

A decorative graphic on the left side of the slide. It consists of a blue parallelogram and a light green parallelogram, both tilted at an angle. The blue shape is in the foreground, and the green shape is partially behind it. They are set against a dark blue background with faint, lighter blue diagonal stripes.

# Project 1

## Joel Quek



# Problem Statement

It is often said that wealth inequality is a barrier to education and social mobility. As a data scientist, I am keen to find out if that is true. To approach this, I will study if there is a correlation between the Median Household Income of each state with their average SAT/ACT scores.

And if there is a correlation found between wealth and educational attainment, we will discuss what can be done to bridge that gap, possibly in the form of monetary grants or tuition help.




# Data Dictionary

Feature	Type	Dataset	Description
2017 SAT Total	float	SAT 2017	The average total score by state in the 2017 SAT. Highest possible score is 1600.
2018 SAT Total	float	SAT 2018	The average total score by state in the 2018 SAT. Highest possible score is 1600.
2019 SAT Total	float	SAT 2019	The average total score by state in the 2019 SAT. Highest possible score is 1600.
2017 ACT Composite	float	ACT 2017	The average composite score by state in the 2017 ACT. Highest possible composite score is 36.
2018 ACT Composite	float	ACT 2018	The average composite score by state in the 2018 ACT. Highest possible composite score is 36.
2019 ACT Composite	float	ACT 2019	The average composite score by state in the 2019 ACT. Highest possible composite score is 36.
2017 Median Income	int	2017 Median Income by State	2017 Median Annual Income by State. In USD.
2018 Median Income	int	2018 Median Income by State	2018 Median Annual Income by State. In USD.
2019 Median Income	int	2019 Median Income by State	2019 Median Annual Income by State. In USD.

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# Exploratory Data Analysis



## States that have the highest and lowest mean total/composite scores for the 2017, 2019, or 2019 SAT and ACT

### SAT Total Scores

Minnesota , Wisconsin , Iowa , Missouri , Kansas , North Dakota , Nebraska , Kentucky , Mississippi , Utah have the highest SAT scores.

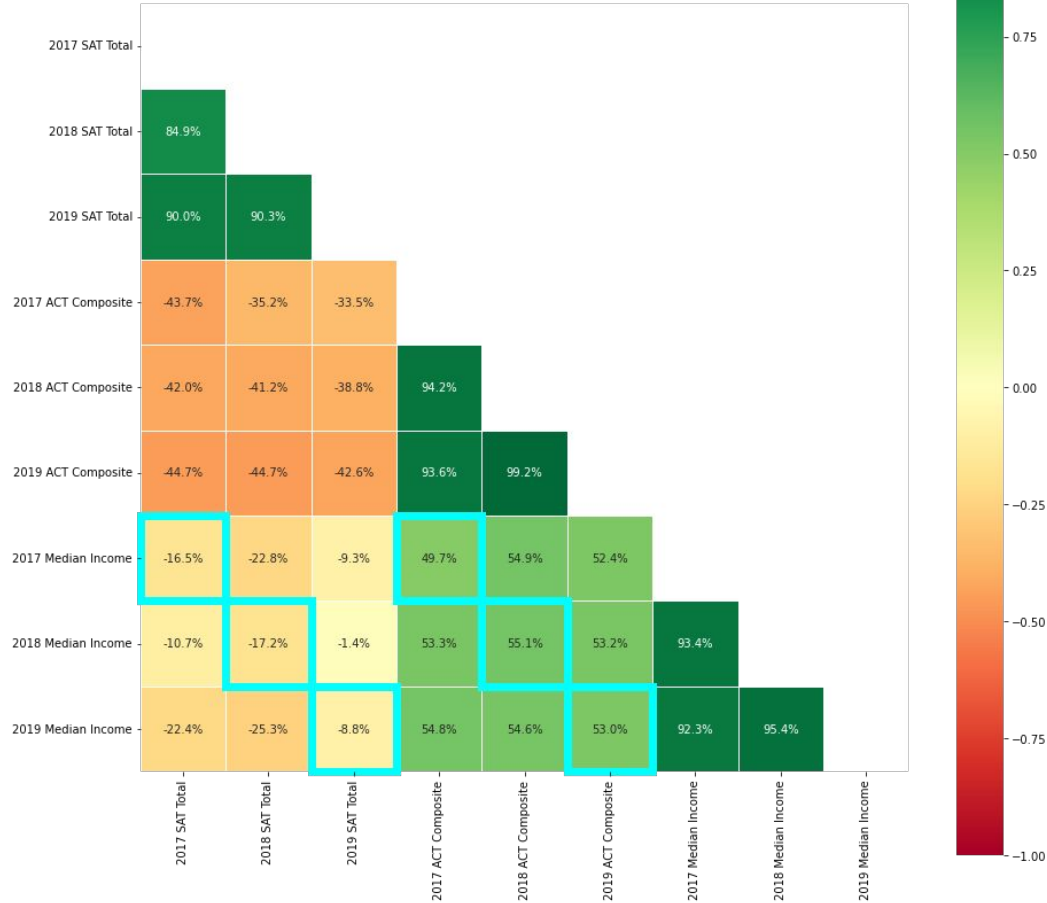
Delaware , Idaho , Michigan , Maine , Maine , Florida , Texas , Connecticut , Oklahoma , Georgia have the lowest SAT scores.

### ACT Composite Scores

New Hampshire , Massachusetts , Connecticut , Maine , Maine , New York , Michigan , Delaware , Rhode Island , New Jersey have the highest ACT composite scores.

Nevada , Mississippi , South Carolina , Hawaii , North Carolina , Alabama , Oklahoma , Arkansas , Louisiana , Arizona have the lowest ACT composite scores.

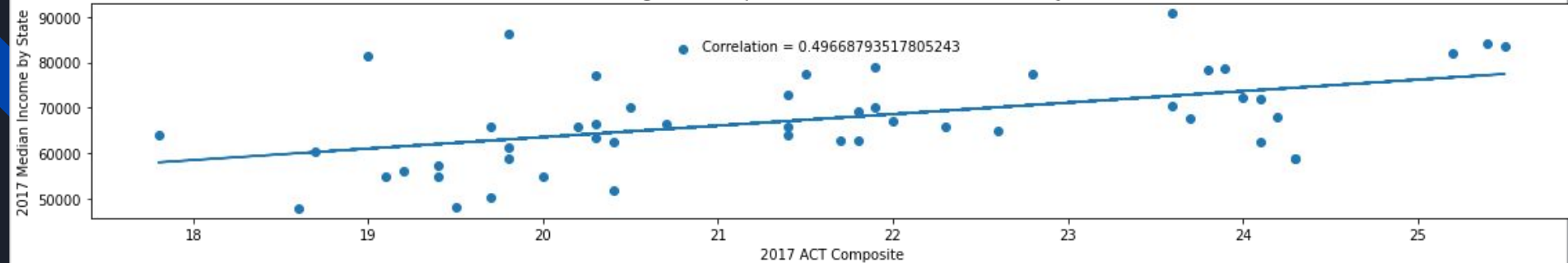
# Correlation Between Merged Data



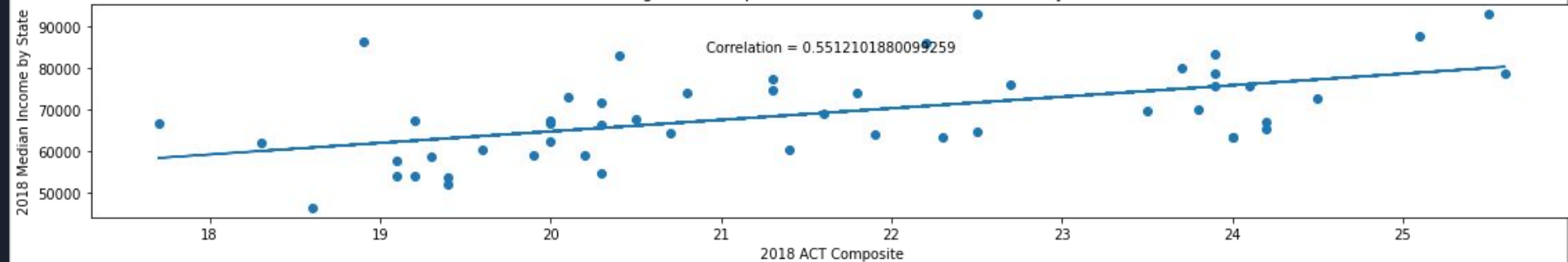


# Median Household Income Versus ACT and SAT Scores

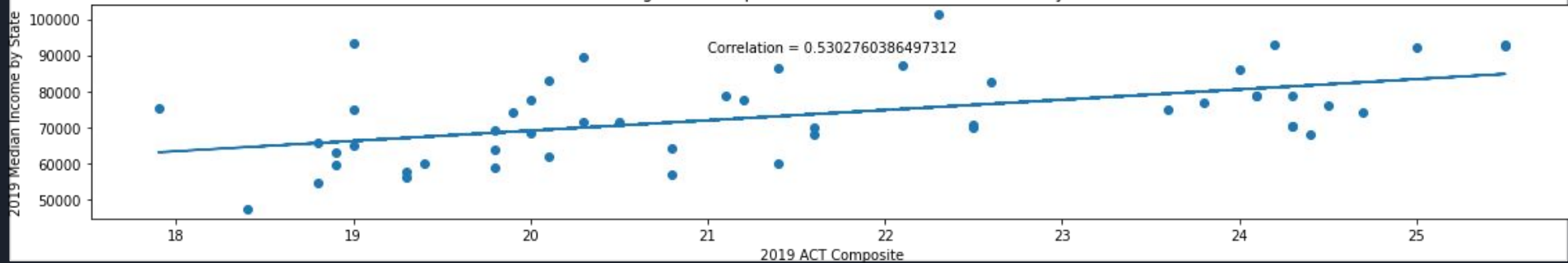
2017 Average ACT Composite Score Versus Median Income by State



2018 Average ACT Composite Score Versus Median Income by State

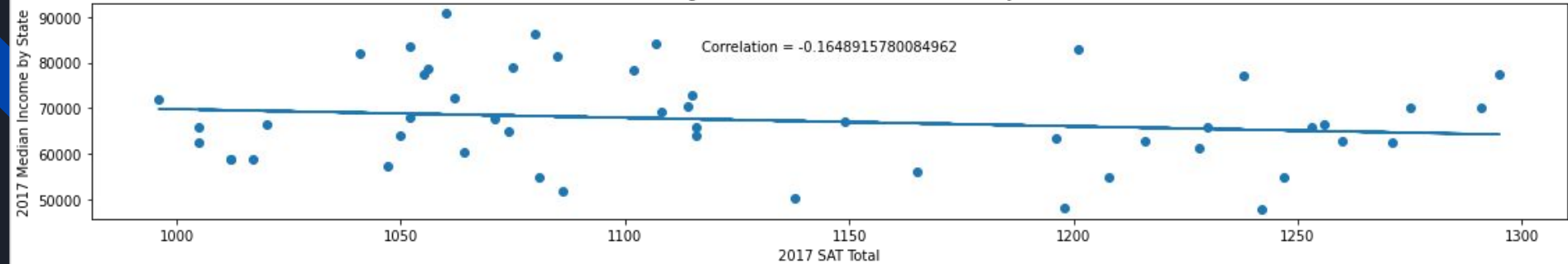


2019 Average ACT Composite Score Versus Median Income by State

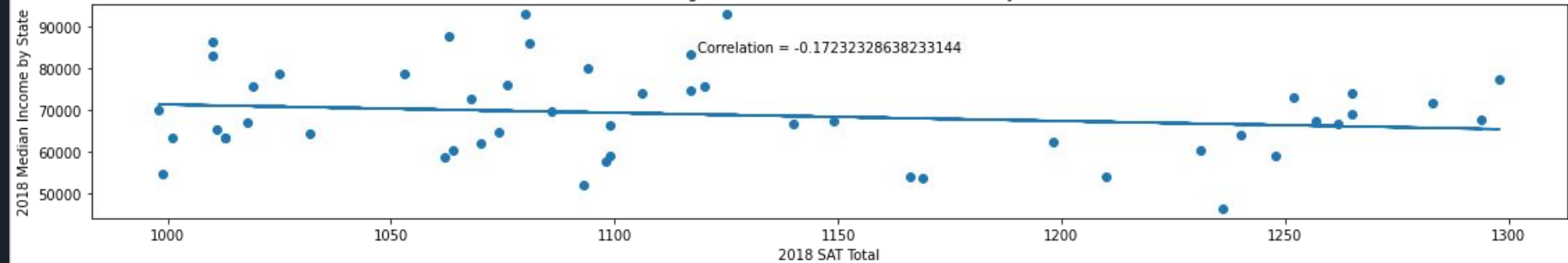




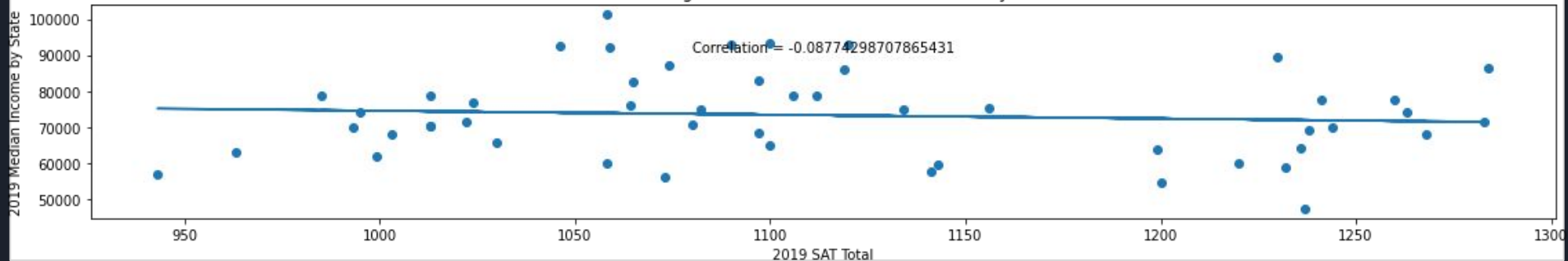
2017 Average SAT Score Versus Median Income by State



2018 Average SAT Score Versus Median Income by State



2019 Average SAT Score Versus Median Income by State





### Median Income against ACT Scores

Dependent Variable	Independent Variable	Correlation Coefficient
2017 Median Income	2017 ACT Composite	49.7%
2018 Median Income	2018 ACT Composite	55.1%
2019 Median Income	2019 ACT Composite	53.0%



### Median Income against SAT Scores

Dependent Variable	Independent Variable	Correlation Coefficient
2017 Median Income	2017 SAT Total	-16.5%
2018 Median Income	2018 SAT Total	-17.2%
2019 Median Income	2019 SAT Total	-8.8%



## Preliminary Conclusions

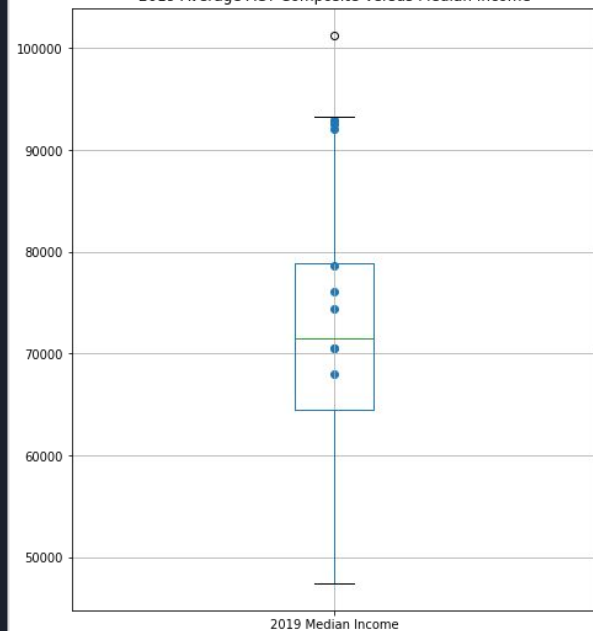
There appears to be a weak negative correlation (0 to 0.3) between Median Household income and the SAT Total Scores.

There also appears to be a strong positive correlation (0.5 to 1.0) between the median income and the ACT composite scores.

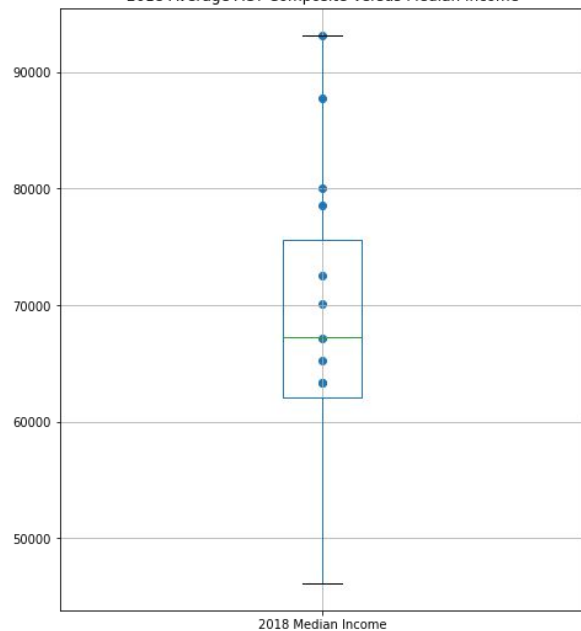


## ACT Scores and Median Income - Data From States with Highest Scoring Rates

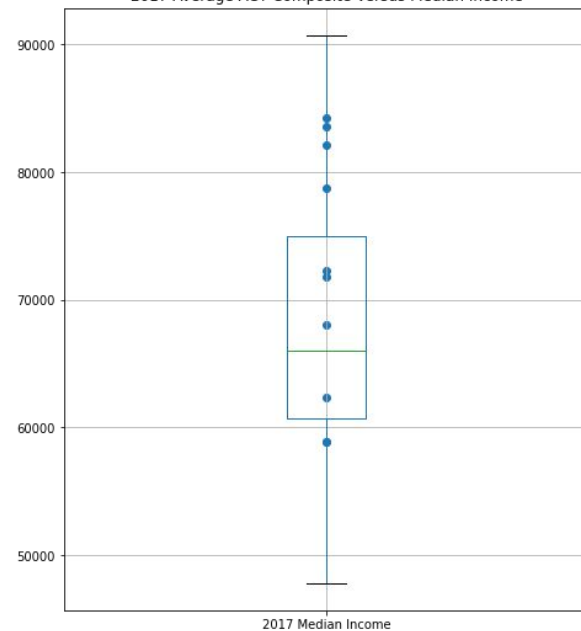
2019 Average ACT Composite Versus Median Income



2018 Average ACT Composite Versus Median Income



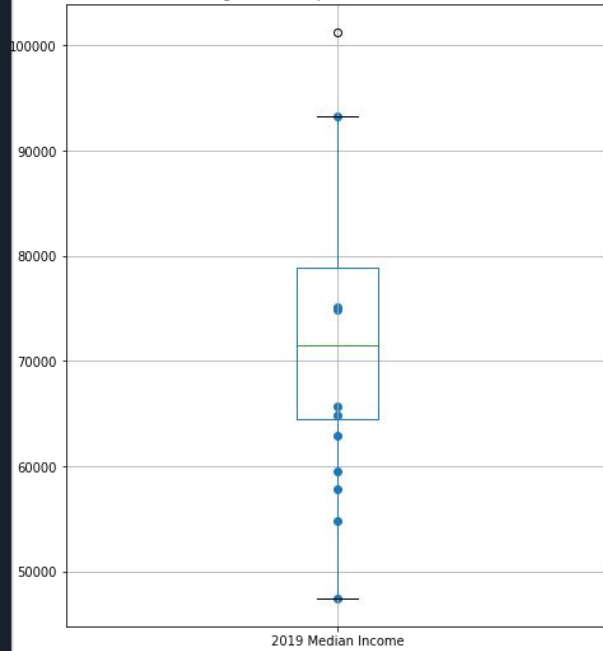
2017 Average ACT Composite Versus Median Income



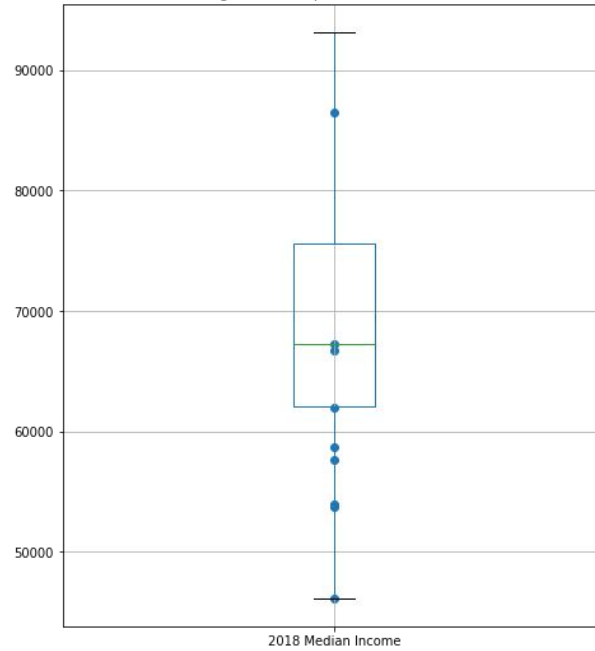


## ACT Scores and Median Income - Data From States with Lowest Scoring Rates

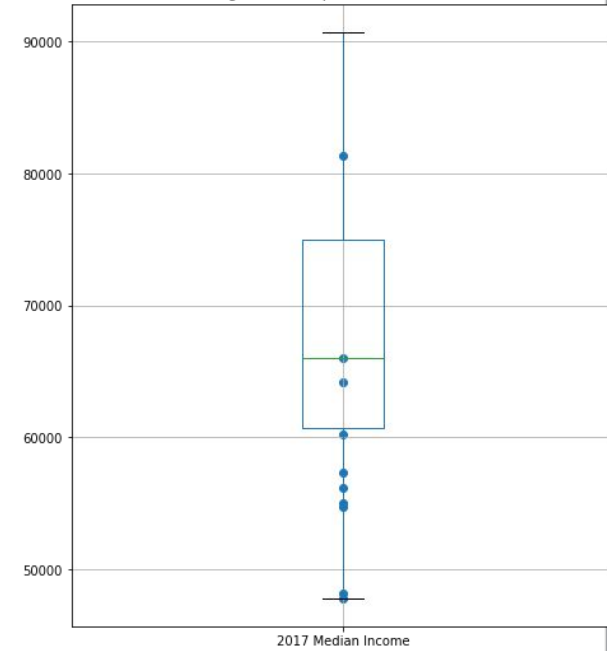
2019 Average ACT Composite Versus Median Income



2018 Average ACT Composite Versus Median Income



2017 Average ACT Composite Versus Median Income

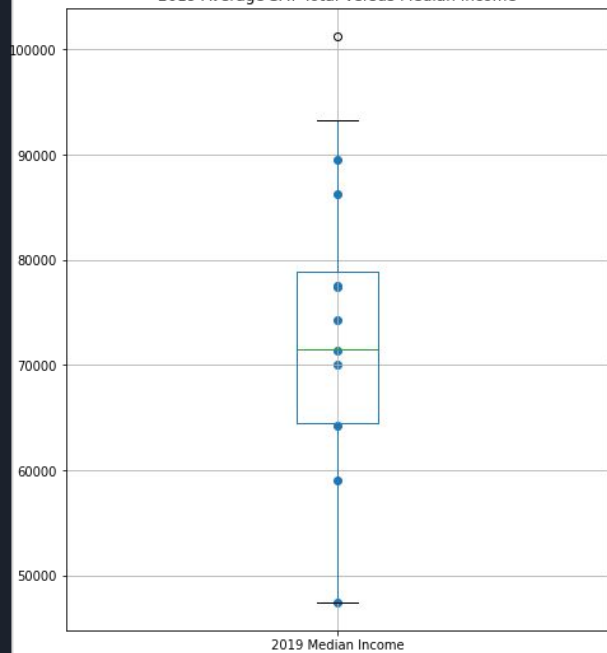




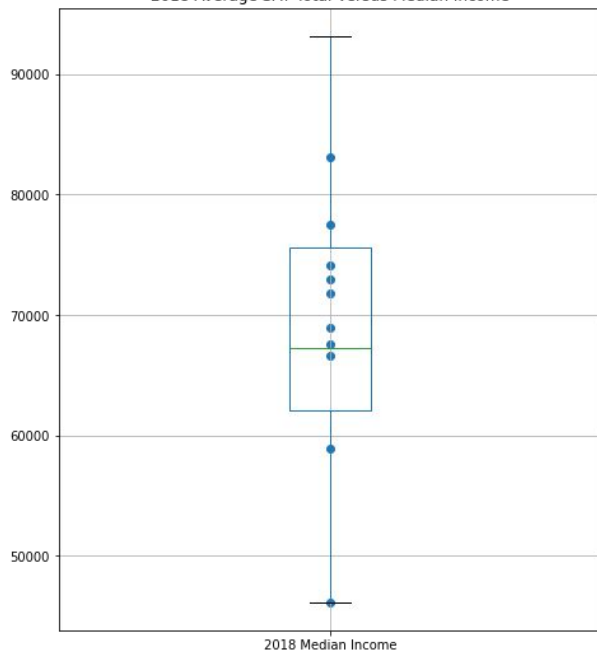


## SAT Scores and Median Income - Data From States with Highest Scoring Rates

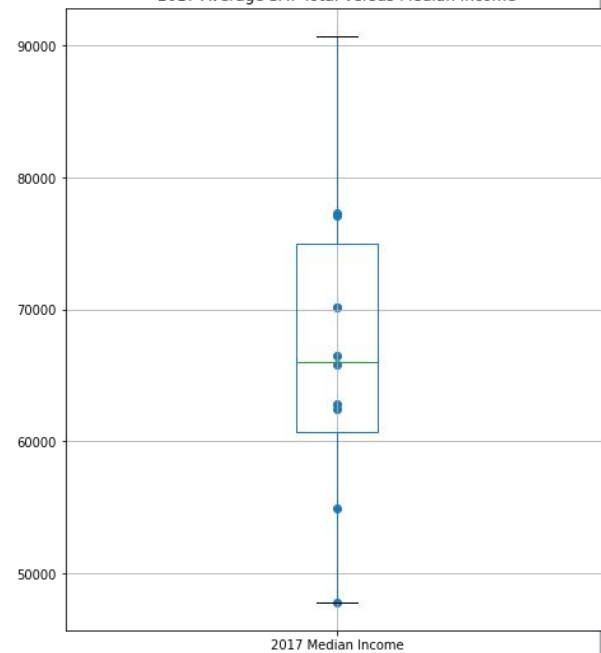
2019 Average SAT Total Versus Median Income



2018 Average SAT Total Versus Median Income



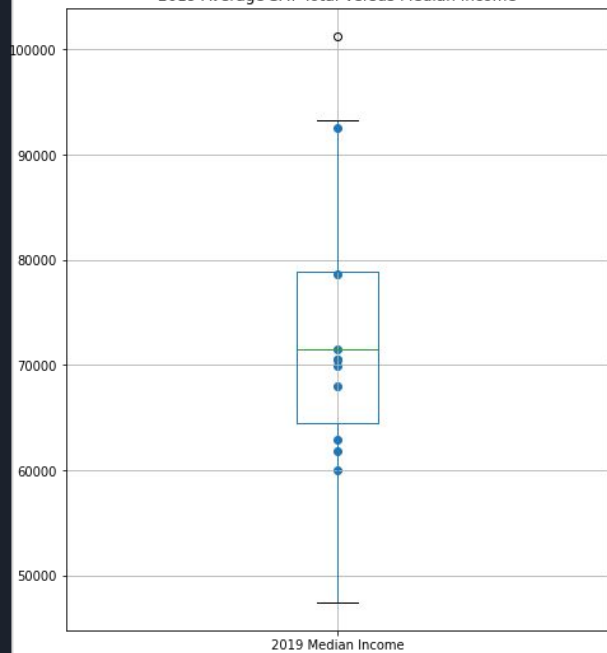
2017 Average SAT Total Versus Median Income



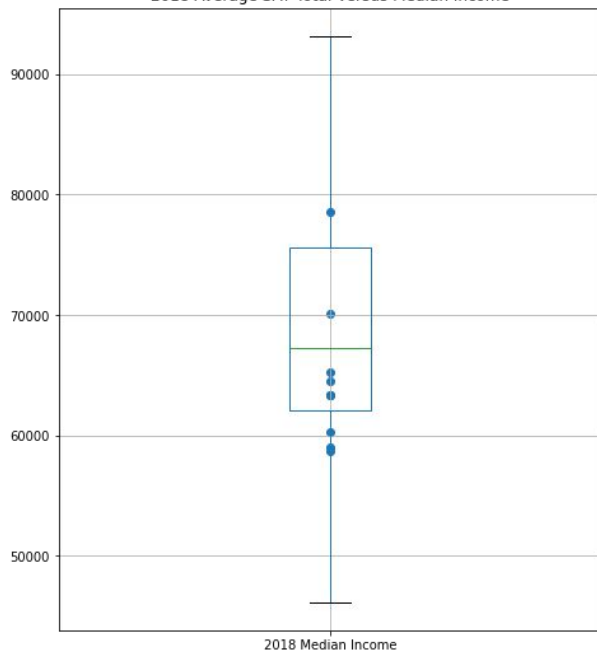


## SAT Scores and Median Income - Data From States with Highest Scoring Rates

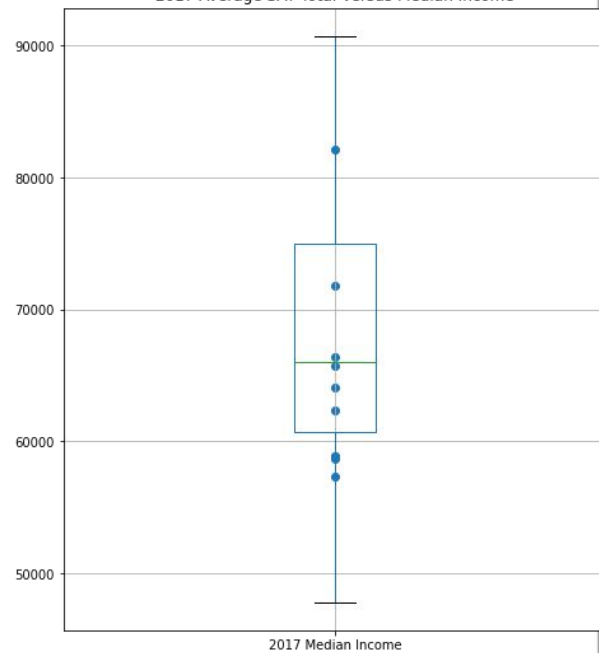
2019 Average SAT Total Versus Median Income



2018 Average SAT Total Versus Median Income



2017 Average SAT Total Versus Median Income





## Correlation between ACT Scores and Household Income

There appears to be a strong positive correlation (0.5 to 1.0) between the median income and the ACT composite scores.

From the boxplots, we can see that the states with highest ACT composite scores have above average Median Household Incomes, whilst the states with lowest ACT composite scores have below average Median Household Incomes.



## Correlation between SAT Scores and Household Income

There appears to be a (very) weak negative correlation between median income and SAT Total Scores.

Based on the boxplots, there is no observable trend between the highest/lowest scoring states with median household income.

We can conclude that there is no effect of household income on SAT scores.




## Recommendations

The college board can look into providing grants to students from households with average or below average median household income, to help boost the grades of these students sitting for entrance examinations.

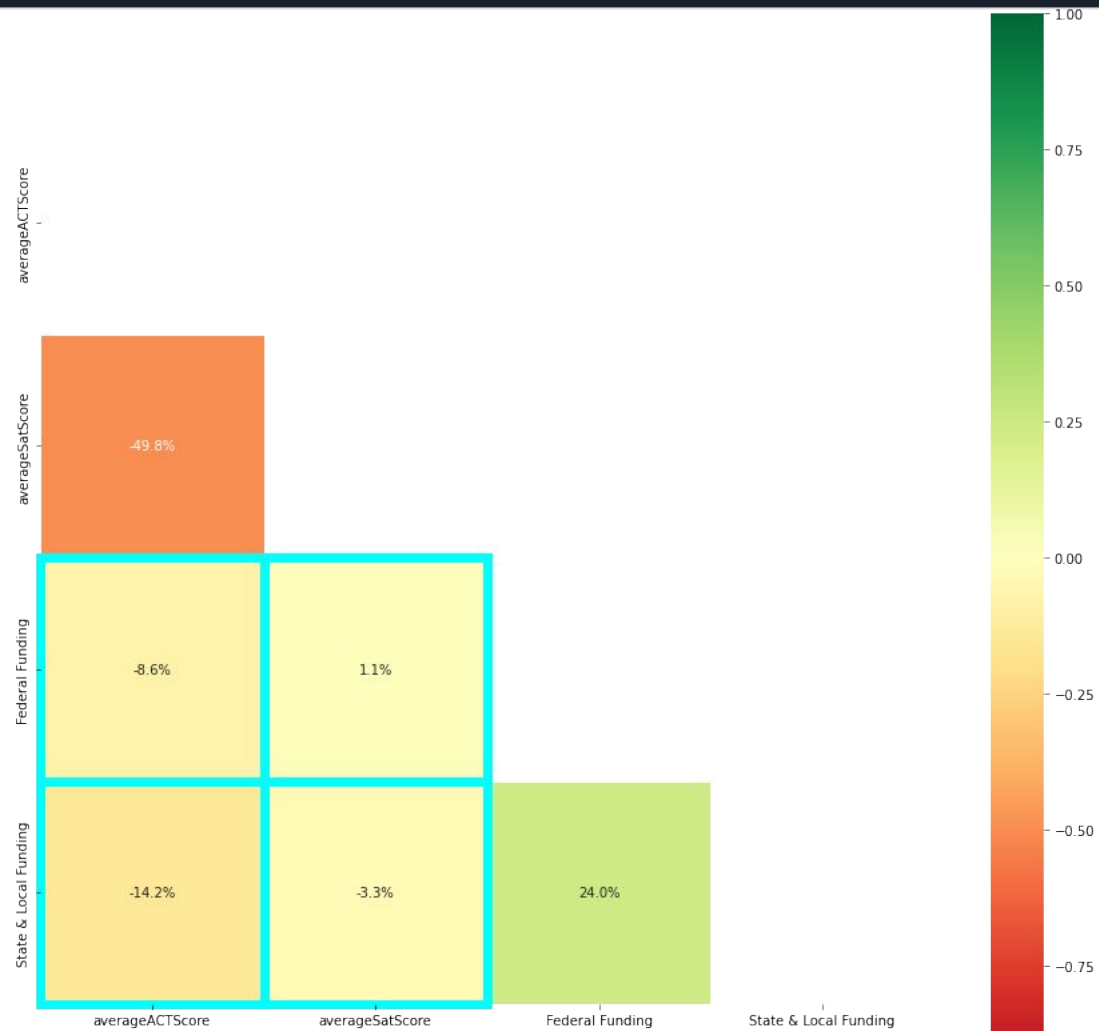


# Addendum





This addendum was done after I completed my project because I wanted to also find out if external funding could affect average SAT or ACT scores.





From the heatmap, we can also conclude that there is not correlation between external funding and average ACT or SAT scores.