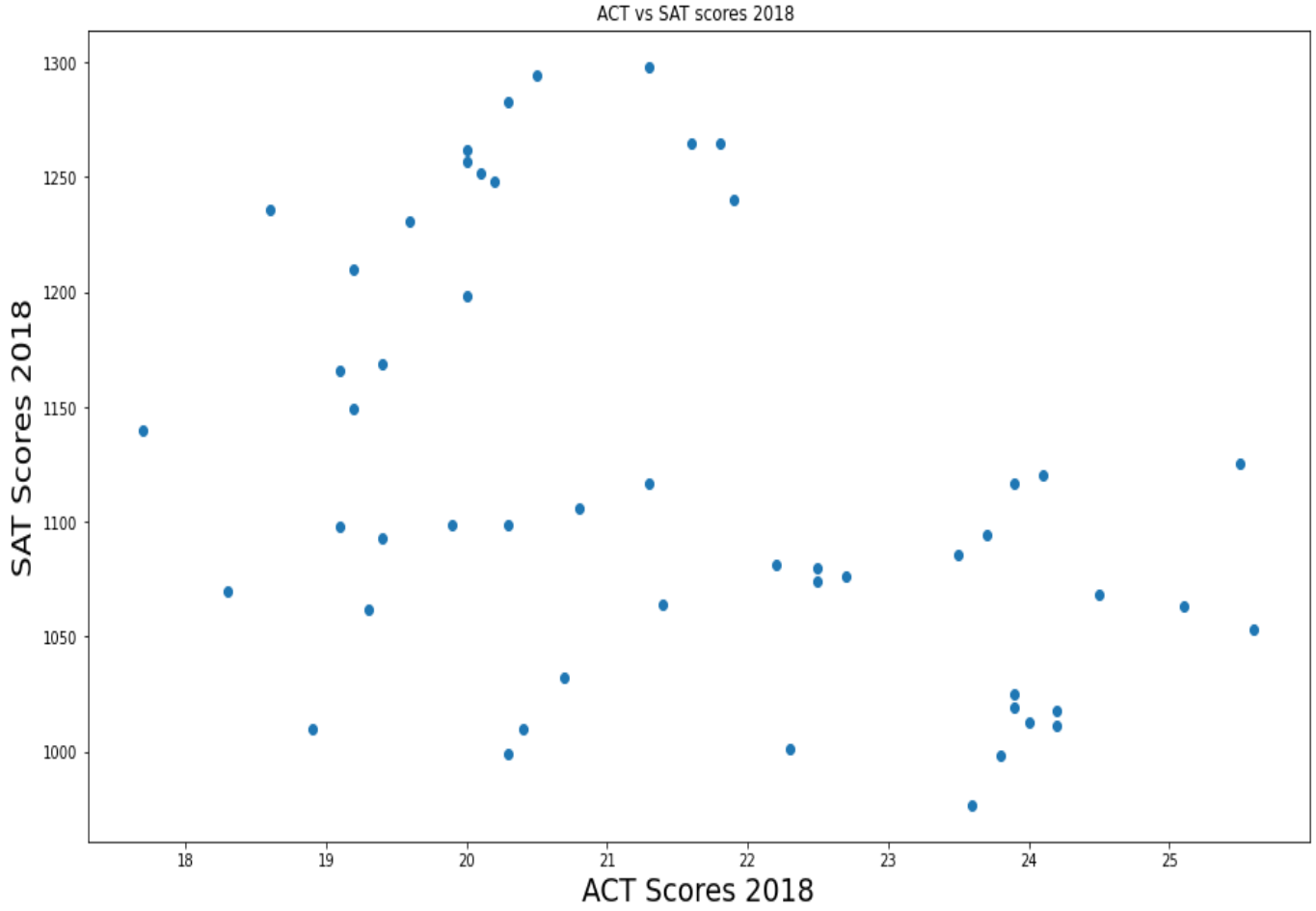
- First, we observe that the participation rates of a particular test in one year is highly negative correlated to that the other test. For example, states doing ACT in 2017 are unlikely to have high participation rates of SAT in 2017.
- Secondly, there are negative score correlations between ACT subjects and SAT subjects.

Analysis – Total scores 2017



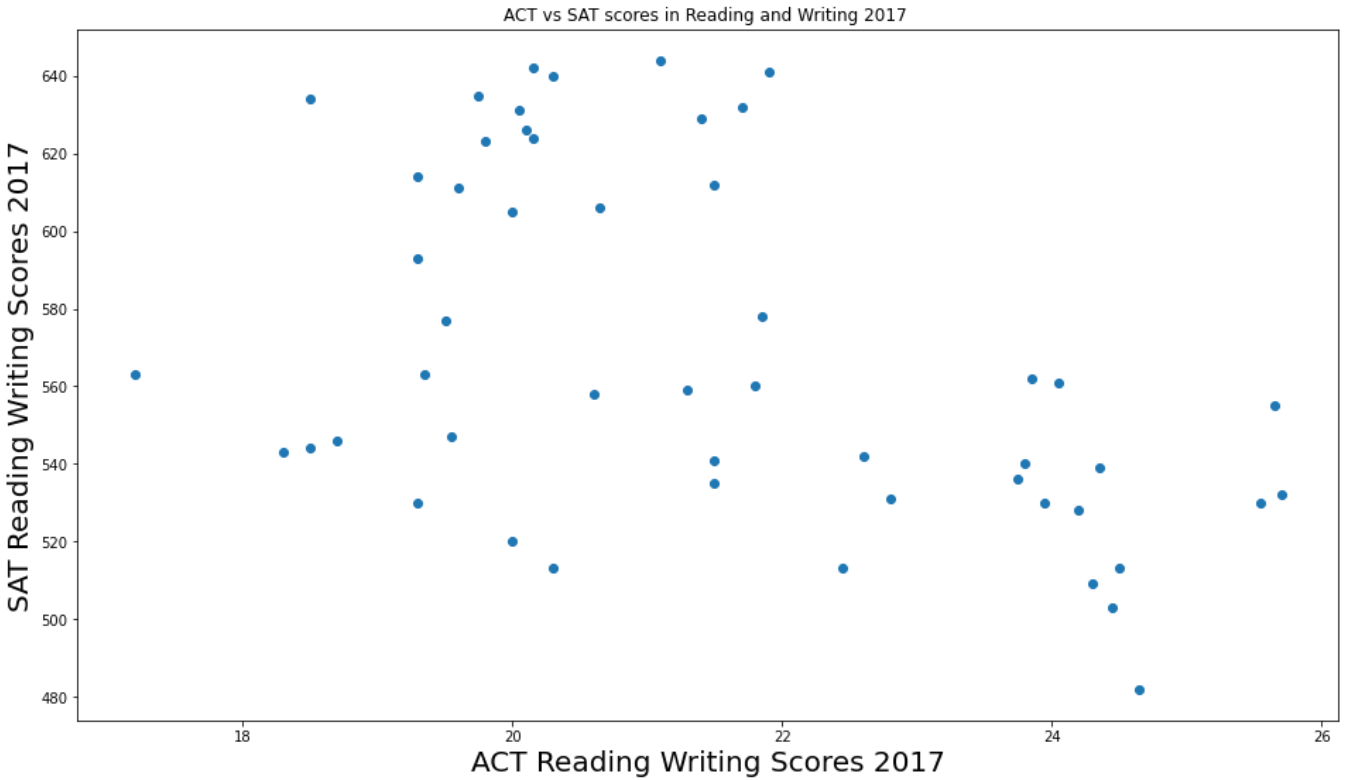
- From the scatterplot, there appears to be no clear relation between the SAT scores of 2017 by state and ACT scores.

Analysis – Total Scores 2018



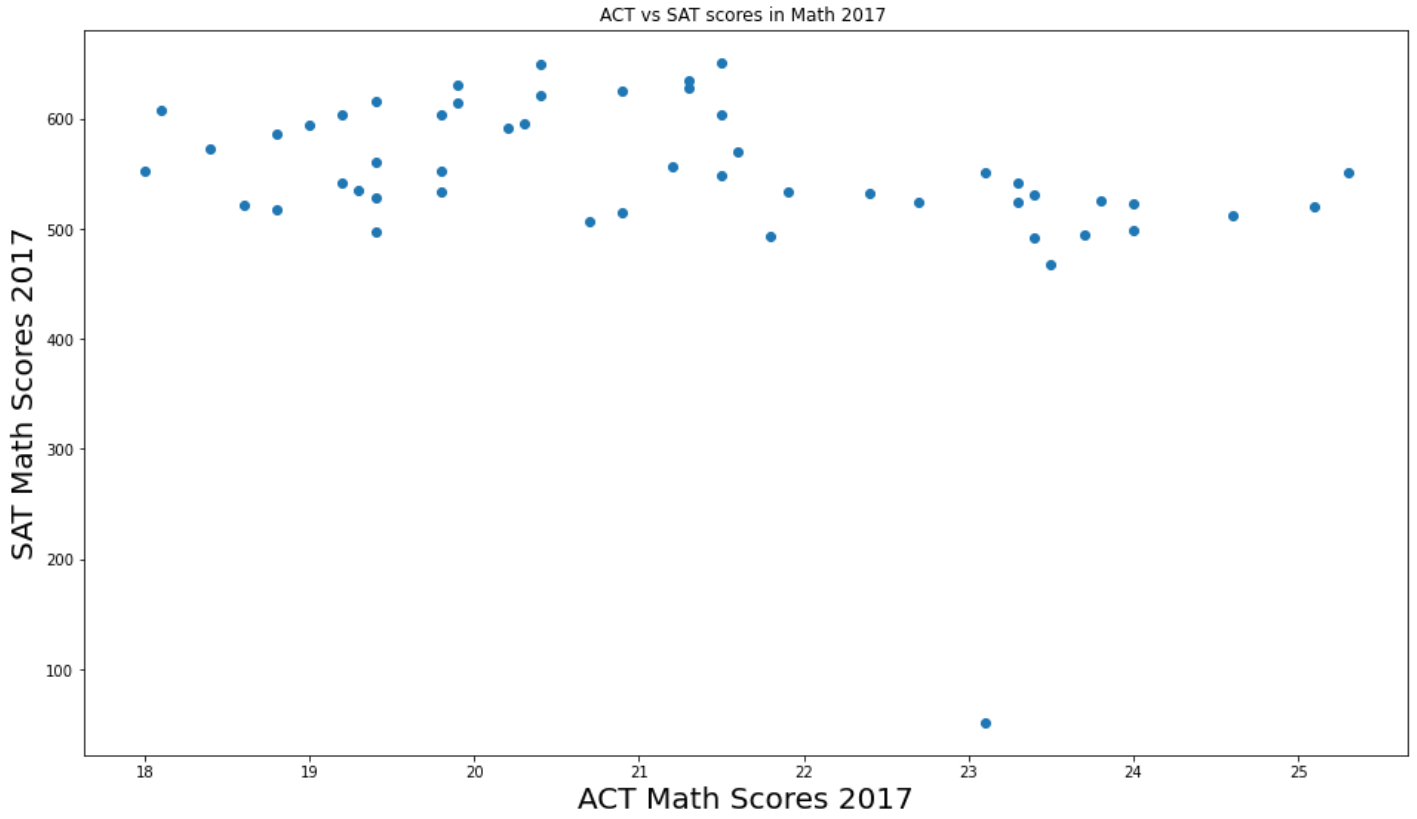
- From the scatterplot, there appears to be no clear relation between the SAT scores of 2018 by state and ACT scores.
- **States do not seem to be preparing students well across the board regardless of tests.**
- **There might be other reasons why certain students are doing well.**

Analysis – Reading / Writing Scores



- From the scatterplot, there appears to be no clear relation between the SAT scores of reading and writing in 2018 and ACT scores.

Analysis – Math Scores



- It appears that students tend to do well in SAT Math, regardless of how well they do in ACT Math.
- However, it is due to the outlier at about 23 on the x-axis that caused the graph to shift upwards. Else, there should be little to no correlation between SAT Match Scores and ACT Math Scores in 2017.

Analysis of Findings 1

- From the heatmap, we can see that **there is a negative correlation for participation rates between ACT and SAT.** Students who can afford to take different tests might be more affluent, and score better with better resources.
  - It has been shown that while there are state-wide mandated tests, children from low income families see are unlikely to pay to take tests that they might be better at, with more affluent families taking such tests.
  - The cost to take the SAT during the 2018-2019 school year was about $47.50 for the basic test and $64.50 to take the test with the full essay section. To take an SAT subject test, students must pay a $26 registration fee, $22 for each additional test and $26 for each language test.
  - These costs can be prohibitively expensive for many students. Many low-income students are provided fee waivers that cover two free SATs, with or without the essay, and six free SAT subject tests. But wealthy students are still more likely to have taken standardized tests like the SAT more than once.
  - Source: https://www.cnbc.com/2019/10/03/rich-students-get-better-sat-scores-heres-why.html

Analysis of Findings 2

- These students who are able to take alternative tests are also likely to have access to more resources that can enable them to score better, which might lead to a disparity between scores of SAT and ACT within the same state.
  - Students who live in wealthy school districts typically attend better-funded schools. These funding disparities mean that wealthy students are more likely to attend high schools that will give them advantages in the college application and standardized test-taking processes.
  - Wealthy students are more likely to attend high schools with a significant number of AP classes, more likely to have access to tutors and more likely to have taken standardized test preparation classes — all advantages that have been tied to higher standardized test scores.
  - Source: https://www.cnbc.com/2019/10/03/rich-students-get-better-sat-scores-heres-why.html

Conclusion and Recommendations

- Our conclusion recommendation is that state-wide education is not sufficient for students to excel compared to certain counterparts.
- More research will have to be done to understand why students are doing better than the national average, and whether affluence is the key.
- To dive deeper into this topic, information on income of household and the students eventual SAT income can be explored.
- More has to be done in schools to ensure that students can do well, regardless of other factors.

Thank you.