Project 1: SAT & ACT Analysis

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SAT & ACT Testing: A Data Problem

In this project, we use Data Science to address key questions:

- What can be learned from ACT & SAT 2017 / 2018 testing data across all US states?
- How can we use that information to improve SAT Participation rates?

What Data Did We Review?

We reviewed SAT and ACT testing data for all US states from 2017 and 2018, including:

- ACT & SAT Participation Rates (2017 / 2018)
- ACT Test Scores by Subject (2017)
  - English
  - Math
  - Reading
  - Science
- ACT Composite Scores (2017 / 2018)
- SAT Test Scores by Subject (2017 / 2018)
  - Evidence-based Reading & Writing *(ERW)*
  - Math
- SAT Total Scores (2017 / 2018)

Note: ACT Test Scores by Subject were not available for 2018

"Data Munging": Cleaning Up Data

Because our data comes from different sources, we start our analysis with "munging", or cleaning the data. This involves multiple techniques:

- Checking consistent formatting
- Removing empty/unusable values
- Combining multiple datasets into one
- Checking for reasonable values (i.e., an SAT score below 200 must be an error)

EDA: Exploratory Data Analysis

Once our data is organized, we take a look for trends and relationships between variables, such as:

- ACT vs. SAT scores within states
- Participation rates vs. scores
- Changes in scores and rates

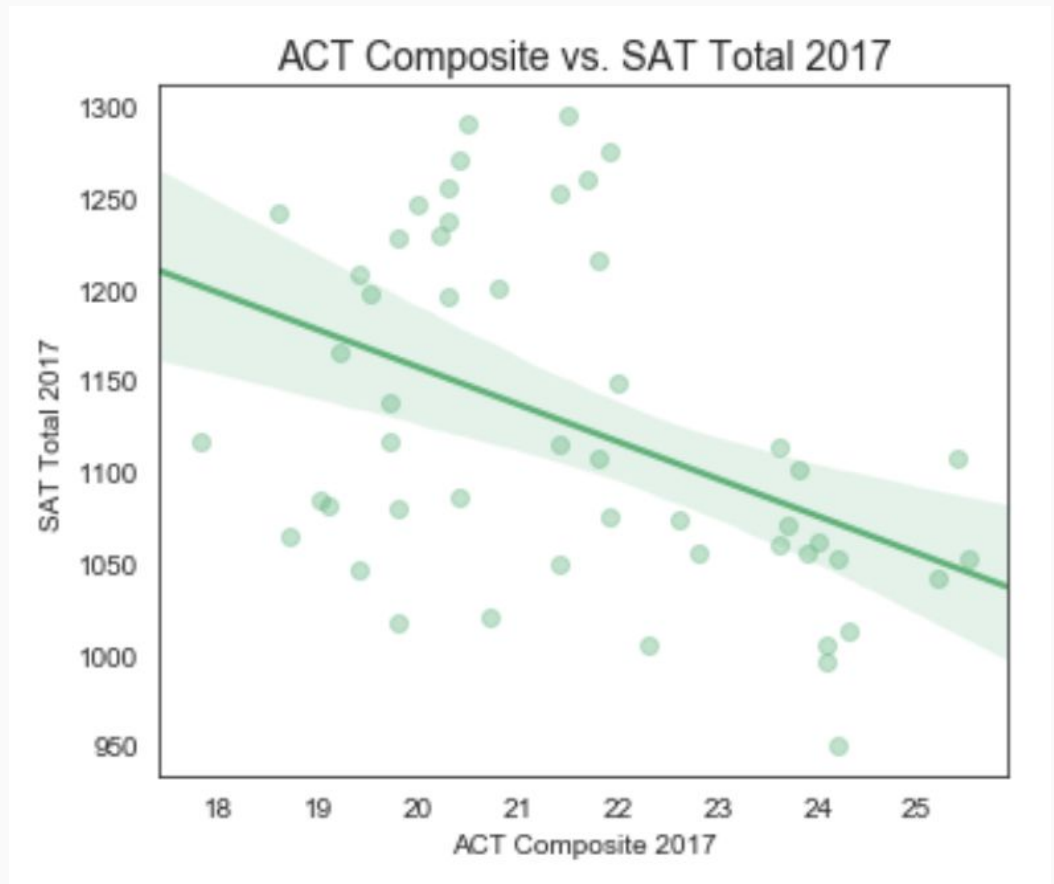With this knowledge, we can begin to visualize our dataset.

Observations from SAT & ACT Analysis

Test Scores

One relationship we identified concerned states where both the ACT and SAT were taken. Test scores hold an inverse relationship, where the higher a score is for one test in a state, the lower the average score tends to be for the other.

This inverse relationship can be seen in the downward slope of the regression line on this scatter plot showing a comparison of ACT Composite and SAT Total scores for 2017.
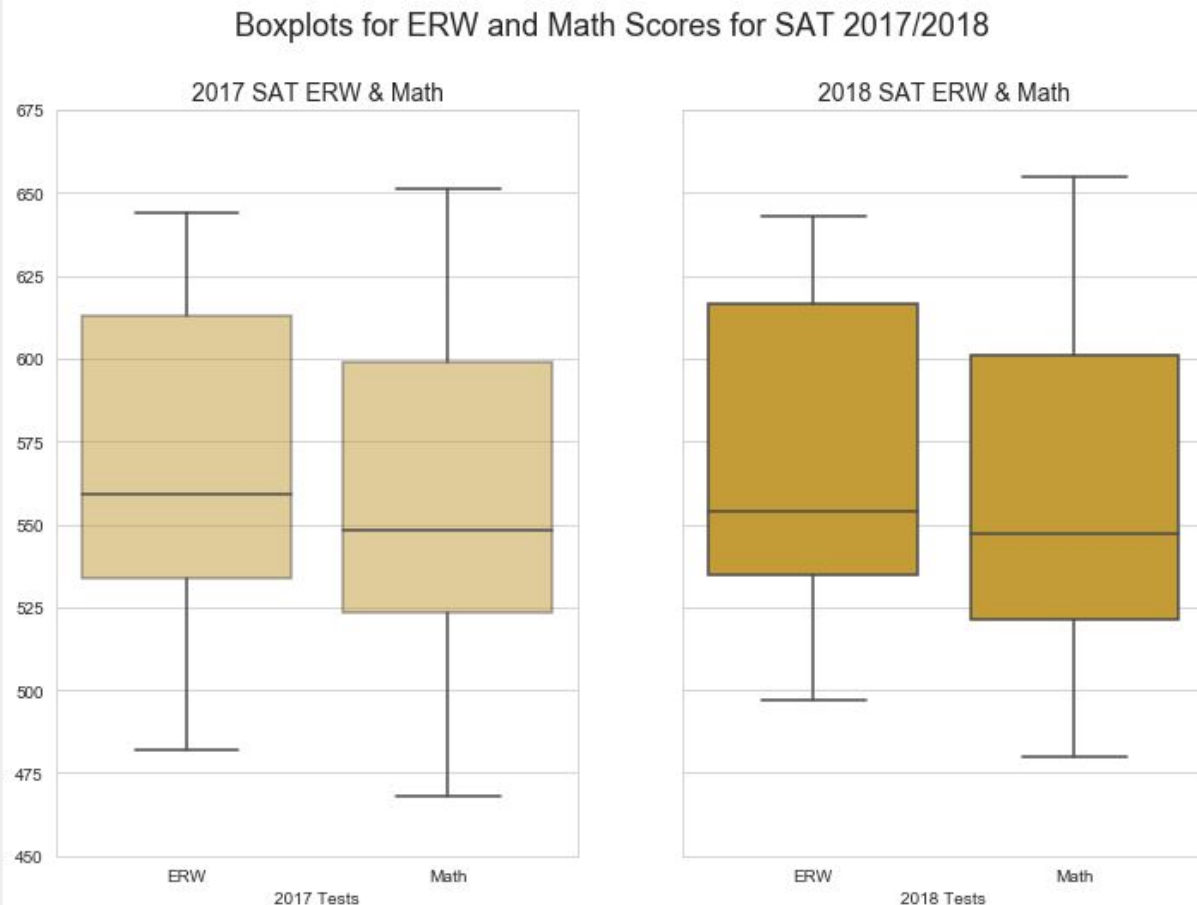
Test Scores

By using box plots, we can observe entire score distributions as well as how they change over time.

Here we see that in both 2017 and 2018, the Evidence-Based Reading & Writing scores for the SAT outperformed Math scores on average.

However, the maximum Math scores in both years are greater than those for ERW. This plot shows a slight reduction in mean in one year, which is likely due to increased participation rates.

Boxplots for ERW and Math Scores for SAT 2017/2018

Participation Rates

We noted high contrast in participation rates between SAT and ACT among states.
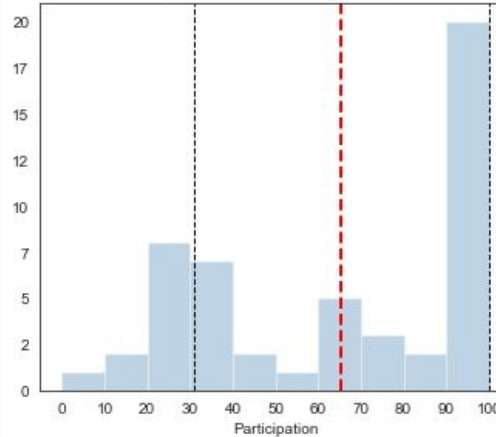
Over 25% of states where ACT is taken have 90-100% participation rates, while for the SAT over 25% have 0-10% participation rates.

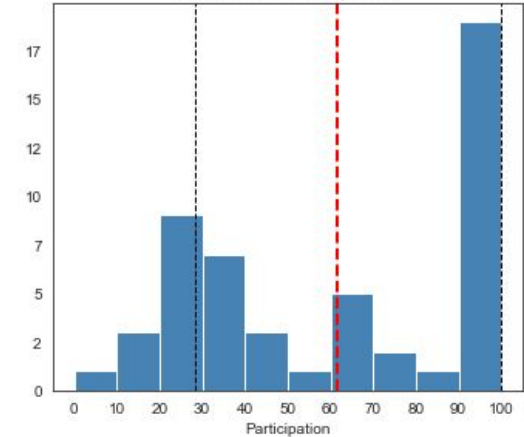However, we see on the right side of the SAT Histogram a spike in 90-100% participation due to growing popularity:

Increased from 6 to 10 states in a year

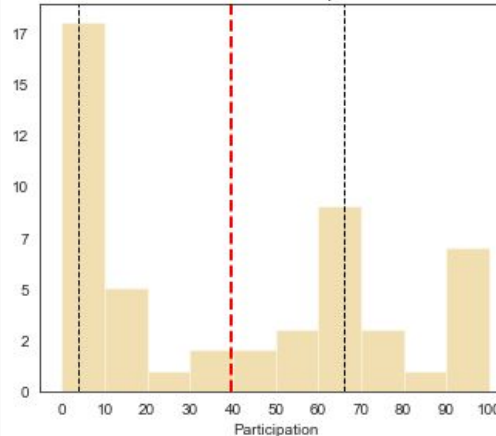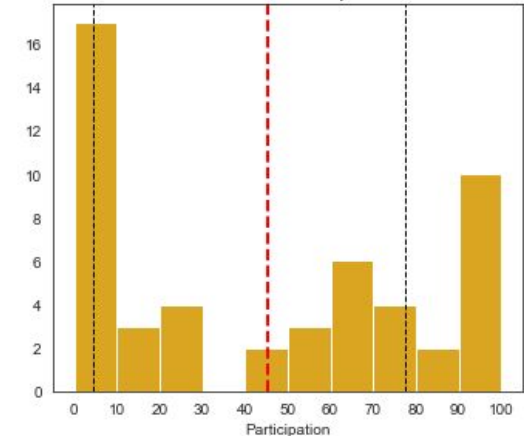Histograms of ACT & SAT Participation Rates in 2017/2018
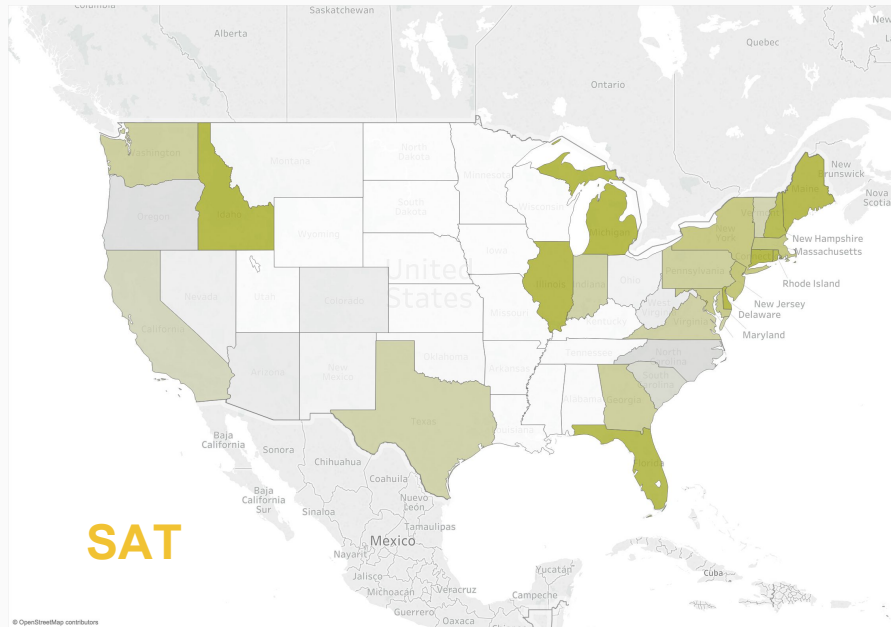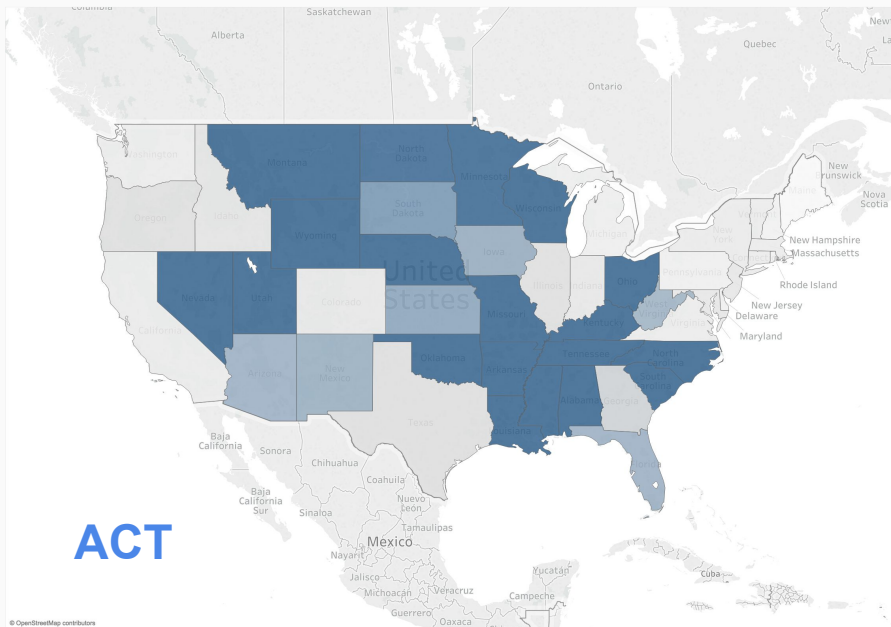
Participation Rates

We can see the geographic distribution much more clearly on the US map. The darkest blue states have 100% ACT Participation, while the darkest gold states have 100% SAT Participation. The ACT is widely popular across the Midwest, while the SAT is concentrated in coastal areas.

Strategic Recommendations

Shifting Legal Landscape

States treat the ACT and SAT differently depending on education regulations, which change frequently.

- 16 states provide ACT exam for free or reduced cost
- 8 states provide the SAT exam for free or reduced cost
- 14 states require ACT for all students
- 9 states require SAT for all students
- 3 states require either ACT or SAT

Knowing this, we targeted the 23 remaining states for strategic opportunities with minimal interference.

SAT Participation Target:
New Mexico

- Geography
  - Located next to ACT stronghold of Midwest, but also next to Texas - SAT Participation grew from 62% to 66% in 2018.
  - Shares border with Colorado, which recently switched from mandatory ACT to mandatory and subsidized SAT
- Growth Potential
  - Major increase from 11% SAT participation in 2017 to 16% in 2018, almost 50% increase
  - ACT rate holding around 67%, leaving room to grow, unlike many full participation ACT states in the region

New Mexico Strategy

We recommend that the College Board consider the following 3 strategy points to increase SAT participation rates in New Mexico:

1. **Engage with State and Local Governments**

   - SAT can be offered free or discounted by municipalities too
   - No existing programs that would be crowded out

2. **Invest in Marketing Efforts**

   - New Mexico allows students to choose between SAT and ACT, or neither
   - Potential customers if they can be reached effectively

3. **Leverage Neighbors' Successes**

   - Make use of trends in Texas and Colorado, where SAT participation is increasing

Questions?