Improving SAT and ACT Scores

An evaluation on increasing participation rates and budget

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Problem Statement

- State education board wants to increase SAT and/or ACT test scores
- However, they have two main concerns that should be investigated:

1. They suspect that participation rates have an inverse relationship with test scores. They fear that increasing participation rates will reduce test scores
2. They think that increasing the state's education budget will lead to an improvement in test scores as schools can better focus on these tests

Methodology

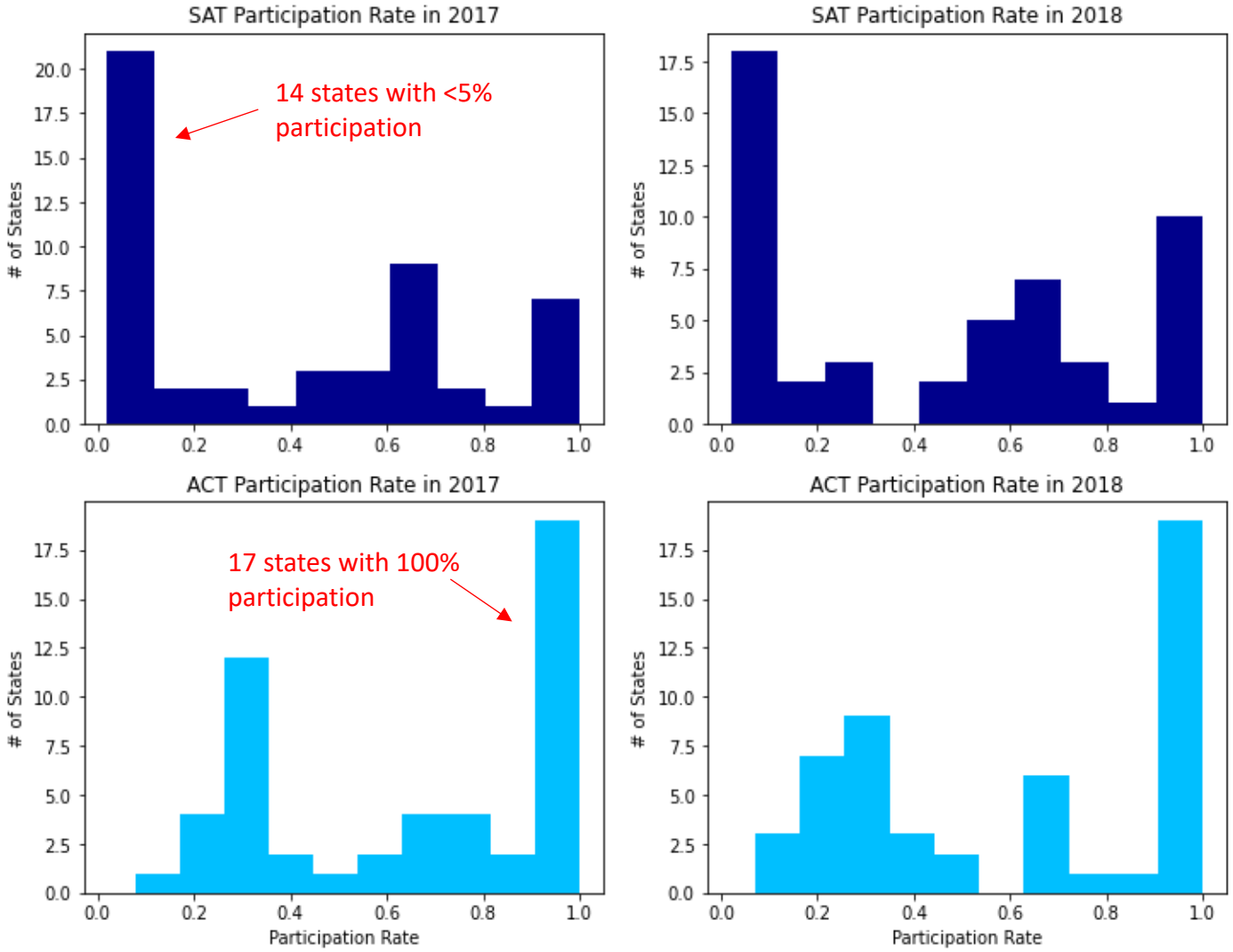
1. **Import data:**

   SAT and ACT participation rates (%) and scores in 2017 and 2018, elementary and secondary school budget per capita (USD)

2. **Data cleaning and Exploratory Data Analysis (EDA)**

3. **Visualisation:**
   - Participation rates vs SAT/ACT test scores
   - Δ participation rates vs Δ SAT/ACT test scores
   - Budget per capita vs SAT/ACT test scores
   - Δ budget per capita vs Δ SAT/ACT test scores

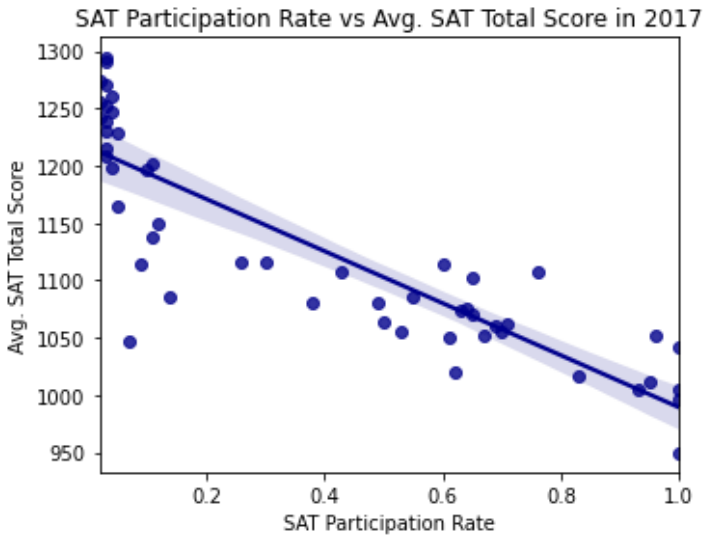
Distribution of Participation Rates

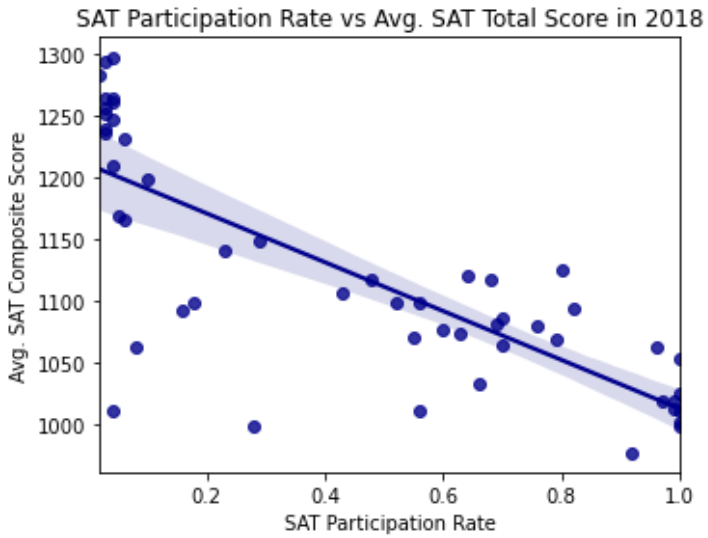


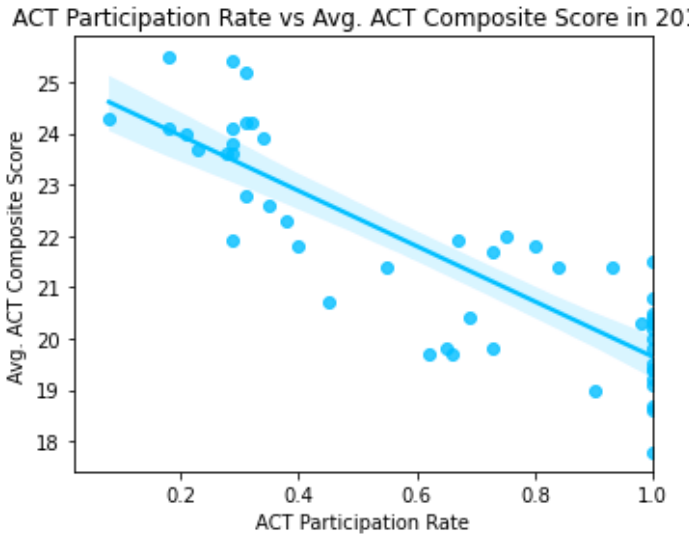
- To start our analysis on participation rates, we first looked at the distribution of participation rates for both tests
- Concentration at both ends – students either take SAT or ACT.
- Various factors: 1) one test more widely accepted than the other, 2) mandatory state policy to take a particular test
- Highest maximum participation rate for ACT (17 states @ 100%) is significantly larger than highest maximum participation rate for SAT (4 states at 100%)

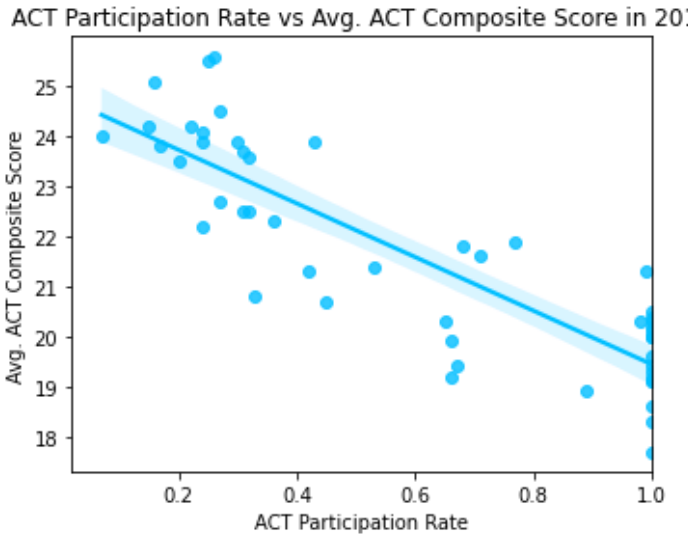
Participation Rate vs Scores

- Inverse relationship observed for both tests, and in both 2017 and 2018 data
- The higher the participation rate, the lower the test score



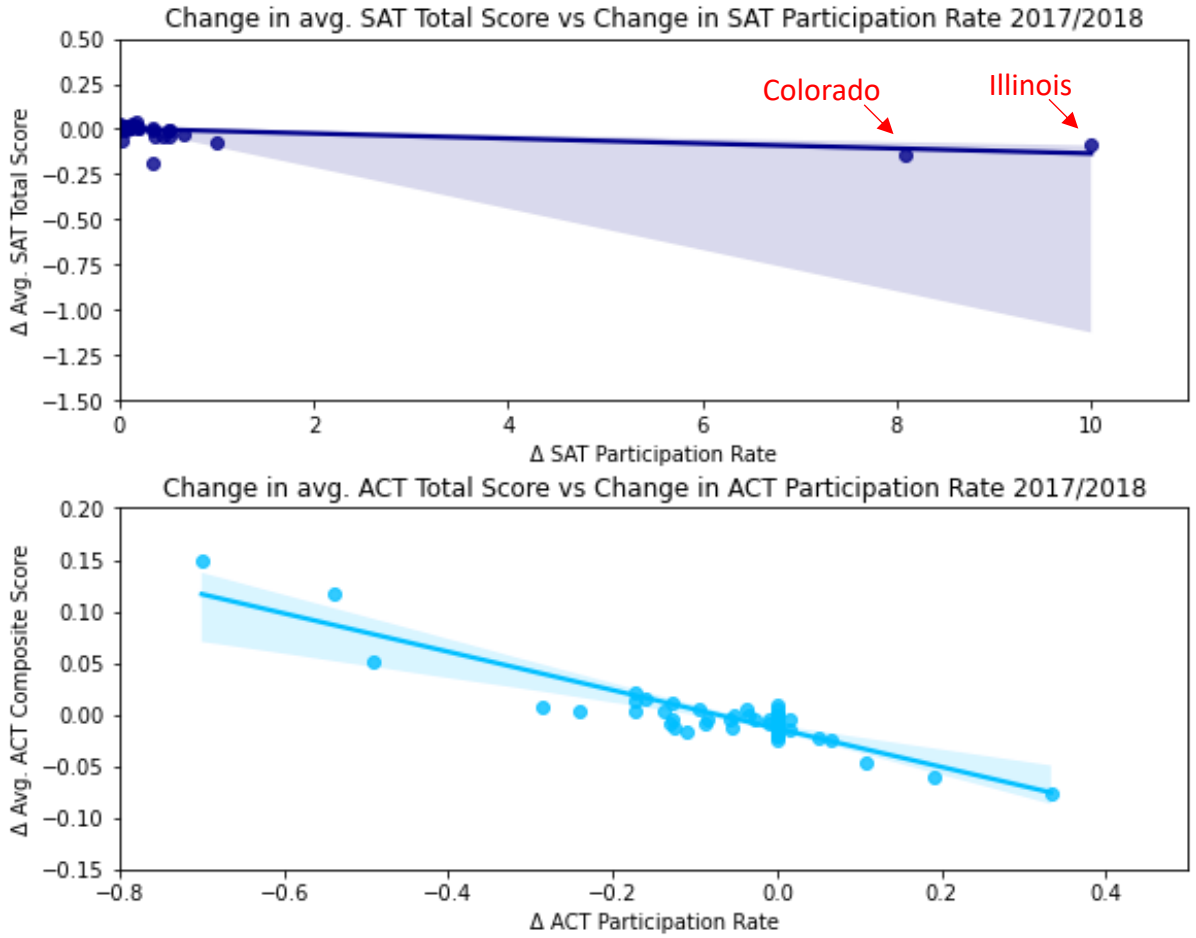






Change in Participation Rate vs Scores

- In our 1st problem, the education board is concerned that if more students take a particular test (e.g. via mandatory testing policy), the state's mean test scores will fall – **this could be true.**
- When plotting the change in participation rates against the change in scores, the negative correlation is still observed
- Interestingly, there are two major outliers in our SAT data – Illinois and Colorado (we will investigate them further in the next section)



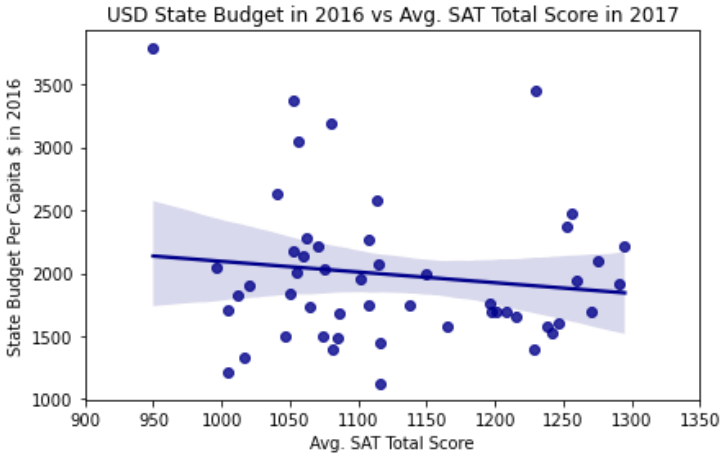
Colorado / Illinois – should we follow?

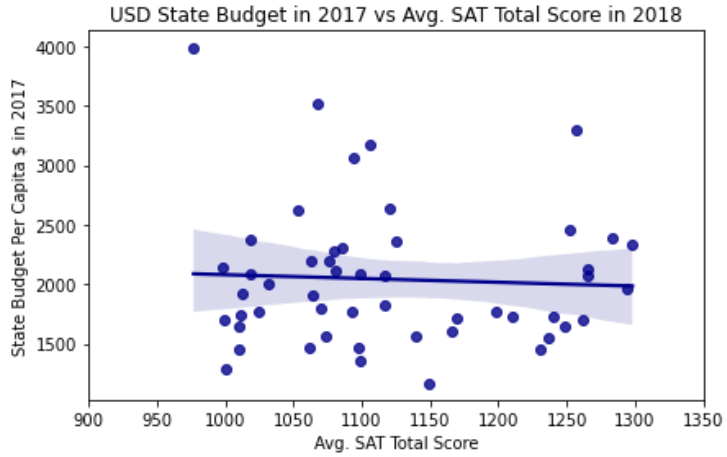
	State	Δ SAT Participation 17/18	Δ SAT Total Score 17/18
5	Colorado	8.091	-0.147
13	Illinois	10.000	-0.086

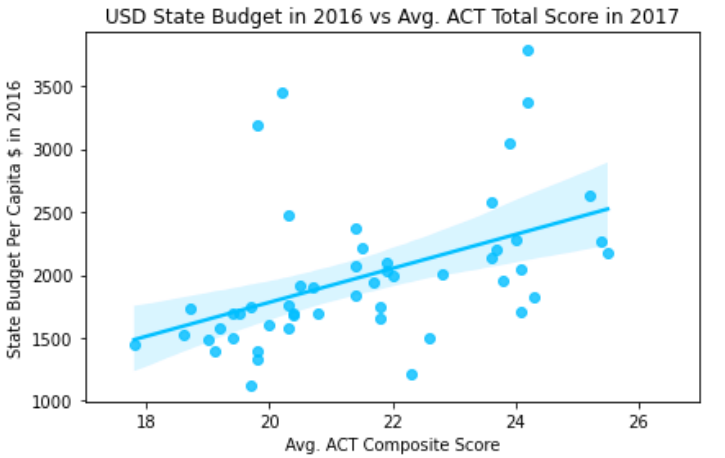
- Both states have large spikes in participation rates (8x and 10x) – due to mandatory state policy to take SAT from 2016
- However, the spikes were met with significant drops in SAT Total scores (15% and 9%) – these are way above the mean of 0.4% nationwide
- Research have suggested that once tests are made mandatory/encouraged, test results tend to be lower because students need to prepare for a new test format or it could just be driven by the fact that academically weaker students are now ‘forced’ to take these tests
- Before we can provide a definitive answer, recommendation to look if this decline in test score is persistent – will help us tailor better policies (should we help schools better coach students once participation rates increase?)

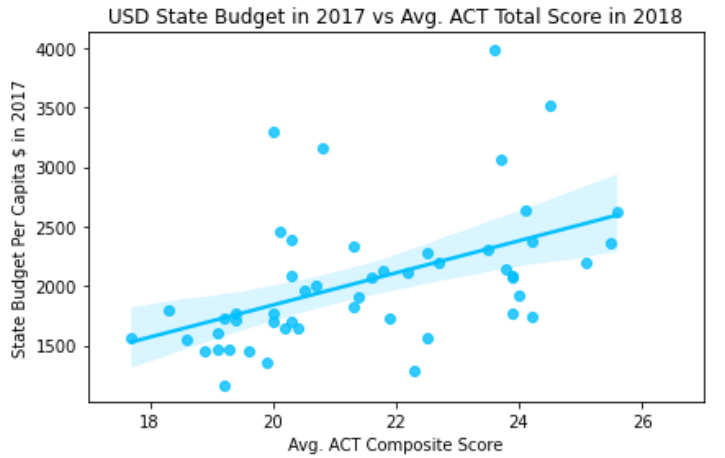
Budget – Larger the better?

- SAT: No obvious correlation between budget in previous year vs test score in the next
- However, ACT: some observable positive correlation – states with higher budget and have higher score



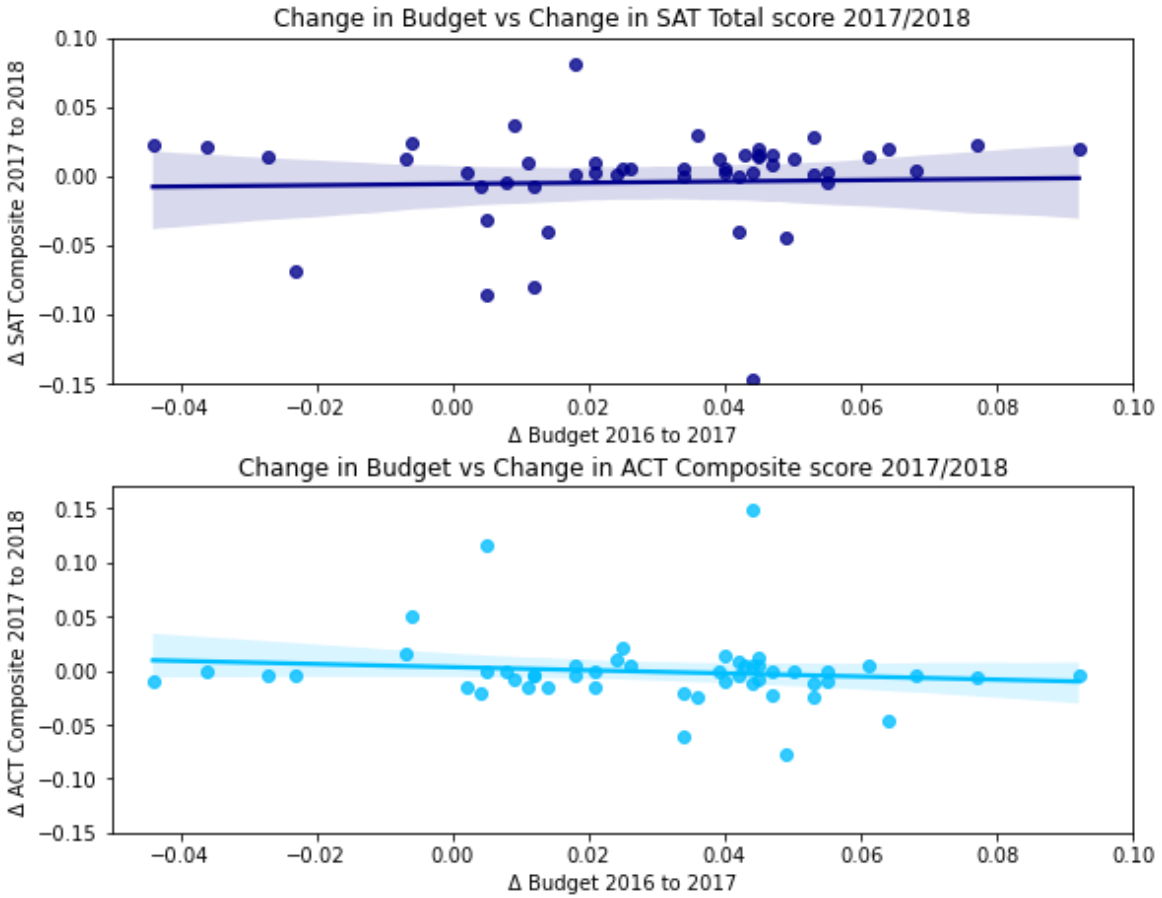






Change in Budget vs Scores

- No obvious correlation when plotting against the change in budget vs change in test scores
- Possible explanations:
  - Better schools tend to be in rich state. Better schools tend to have better performing students – they would score well in these tests anyway regardless of funding changes
  - Other social and economic factors could play a part, not just better funding.
- Therefore, in addressing our 2nd problem, we **cannot definitively conclude that increasing the budget will improve test scores** (even though we see higher ACT scores in states with larger budgets)



Conclusion

1. Increasing participation rate – proceed with caution! Will likely lead to lower test scores with an increase in participation rate
2. No clear answer that increasing state budget will improve test scores. Longer periods of data and consideration of other variables will be needed