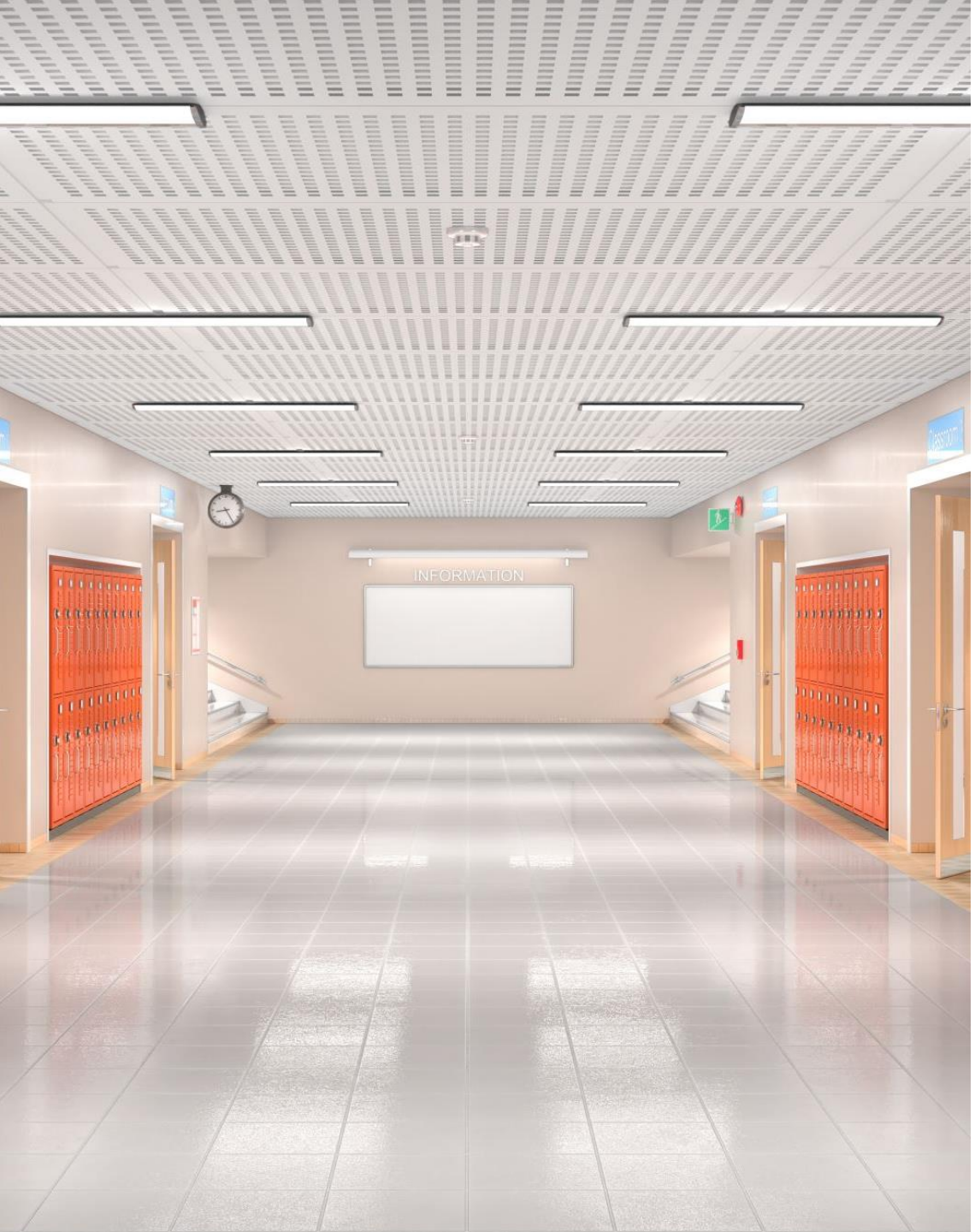


Identify states with low test scores associated with lower income group across 2017 and 2018 to recommend for funding delegation.

Sufyan, Advisor from Education Board

Context

- From Washington's Post, scores from the ACT show that only 9% of students in the class of 2017 who came from low-income families are strongly ready for college in 2017.
- This is a cause of concern, as this disparities in college readiness will put students of lower income to a disadvantage competing with the rest, hence less like to have access to high-quality educational and career planning opportunities and resources
- Thus, we will need to evaluate both test across 2017 and 2018 and produce improvement plans.

Data import and cleaning

Data	Year	State	Problem statement	Error	Fix
act_2017	2017	Wyoming	Composite score - object	Found 20.2x	Use function to remove non int and return as
act_2017	2017	National	incorrect additional state	Additional row of National	Used additional source called us_states to mask out which state not in list. Then remove using drop and reset index
act_2017	2017	Maryland	Science too low	Value = 2.3, while Ave = 23.6	Re-work from average and other subjects to get Science score
act_2017	2017	Maryland	Math too low	Value = 52, while Total = 1060	Re-work from total and other subject to get
act_2018	2018	Maine	replicated	Having two rows of same values	Identify by index, and remove using act_2018.drop(index = act_2018.index[20],
act_2018	2018	District of Columbia	Column name not matched while matching with s	sat_2018 has 'C' while Right list has 'c' at index 12	Identify by index, and rename to match

EDA (Exploratory Data Analysis)

Explore mean scores across 2017 and 2018 Vs Income

	<$41,000	$41,000-$45,000	$45,000-$51,000	>$51,000
sat_total_2017	1131.85	1135.17	1152.23	1085.85
act_comp_2017	20.11	20.93	21.86	23.14

Not much association with SAT scores

	<$41,000	$41,000-$45,000	$45,000-$51,000	>$51,000
sat_total_2018	1105.92	1142.25	1127.46	1106.15
act_comp_2018	20.02	20.61	22.18	23.11

The higher the income the higher the ACT composite score

Consistent lowest performing states in 2017, 2018

List of low performing ACT test scores: Nevada, Mississippi, South Carolina and Hawaii
Mean score difference is about ~2.97

List of low performing SAT test scores: District of Columbia, Delaware, Idaho
Mean score difference is about ~140

	act_eng_2017	act_math_2017	act_read_2017	act_sci_2017
mean	17.52	18.64	18.96	18.90
median	17.80	18.60	19.10	18.90
std	0.73	0.60	0.56	0.45
count	5.00	5.00	5.00	5.00

Amongst the 5 lowest states, English is found to be lowest by 1 score

Participation rate changes over 2017, 2018

Following states had huge change in participation rates from 2017 to 2018
ACT:

- Colorado from (100% to 30%) (Source)
- Illinois from (93% to 43%) (Source)

Following states had huge change in participation rates from 2017 to 2018
SAT:

- Colorado from (11% to 100%) (Source)
- Illinois from (9% to 99%) (Source)

Test Score changes over 2017, 2018

Following states had huge change in test score from 2017 to 2018
ACT:

- Colorado (+14.9%) (Source)
- Illinois from (11%) (Source)

Following states had huge change in test score from 2017 to 2018
SAT:

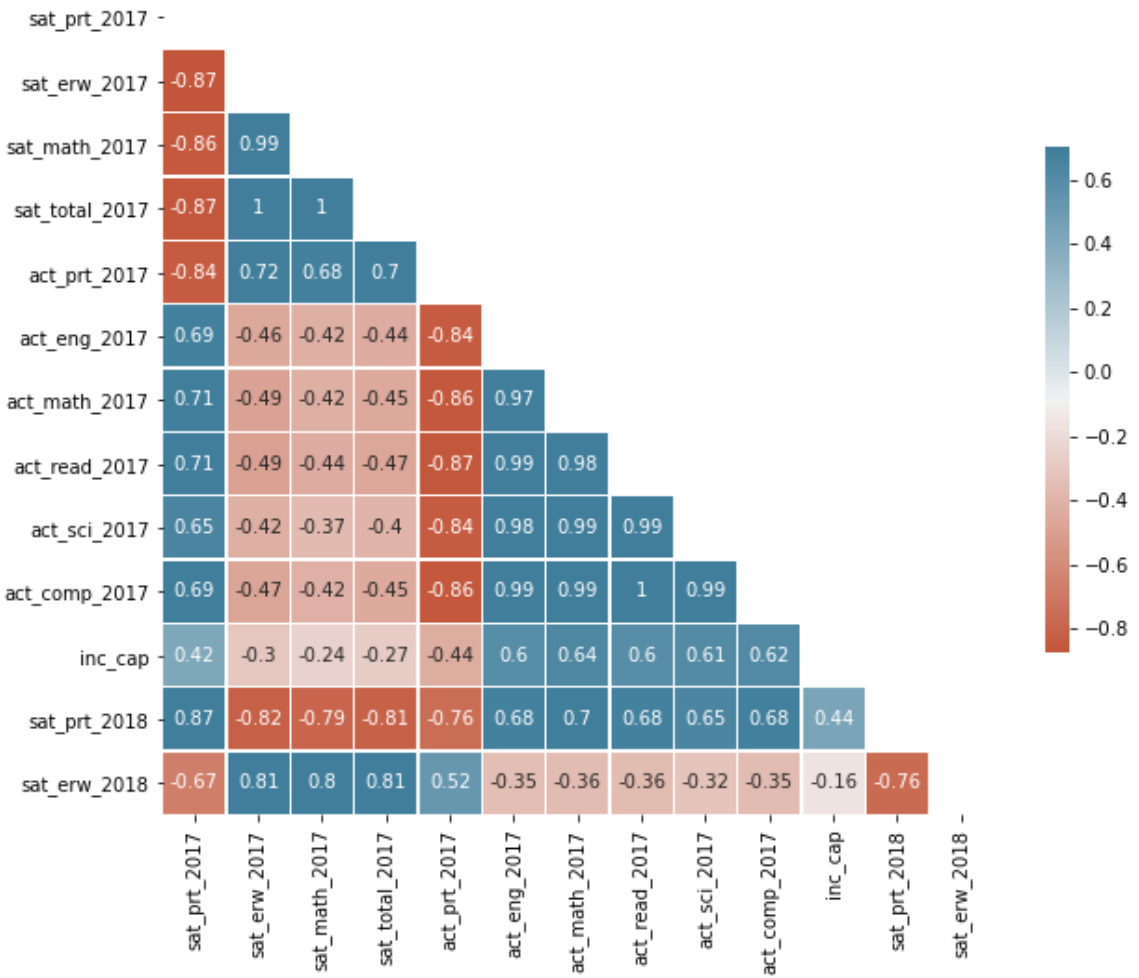
- Colorado (-14.6%) (Source)
- Illinois from (-8.6%) (Source)

Colorado sees biggest jump in ACT grades, while SAT scores dropped by similar percentage of about 14.6%.

This is likely due to an effect whereby lower participation rates have average scores reflective of smarter and better prepared students who voluntarily taking the test.

(Source)

Heatmap on correlation of all numerical variables



General observations

1) Higher participation rates for SAT/ACT will have negative correlation with ACT participation rates (-0.76 ~ -0.87)

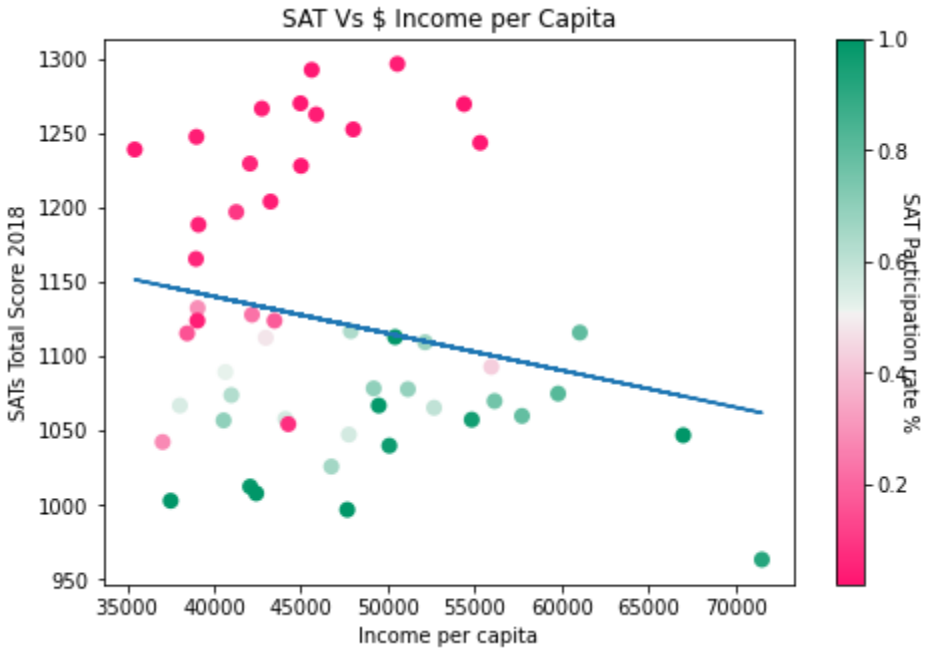
- Suggest it might be attributed by mandate of each state to do either one of the test

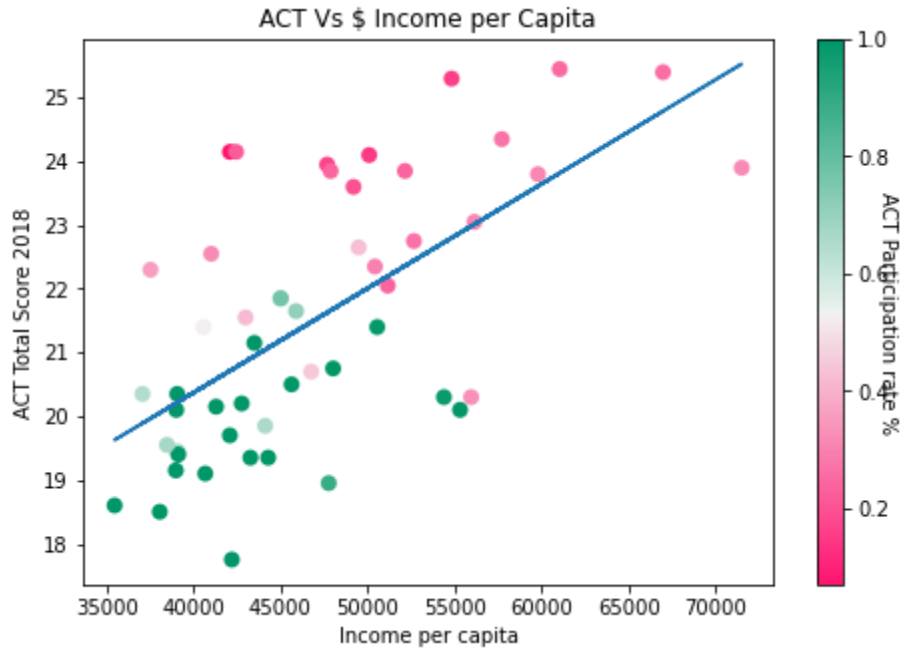
2) SAT scores does not have strong correlation with income (-0.14 ~ -0.27)

3) ACT scores have a stronger positive correlation with income (0.44 ~ 0.62)

4) Participation rate has high negative correlation with scores across both test, meaning the higher the participation rate, the lower the scores.
SAT (~-0.8)
ACT (~-0.8)

Income Vs ACT/SAT scores

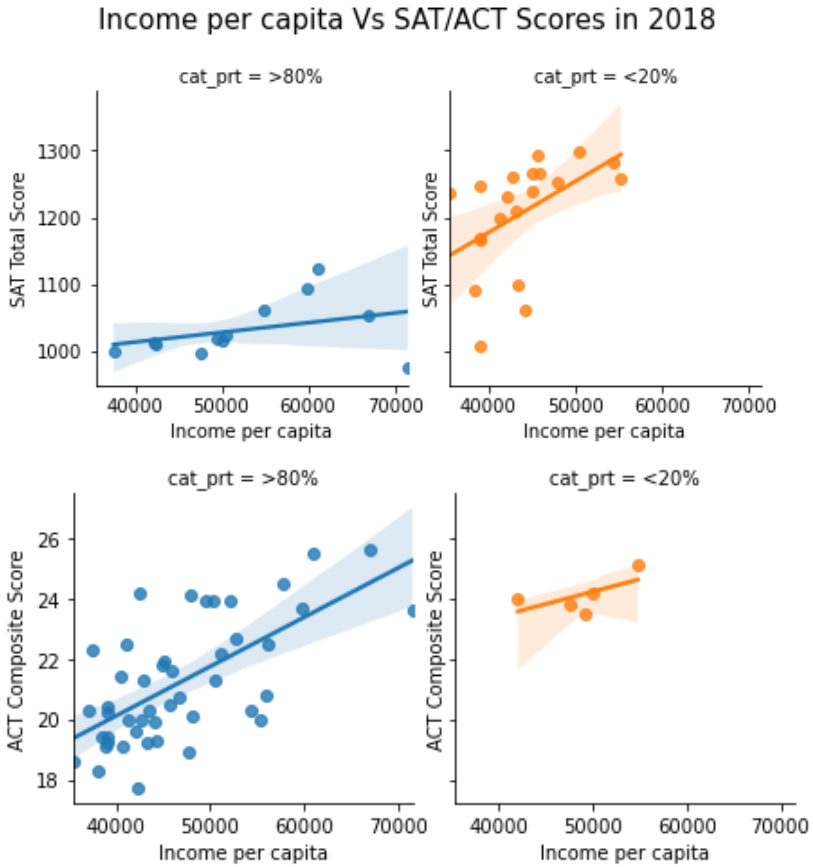


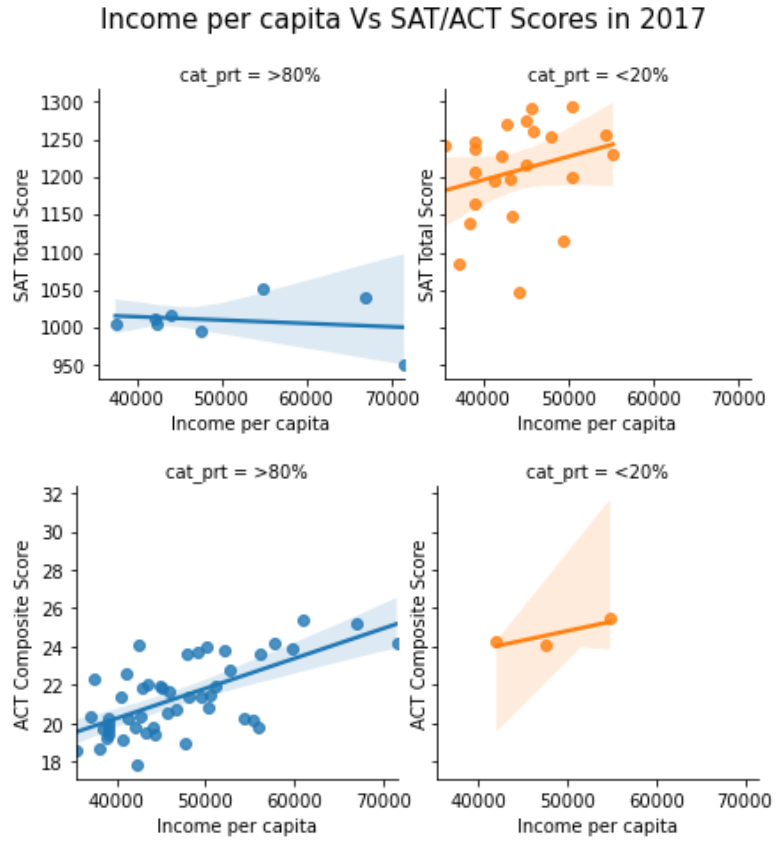


Observed that the ACT scores have positive correlation with the income levels of the students about 0.6. On the contrary, the SAT scores showed little correlation with income about -0.2

We need to dissect the graph further by looking into the participation rates closely.

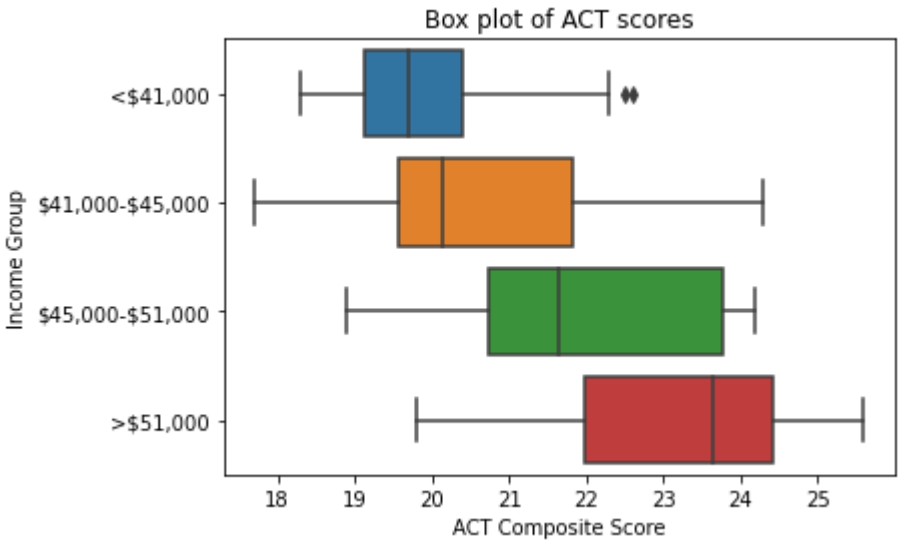
Income Vs ACT/SAT scores

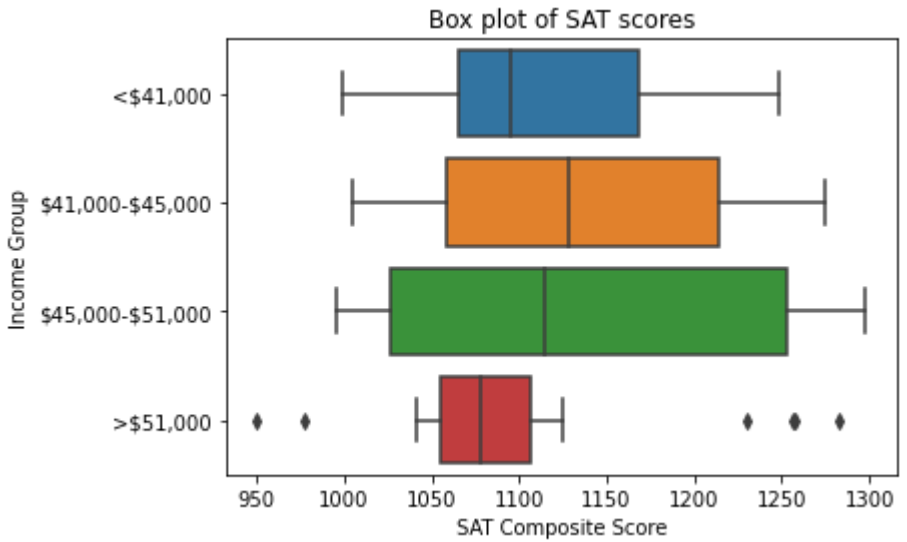




When split by participation rates between the <20% and >80%, can see positive correlation between income and SAT/ACT scores

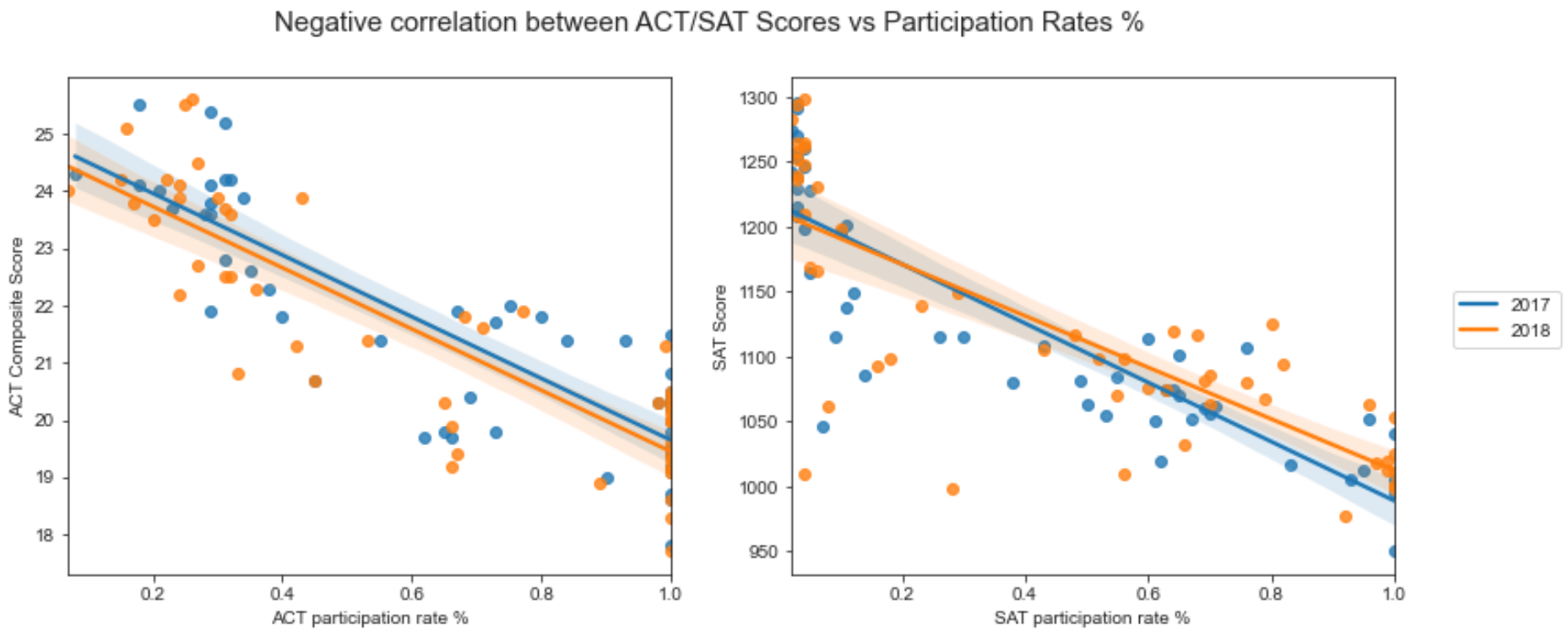
Boxplot by Income Group vs Scores





Observed disparity in ACT scores vs income levels of students.

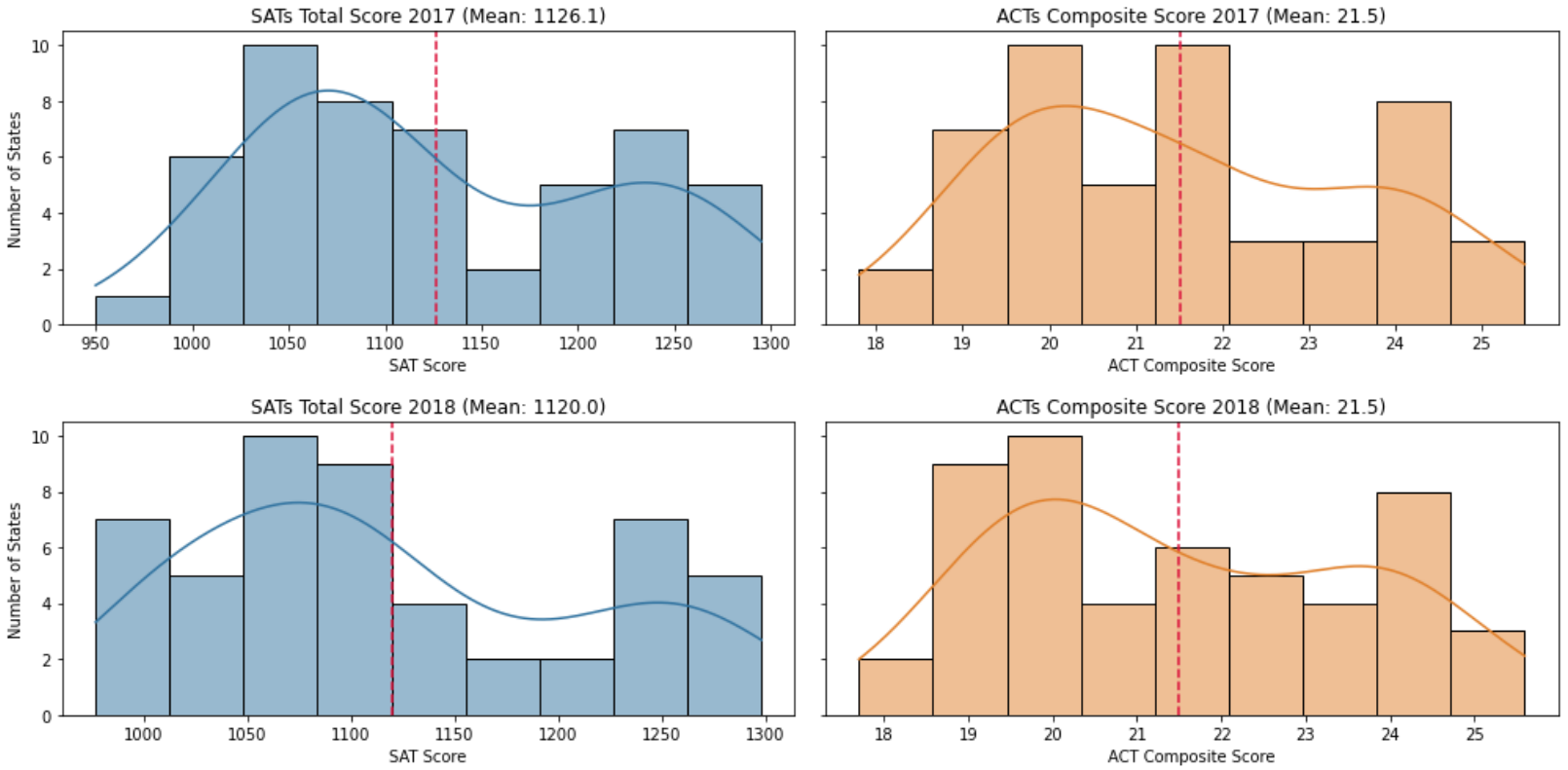
Linear regression plot between scores and participation rates



Noted huge cluster of high scoring SAT students below participation rate of 20%

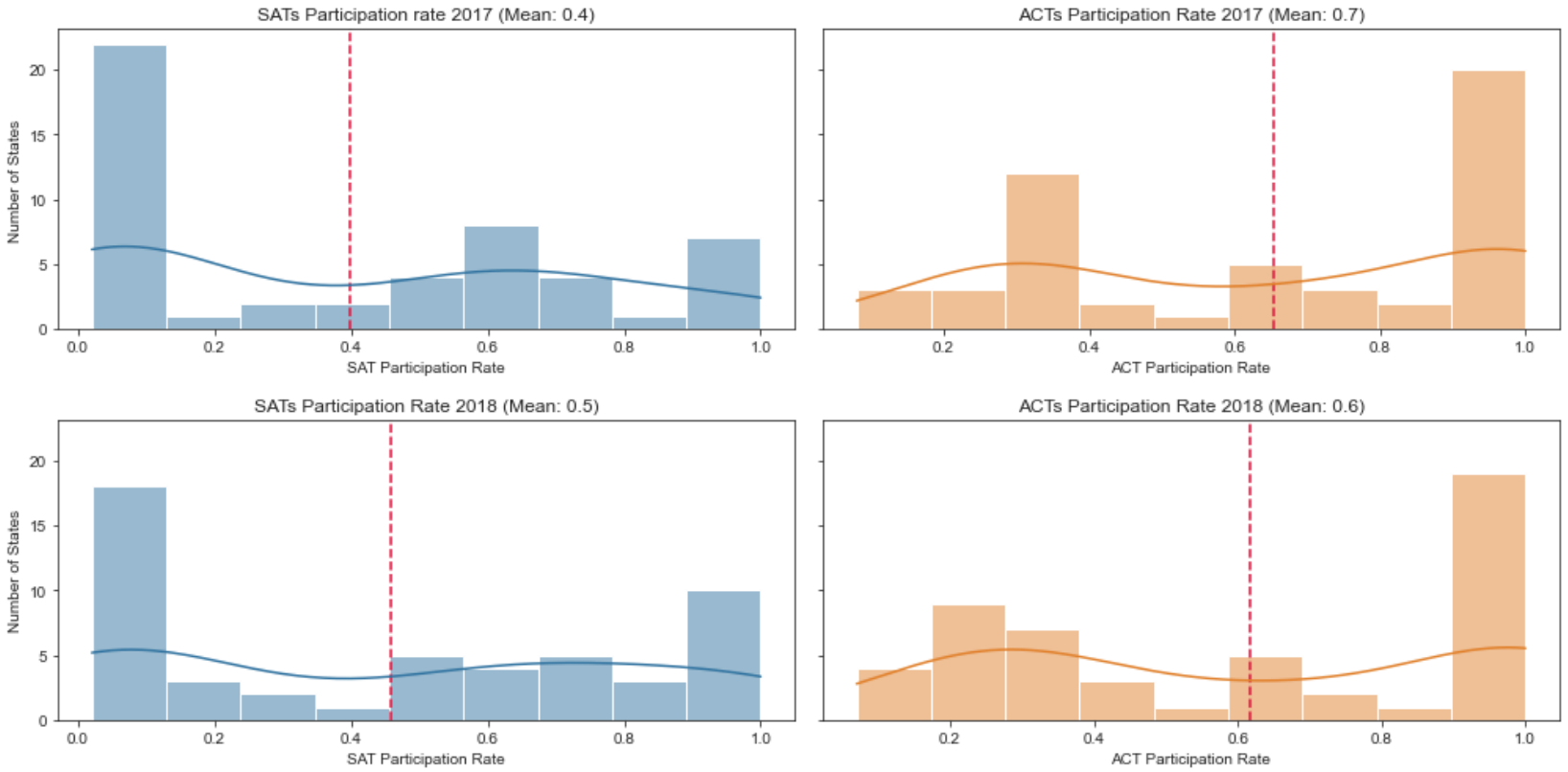
At least 13 states has scored more than 75% percentile for SAT scores across both years

Histogram plot SAT/ACT scoress across 2017 and 2018



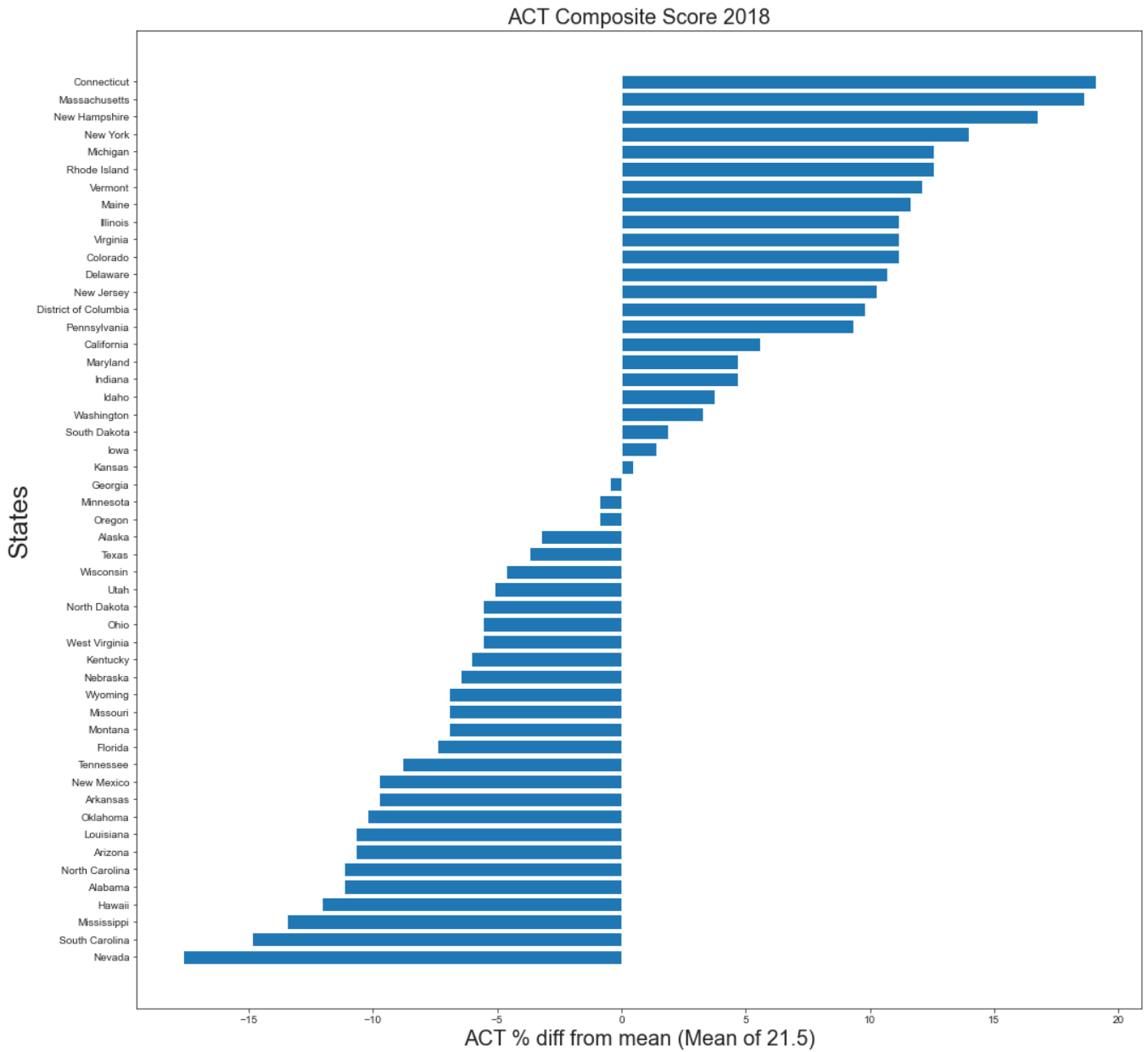
- Observed bi-modal distribution on the average scores across 2017 and 2018
- Distribution seems to be right skewed
- Mean score for SAT decreased from 2017 to 2018

Histogram plot for SAT/ACT participation rates



- Observed bi-modal distribution on the average participation across 2017 and 2018
- Mean increased from 2017 to 2018, exhibiting higher counts of states on the right side of the histogram.

Histogram of percentage difference VS Statewide mean (21.5)

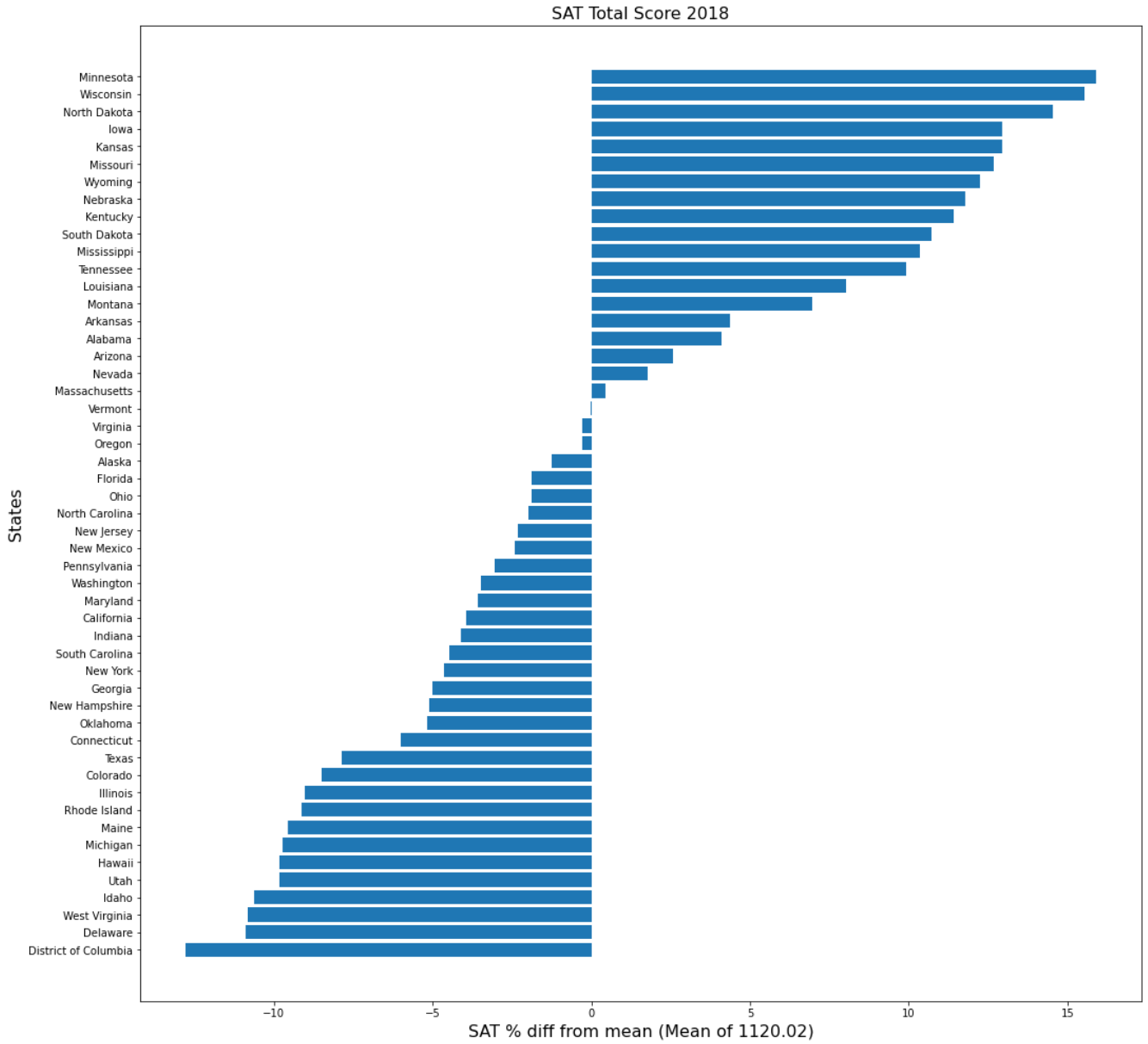


4 consistently lowest states for ACT

1. Nevada
2. South Carolina
3. Mississippi
4. Hawaii

Also falls under lower income group

Histogram of percentage difference VS Statewide mean (21.5)



3 consistently lowest states for SAT

1. District of Columbia
2. Delaware
3. Idaho

Also falls under lower income group

Conclusion & Recommendation

In order to help bring up the overall likelihood of most students having better chances to enter college and essential prep and resources, we would like to recommend;

1) Allocating more funding / test preparation resources in states with lower income per capita such as Nevada, Mississippi, South Carolina and Idaho.

2) Recommend states to provide free waiver especially for lower income to access to OPL, Online prep live. Reports from OPL mentioned that one academic year associated with an average score of 1.64, especially boosting up students from the lower income group. (Source)

3) Recommend allocating more resources that helps students in their weakest subjects, typically pulled down by English was the weakest amongst lowest income group for ACT . SAT has Math as the weakest among lower income group