

# Project 1

# SAT & ACT Analysis

General Assembly DSI14

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# Presentation Outline

1. Problem Statement
2. Methodology
3. Exploratory Data Analysis
4. Descriptive & Inferential Statistics
5. State-focused Research
6. Recommendation
7. Conclusion

# Problem Statement

Since 2012, many states have enacted law to mandate ACT as the default assessment for high school graduates, giving rise to the popularity of ACT, taking over SAT.

Hence for the College Board, it would be quintessential to understand the reason behind ACT long-lasting popularity and formulate a cost-efficient solution to improve the SAT participation rate.

# Methodology

## Data Visualization

In this project, we use codes to plot and identify the key questions by comparing ACT & SAT data set.

- What is to be studied and learned from ACT & SAT test data of year 2017 & 2018?
- Recommendation on how to improve the SAT participation rate?

# Methodology

## Datasets & Variables

The data reviewed from SAT and ACT datasets for all US states from 2017 and 2018 :

- ACT Participation Rates
- ACT English Scores
- ACT Maths Scores
- ACT Reading
- ACT Science
- ACT Composite Scores

- SAT Participation Rates
- SAT Evidence-based Reading & Writing Scores
- SAT Maths Scores
- ACT Total Scores

# Methodology

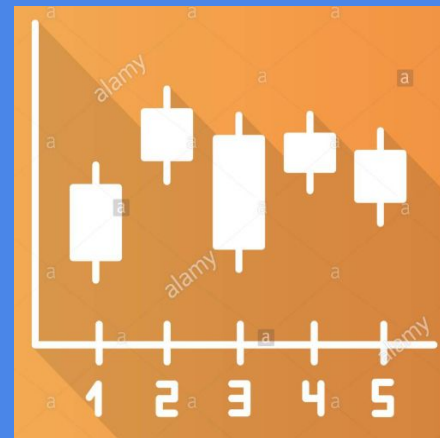
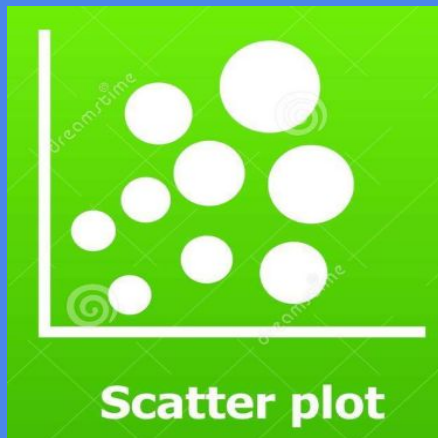
## Data Cleaning & Wrangling

The data were come from different sources so we before we start analysis the data, data study and cleaning is important!

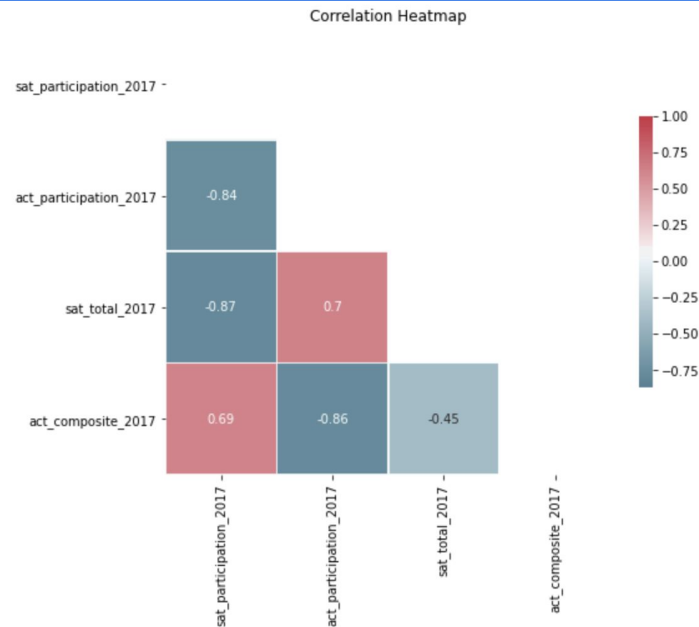
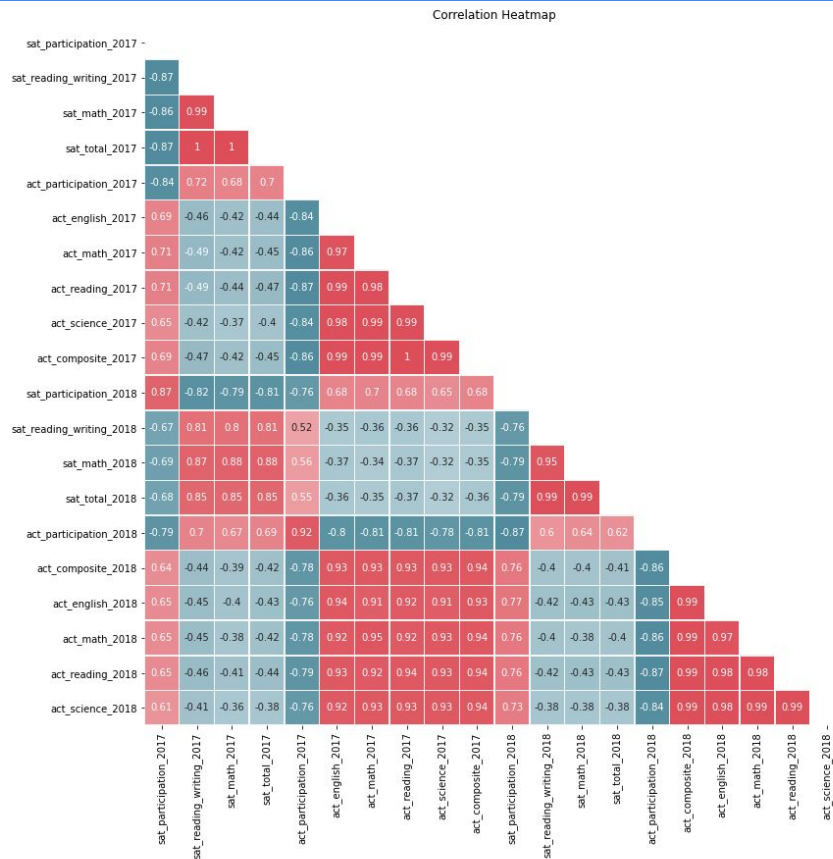
Format	Check the format consistency
Values	Remove the values which is not in use
Cells Rows Columns	Remove empty cells, row or columns
Combine	Combining Datasets
Errors Check	Check for any errors in values
Filter	Filter the errors and do data cleaning
Amend and Analyze !	Amend the error and start analyze !

# Observations From ACT & SAT

## Data Visualization & Exploratory Analysis



# Correlation Heatmap

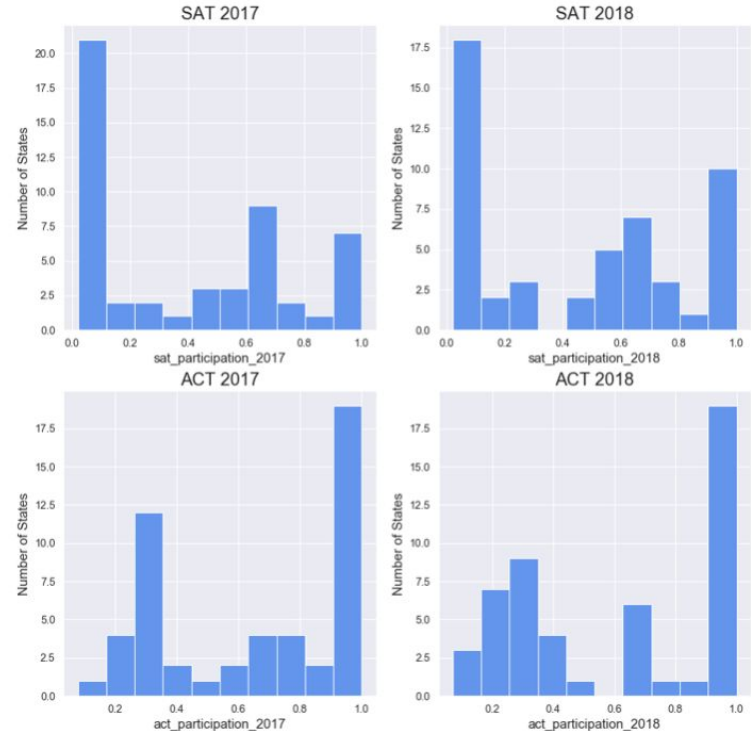


Remove Collinear Variable



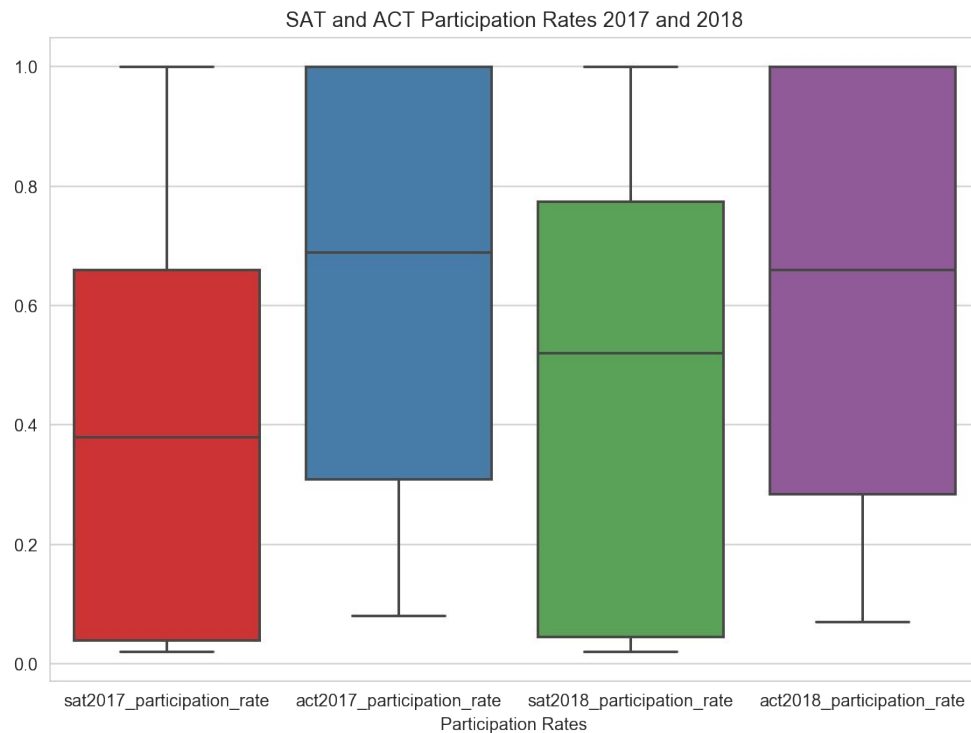
# Histogram

- Notice the SAT participation rate histograms having left sided peaks
- Indicates low participation close to 0% is most frequently occurring
- Notice the ACT participation rate histograms having right sided peaks
- Indicates high participation close to 100% is most frequently occurring
- Could possibly suggest data might influenced by something (Eg: Mandatory state policy to take SAT or ACT)



# Boxplot

## SAT and ACT Participation Rate in 2017 and 2018



- Boxplots can help further describe the behavior of the histograms
- SAT participation rate 25-50-75 quartiles are around the lower end of participation rates
- Has longer top whiskers indicating outliers are high participation rates
- ACT participation rate 25-50-75 quartiles are around the higher end of participation rates
- Has longer bottom whiskers indicating outliers are low participation rates

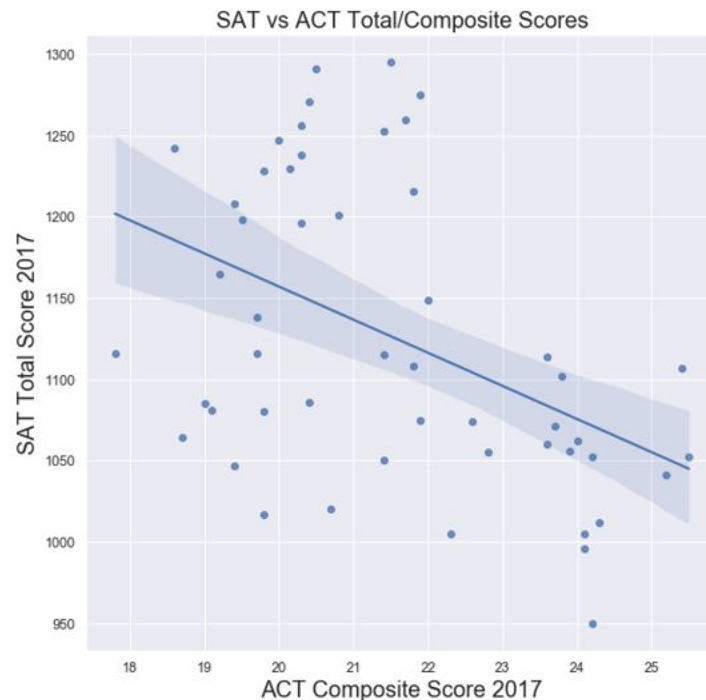
# Scatter Plots

ACT Composite Score vs SAT Total Score

## ACT & SAT Test Scores

By comparing both ACT and SAT test scores we can identify particular states student performance. Each data hold a relationship with each other. As example, the higher score in one test, the average score for the other will tend to be lower.

The relationship can be seen in the regressed linear line on the scatter plot of comparison ACT composite score and SAT total scores in year 2017.

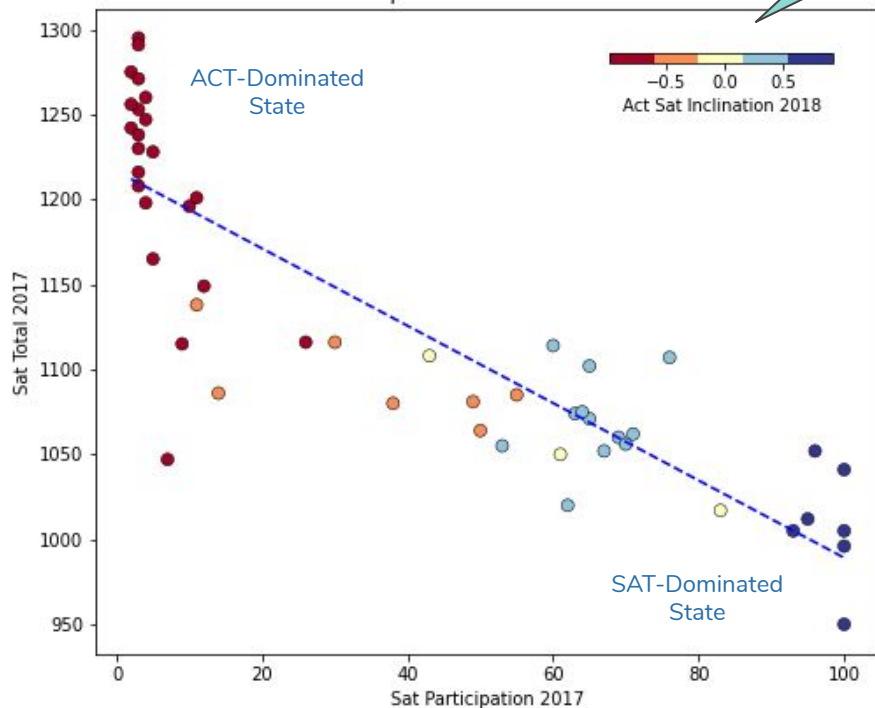


# Scatter Plots

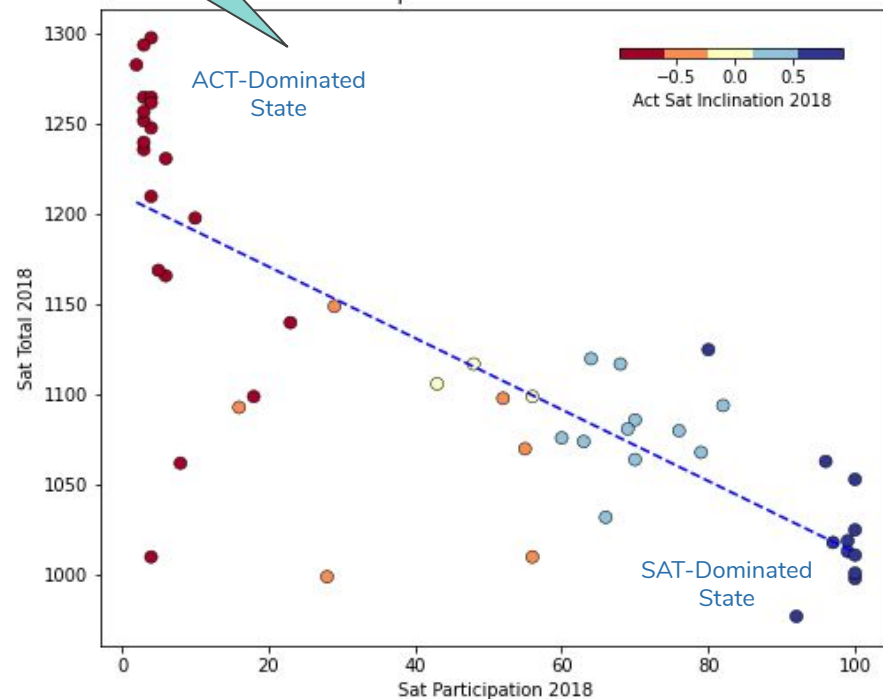
SAT Participation vs Total Score

Negative correlation  
between SAT Total  
Score and  
Participation Rate

SAT Participation vs Total Score in 2017



SAT Participation vs Total Score in 2018

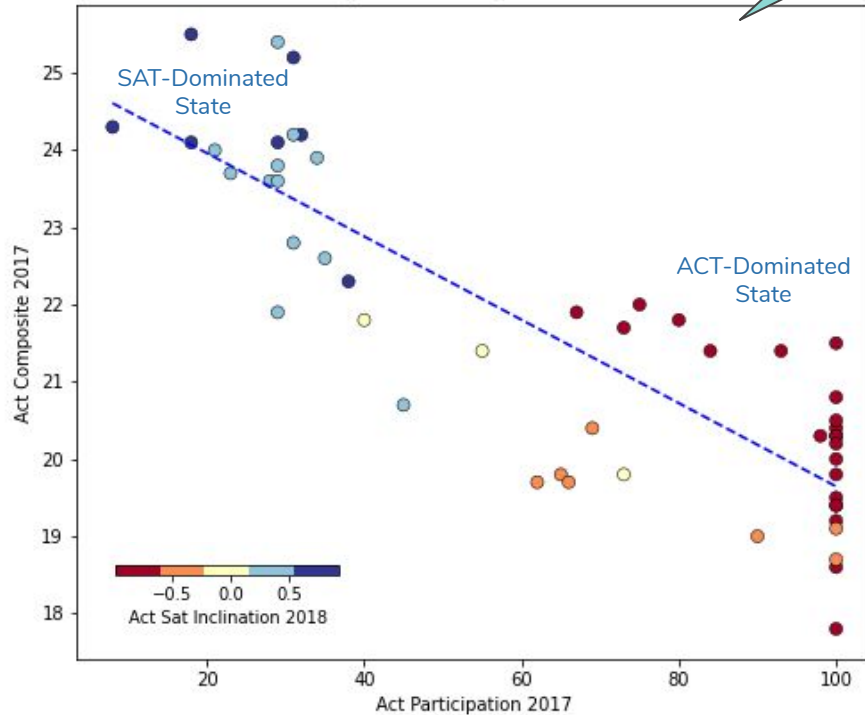


# Scatter Plots

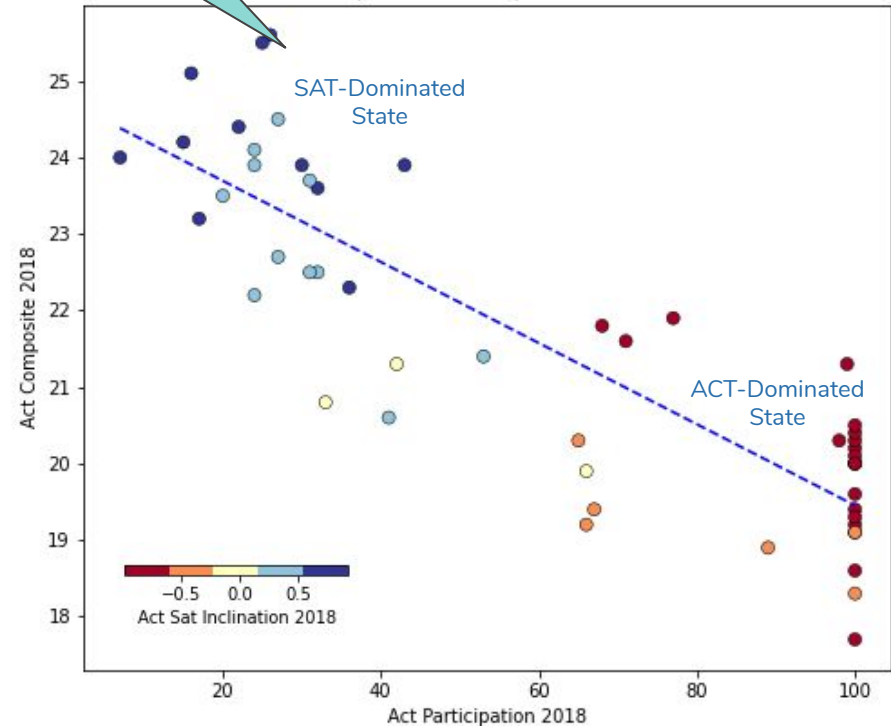
ACT Participation vs Composite Score

Negative correlation  
between ACT  
Composite Score  
and Participation  
Rate

ACT Participation vs Composite Score in 2017



ACT Participation vs Composite Score in 2018

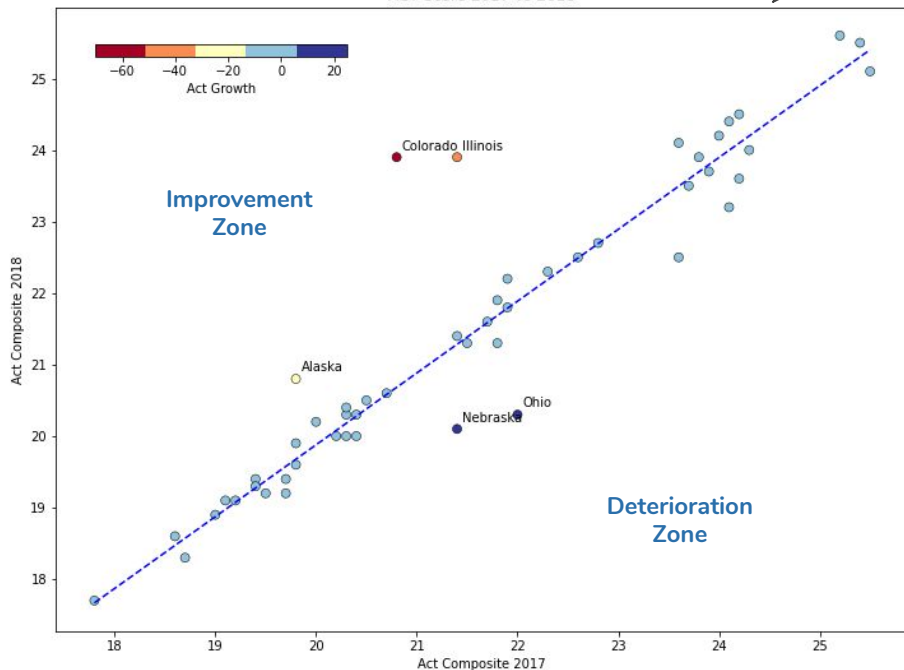


# Scatter Plots

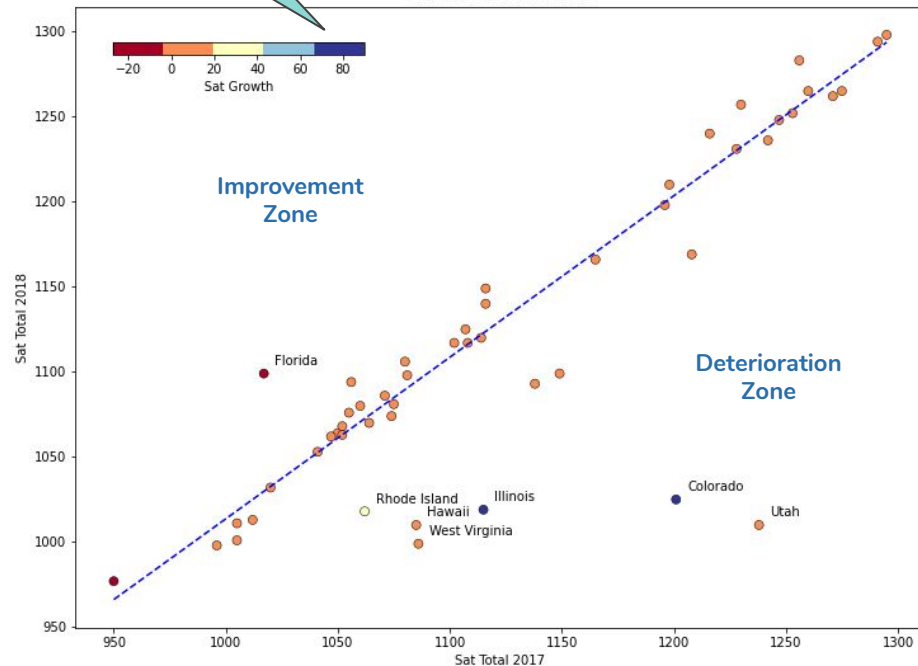
Performance Growth in ACT and SAT

Positive correlation  
between 2017 &  
2018 performance  
for both SAT & ACT

ACT Score 2017 vs 2018



SAT Score 2017 vs 2018



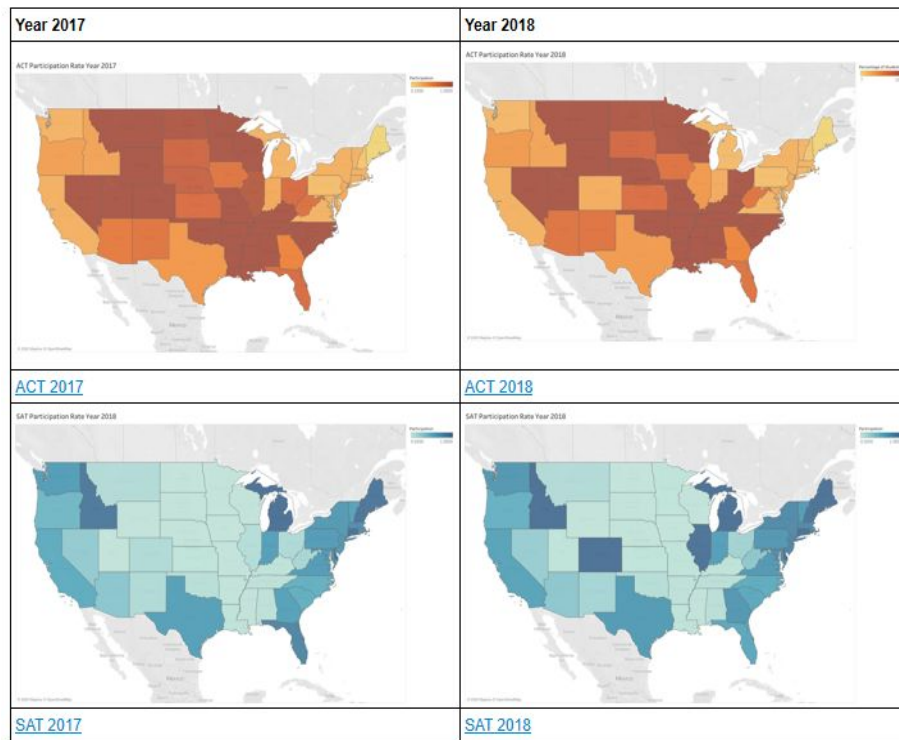
# Choropleth Map

Distribution of SAT and ACT in United States

## Participation Rates

By comparing the choropleth map which indicated in darkest orange color represents the 100% participation rate of ACT test while darkest blue indicate the 100% participation rate of SAT test.

The ACT is more concentrated in central of US while SAT is popular in coastal states.



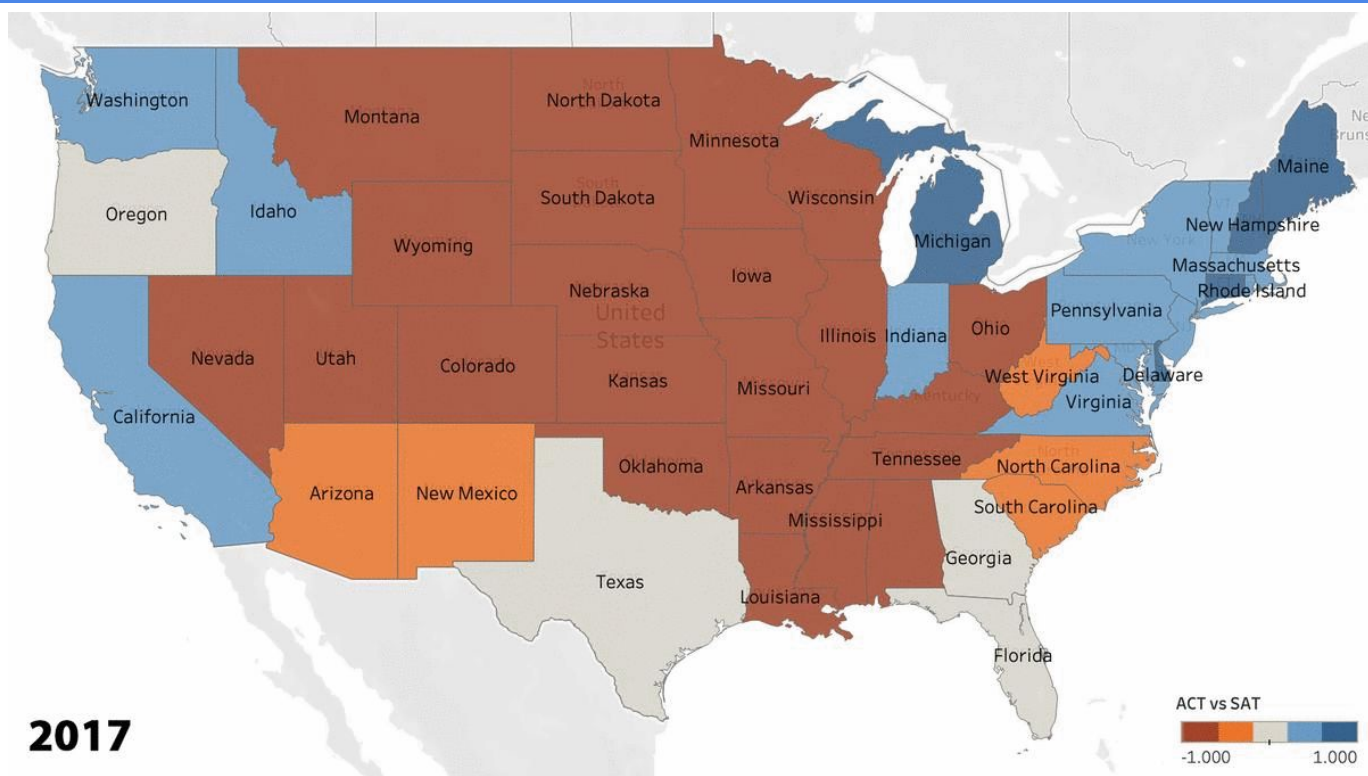
# Outside Research

## We have chosen 3 states for further research:

- **Colorado:** 100% ACT participation rate in 2017, then a 100% SAT participation rate in 2018.
- **West Virginia:** 4% decrease in ACT participation rate from 2017 to 2018, and a 14% increase in SAT participation rate from 2017 to 2018
- **Ohio:** 75% ACT participation rate in 2017, it increases to 100% ACT participation rate in 2018.  
There is also a 6% increase in SAT participation rate from 2017 to 2018



# Outside Research



## Top SAT Growth States

	state	sat_growth	sat_score_diff
0	Illinois	90	-9.0
1	Colorado	89	-15.0
2	Rhode Island	26	-4.0
3	West Virginia	14	-8.0
4	New Jersey	12	4.0
5	New York	12	2.0
6	Georgia	9	1.0
7	California	7	2.0
8	Idaho	7	-0.0
9	Maryland	7	2.0
10	Ohio	6	-4.0

# Case Study - Colorado

In 2017, Colorado had a change in state policy which adopted the SAT over ACT for the class of 2018 as mandatory college entrance exam. The policy change can be seen impacting the change of the Colorado SAT participation rate in 2018.

state	sat_participation_2017	sat_participation_2018	sat_growth
Colorado	11	100	89

Similar policy change has also been witnessed in Illinois, where it has caused a 90% hike in SAT participation rate as well.

# State-mandated Assessment

## 8 States with Policies for mandatory SAT:

- Colorado
- Connecticut
- Delaware
- District of Columbia
- Illinois
- Maine
- Michigan
- New Hampshire

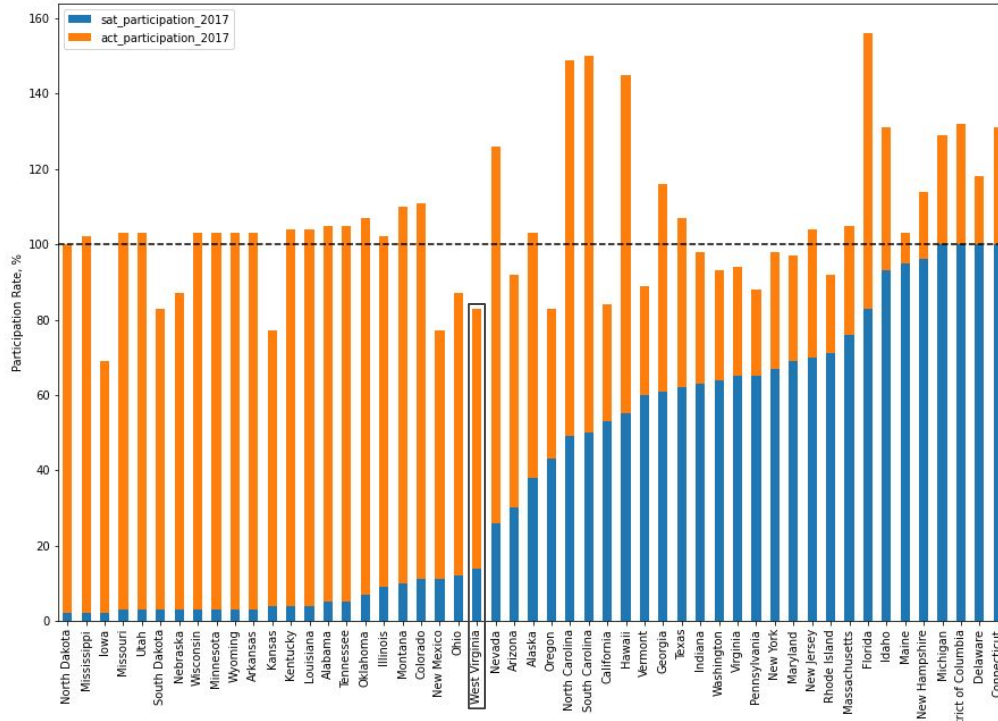
# State-mandated Assessment

## 13 States with Policies for mandatory ACT:

- Alabama
- Hawaii
- Montana
- Nebraska
- Nevada
- North Carolina
- North Dakota
- Utah
- Wisconsin
- Kentucky
- Louisiana
- Mississippi
- Wyoming

# State Participation Rates

SAT & ACT Inclusion at Each States in 2017



- As shown above, generally a state would either be inclined to SAT or ACT
- However, there are several states that have very high participation for both the assessment
- More than half of the states have a combined participation rate of more than 100%
- It means that it is common in most of the states for student to take both SAT and ACT
- Especially in Florida, North Carolina, South Carolina and Idaho, which 3 of them are at the East Coast.

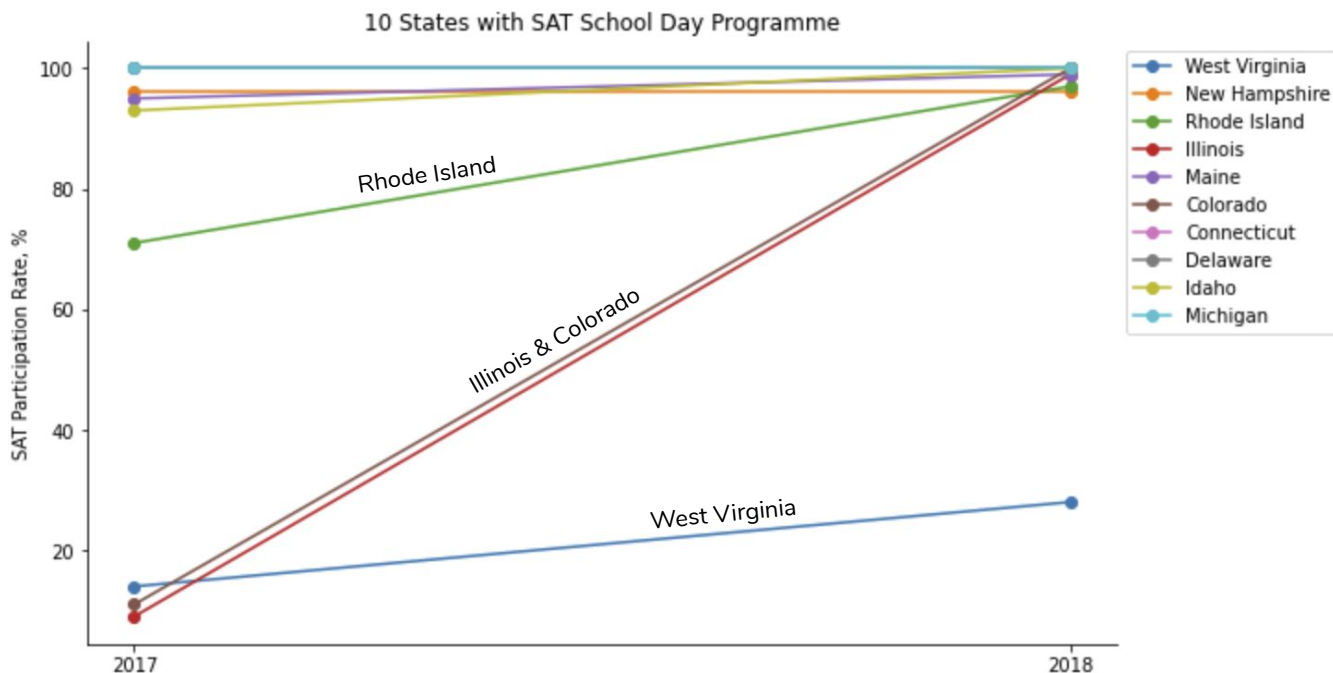
# Case Study - West Virginia

West Virginia had a increased in students taking SAT due to SAT school day, in which the state covers the SAT costs and the tests are conducted on a school day. This explains in the increase of participation rates in SAT.

state	sat_participation_2017	sat_participation_2018	sat_growth	act_growth
West Virginia	14	28	14	-4

Apart from that, West Virginia is relatively neutral in term of inclination towards SAT or ACT. There is no state policy favorable to either assessment, so the SAT school day would be more effective in West Virginia.

# SAT School Day Implementation



- All the states under the programme are on rising trend, including states with near 100% participation rate.

# Case Study - Ohio

In Ohio, the class of 2018 was the first class where the state-government would fully subsidized for all students to participate in the ACT. The subsidy has encouraged thousands of the - otherwise - non college-bound students to take the ACT.

state	act_participation_2017	act_participation_2018	act_growth
Ohio	75	100	25

It has caused the ACT participation to hike from 75% up to 100% in Ohio.

College board may emulate the success of ACT in Ohio by lobbying with selected state government to subsidize for SAT.

source: <https://www.daytondailynews.com/news/national-act-scores-for-class-2018-worst-decades-officials-say/EKA05C3FHcjN4bx8BmcC2N/>



# Recommendation and Conclusion

## Recommendation

- SAT school day helps to increase the participation rate for SAT. Increase collaboration with state education authorities to take up the program of SAT school day.
- In West Virginia, the SAT School Day Programme has gained its momentum, so College Board may leverage on this by marketing and lobby for further Government support.
- Encourage the College Board to ramp up engagement with the state's education authorities to consider making SAT mandatory for all students in the state.

## Conclusion

- We would like to obtain the data for the annual education budget for the states as the 3 recommendations would require funds from the state in order for it to get implemented.
- Knowing which state has an increased in budget would help our recommendations to succeed.

THANK YOU!