

Project 1:

SAT & ACT Analysis

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SAT

ACT

Introduction

- **Problem Statement:**

- As a team member of College Board which administers the SAT, we keep tracking statewide SAT participation rate. From historical data, SAT participation rate is still relatively low comparing with ACT participation rate across 51 States in U.S.

- **Objective:**

- After a new format of SAT released in 2016, we will do data analysis with SAT/ACT 2017 and 2018 dataset and find out potential solutions to **improve SAT participation rate**.

Data Set Description

- 4 sets of data used in analysis: **SAT dataset 2017/2018** & **ACT dataset 2017/2018**

| Dataset | Time Period | Data Fields | Data Type |
|--------------|-------------|---|--------------------|
| SAT datasets | 2017 & 2018 | Participation Rate for each State | Percentage (%) |
| | | Average Score of EBRW & Math for each State | Integer (200-800) |
| | | Average Total Score of EBRW & Math for each State | Integer (400-1600) |
| ACT datasets | 2017 & 2018 | Participation Rate for each state | Percentage (%) |
| | | Average Score of English, Math, Reading & Science for each state | Float (1.0–36.0) |
| | | Average Composite Score as the average score of English, Math, Reading & Science , for each state | Float (1.0–36.0) |

➤ EBRW = Evidence based Reading and Writing

Data Set Description

- Data dictionary for SAT/ACT 2017 dataset (same as SAT/ACT 2018 dataset)

| Feature | Type | Dataset | Description |
|-------------|---------|-----------|---|
| state | object | SAT & ACT | State name |
| sat_par17 | float64 | SAT | SAT participation rate for each State in 2017 |
| sat_ebrw17 | int64 | SAT | SAT average score for Evidence-Based Reading and Writing for each State in 2017 |
| sat_math17 | int64 | SAT | SAT average Math score for each State in 2017 |
| sat_total17 | int64 | SAT | SAT average total score for each State in 2017 |
| act_par17 | float64 | ACT | ACT participation rate for each State in 2017 |
| act_eng17 | float64 | ACT | ACT average English score for each State in 2017 |
| act_math17 | float64 | ACT | ACT average Math score for each State in 2017 |
| act_read17 | float64 | ACT | ACT average Reading score for each State in 2017 |
| act_sci17 | float64 | ACT | ACT average Science score for each State in 2017 |
| act_compo17 | float64 | ACT | ACT average Composite score for each State in 2017 |

Data Analysis Process

- **Data Preparation**

- Data Cleaning – Fix any error and correct any improper date type

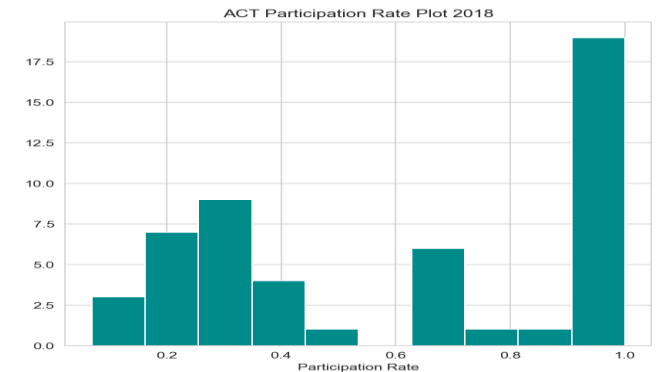
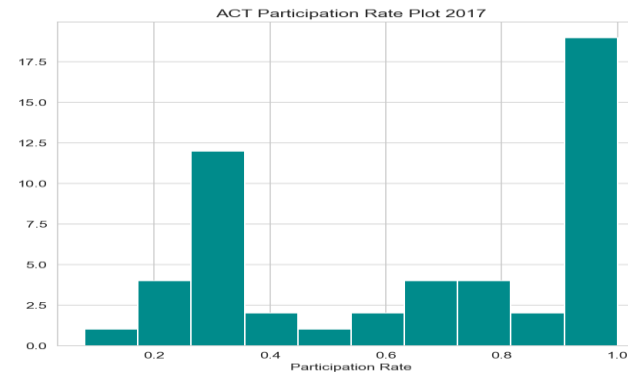
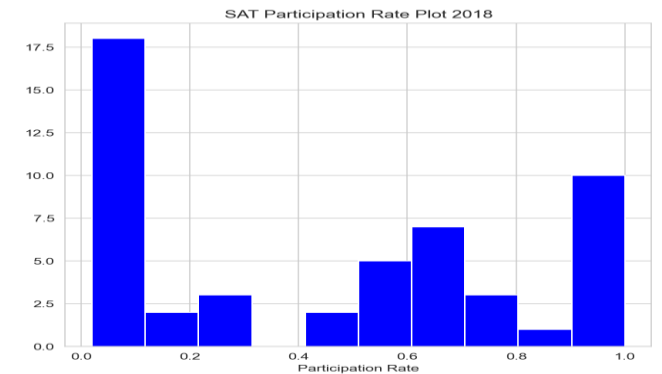
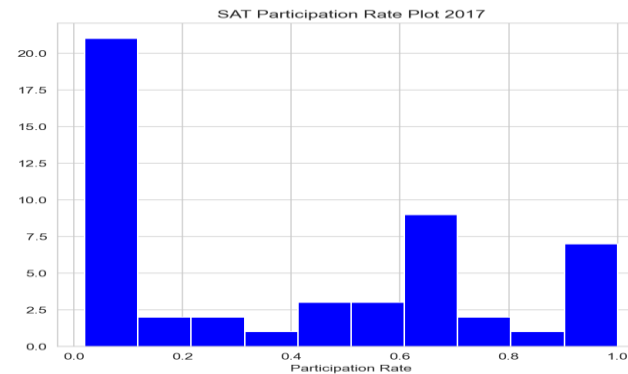
- **Data Analysis**

- SAT/ACT Participation Rate Comparison
 - SAT/ACT Participation Rate Correlation Analysis
 - High SAT Participation Rate Improvement Discovery

SAT/ACT Participation Rate Comparison

Histogram Plots for SAT/ACT Participation Rate in 2017 and 2018

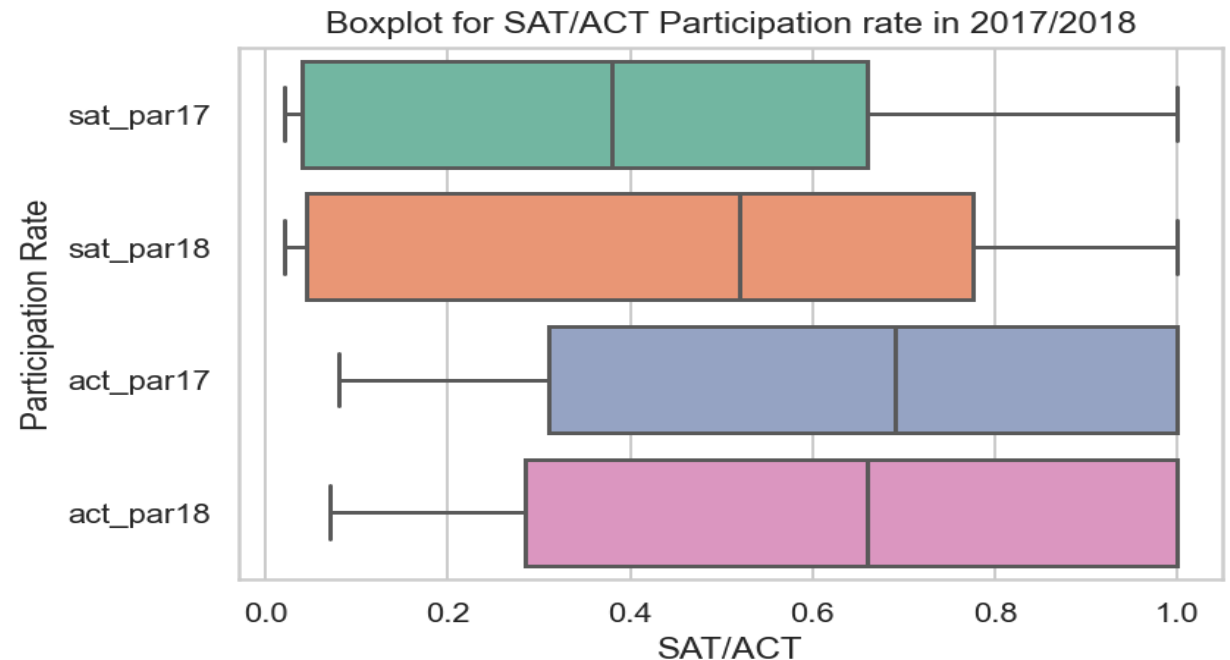
- There is no dramatic change between 2017 and 2018 for both SAT and ACT participation rate.
- For SAT test, there is still large group of States with low participation rate range ($< 10\%$). The good news is that there is increase for group with 100% participation rate.
- For ACT test, No of States with low participation rate ($< 10\%$) increases while there is almost no change for 100% participation rate group.



SAT/ACT Participation Rate Comparison

Boxplot for SAT/ACT Participation rate in 2017/2018

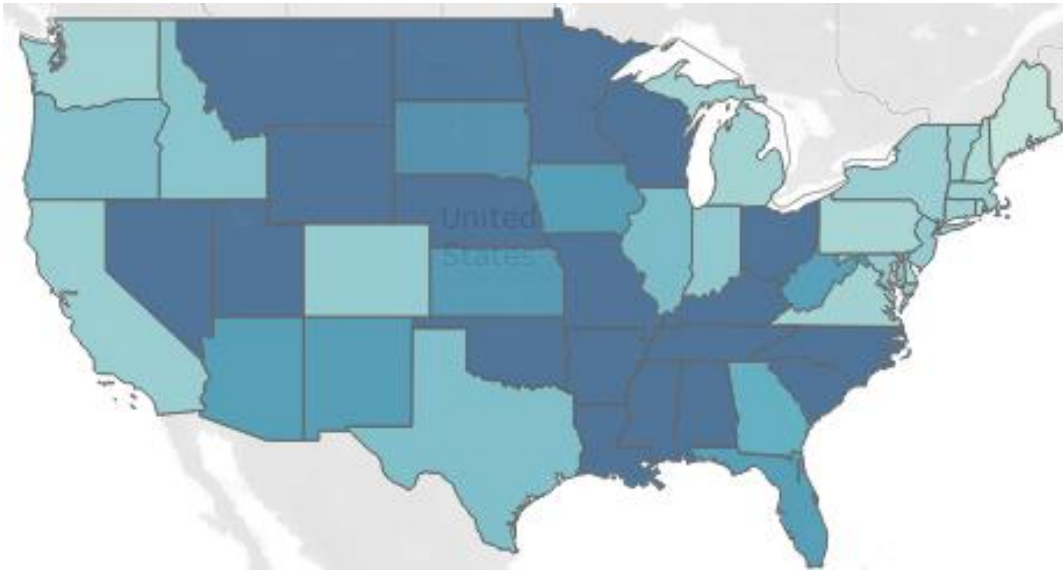
- From the Boxplots, we can observe that the distribution of ACT participation rate is centered significantly higher than that of the SAT.
- The average scores of SAT and ACT do not have significant change in 2017 and 2018.



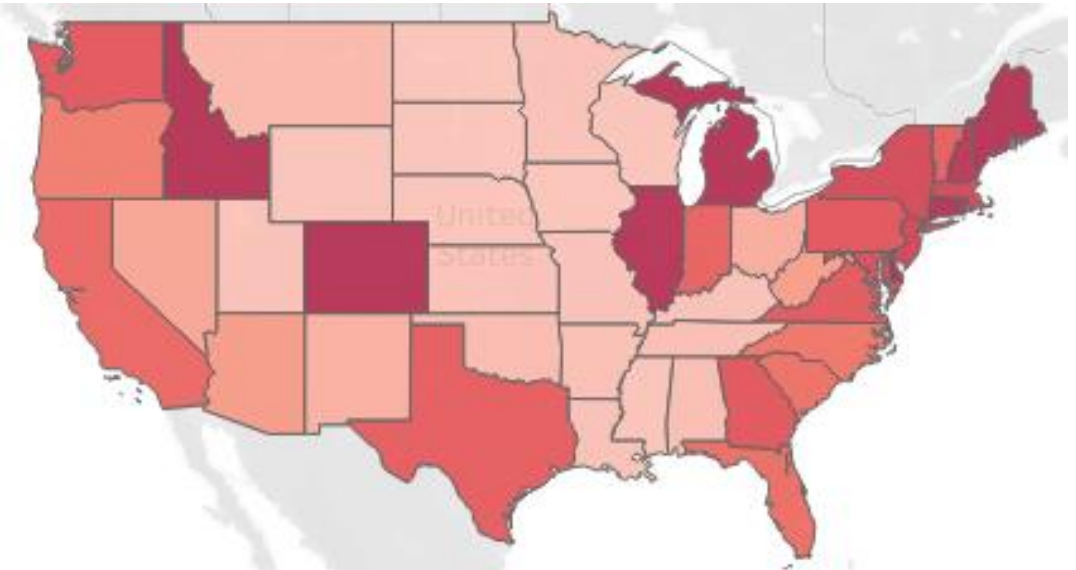
SAT/ACT Participation rate Correlation Analysis

Map View shows almost **no Mutual Participation Rate** of SAT and ACT at the same State, with States tending to prefer one test or the other.

States with ACT Participation Rate 2018
(Darker color means higher rate)

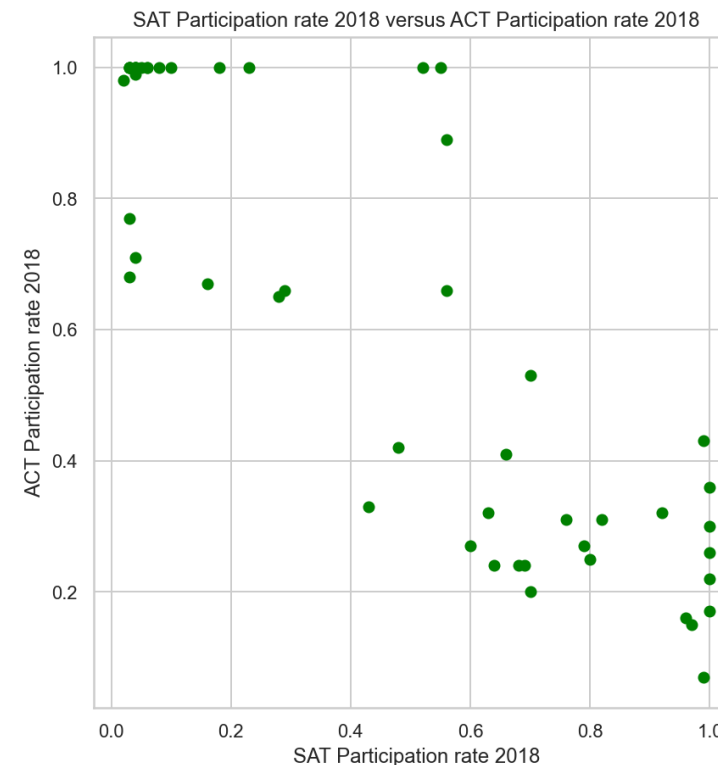
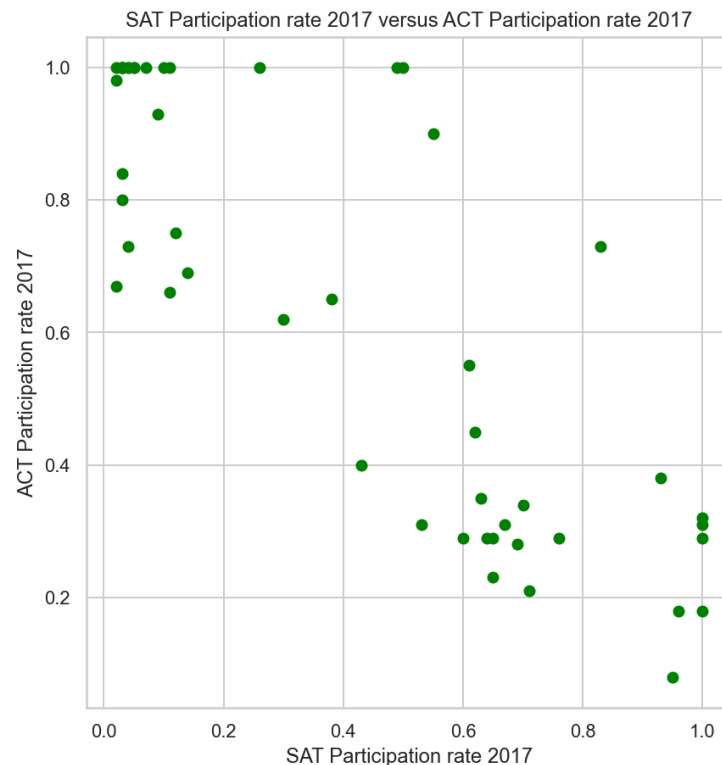


States with SAT Participation Rate 2018
(Darker color means higher rate)



SAT/ACT Participation rate Correlation Analysis

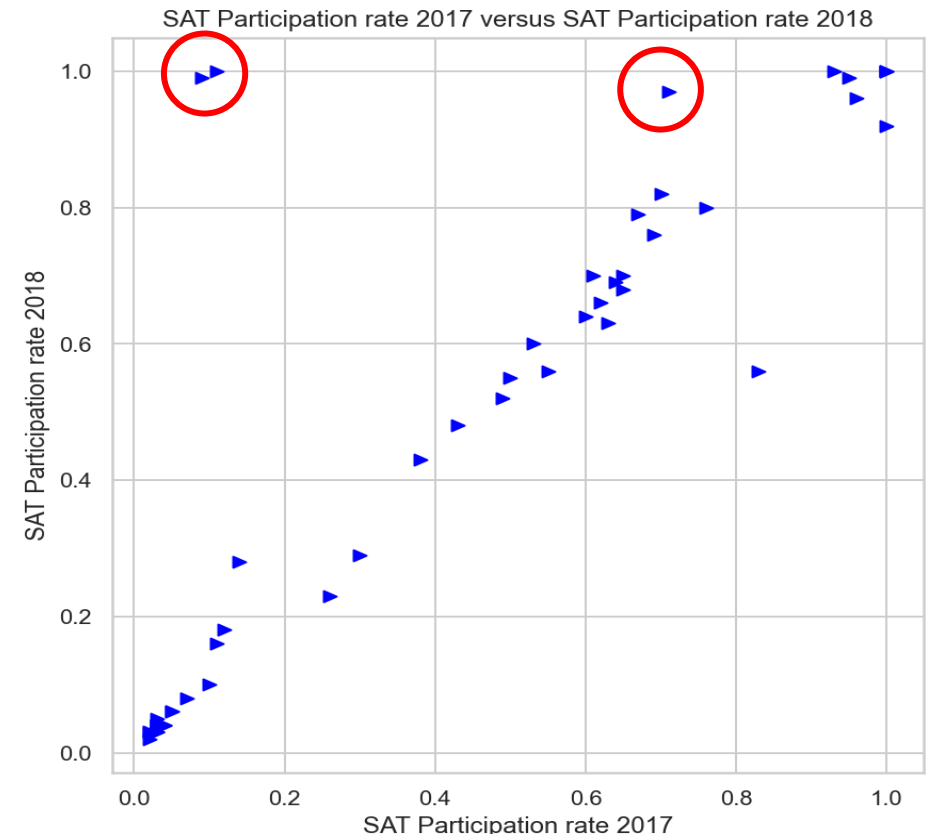
Scatter Plot about Participation Rate of SAT vs. ACT within the same year shows the SAT and ACT participation rate **correlate negatively** and more points concentrated in high/low ends, with States tending to prefer one test or the other.



High SAT Participation Rate Improvement

- SAT Participation Rate scatter plot (2017 vs. 2018)
 - It shows **highly positive correlation**,
 - **Three States as circled in red** in scatter plot have high increase comparing 2017.
 - **Illinois, Colorado** and **Rhode Island** are the three States with highest participation rate improvement. We will take these three States to do further research.

| | state | sat_par17 | sat_par18 | sat_par_change |
|----|---------------|-----------|-----------|----------------|
| 13 | Illinois | 0.09 | 0.99 | 0.90 |
| 5 | Colorado | 0.11 | 1.00 | 0.89 |
| 39 | Rhode Island | 0.71 | 0.97 | 0.26 |
| 48 | West Virginia | 0.14 | 0.28 | 0.14 |
| 30 | New Jersey | 0.70 | 0.82 | 0.12 |
| 32 | New York | 0.67 | 0.79 | 0.12 |



Research and Observation

Observations of **Illinois, Colorado** and **Rhode Island** with highest SAT participation rate improvement in 2018 due to the factors:

- **Administer SAT as required test**
 - From 2016-2017, Colorado high school juniors have been required to take the SAT.
 - As of 2017, all Illinois juniors are required to take the SAT.
 - In 2018, the SAT became graduation requirements in Rhode Island.
- **SAT school day**
 - Colorado, Illinois and Rhode Island schools offer SAT school day so that student can take SAT exam during school day rather than during weekend day.
 - This ensures that working students have the chance to take the SAT test.
 - SAT school day also allows students to take test in their own school and this makes them comfortable and convenient.
- **SAT fee waiver**
 - In 2017-18, 10 States including Colorado, Illinois and Rhode Island covered the cost of the SAT for all their public school students- free test preparation material, counseling and testing fee waivers. This really helps for students from low-income family.

Conclusion and Recommendations

- In conclusion, SAT participation rate has no dramatical increase from 2017 to 2018.
- Some States, like **Colorado, Illinois and Rhode Island** have high SAT participation rate improvement. Further research is conducted for these States.
- The SAT and ACT participation rate roughly **complements** each other. For most State, participation of one test dominates the other. Maybe affected by the policies of the state.
- The States preferring ACT locate in middle region of U.S., while SAT preferred States locate in rest area of U.S.
- We recommend College Board to take the following actions to improve SAT participation rate for states with low SAT participation rate:
 - **Administer SAT as the State's required test**
 - **Offer more SAT School Day to make more flexible for the students who have to work during weekend.**
 - **Offer more incentives for students who come from low-income families, like cover the cost of the SAT for all their public school students.**