
DSIF Group 2

Project 1 Presentation

10 July 2021

Problem Statement

To present recommendations to the US Department of Education on how they should focus their effort & resources to improve overall SAT and ACT participation rates and scores. This is based on studying:

- Different States
- Races
- College Majors
- Income Background
- School Subsidies

External Data Sources Used

- US map geometry: US Census Bureau Cartography Data 2018
- State policy on administering / offering SAT and ACT: PrepScholar
- Fee waiver / school subsidies: Collegeboard & ACT.org
- College data: The Condition of College & Career Readiness 2019 for ACT
- Races: Collegeboard
- Segmentation of states into multiple region: US Census Bureau 2010
- Median Household Income :
 - <https://www.census.gov/topics/income-poverty.html>
 - <https://worldpopulationreview.com/state-rankings/average-income-by-state>
 - <https://www.census.gov/library/visualizations/interactive/2019-median-household-income.html>

Methodologies



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graph LR; A[Data Gathering & Cleaning] --> B[Exploratory Data Analysis & Statistical Analysis]; B --> C[Visualization & Recommendation];
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Data Gathering & Cleaning

Exploratory Data Analysis &
Statistical Analysis

Visualization &
Recommendation

Assumptions

- Data analysis is **focused on 51 US states**: 50 US states + 1 federal state (“District of Columbia”). The 5 inhabited US territories are excluded
- Supporting data is studied in conjunction with SAT , ACT **data in year 2019**.
- “Participation rates” in the SAT and ACT file refer to the % over all of the students who are eligible to take the exam for that year in that state

Recommendations

01

What?

Support state-level effort towards administering tests to students

Where?

Iowa, Kansas and South Dakota

Target Result

To increase combined (SAT & ACT) test participation from <80% to 100%

02

What?

Provide financial aid to household aiming to take ACT

Where?

Mississippi , Arkansas , Louisiana , Alabama, Kentucky , Oklahoma

Target Result

To increase their ACT mean score towards the 25% by 2021

03

What?

Fee waiver and state grant

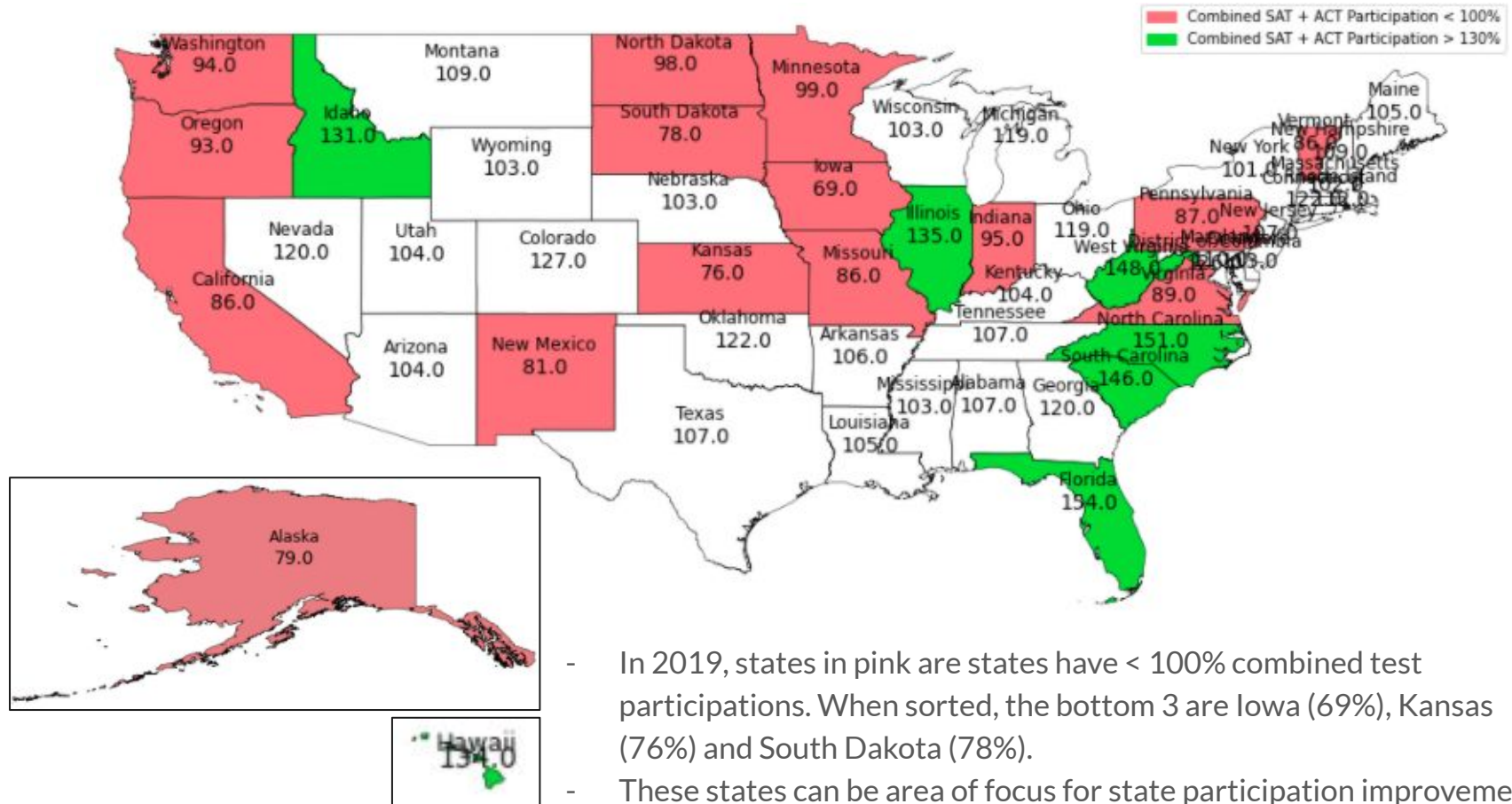
Where?

Iowa , Kansas

Target Result

To increase their SAT Participation from <5% to min. 30%

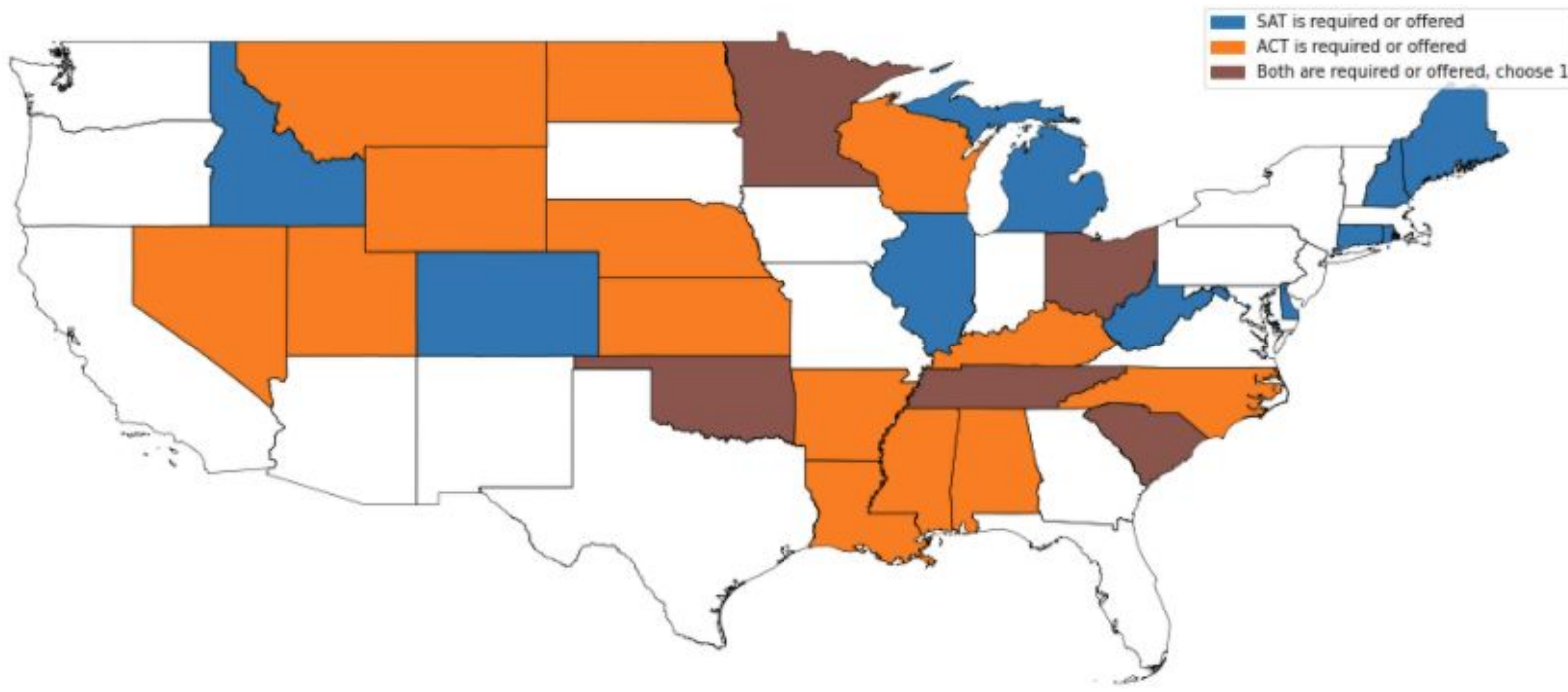
US States with Combined SAT + ACT Participations < 100%



- In 2019, states in pink are states have < 100% combined test participations. When sorted, the bottom 3 are Iowa (69%), Kansas (76%) and South Dakota (78%).
- These states can be area of focus for state participation improvement

2 states (Hawaii and Alaska) aren't displayed correctly in this picture, for readability purposes

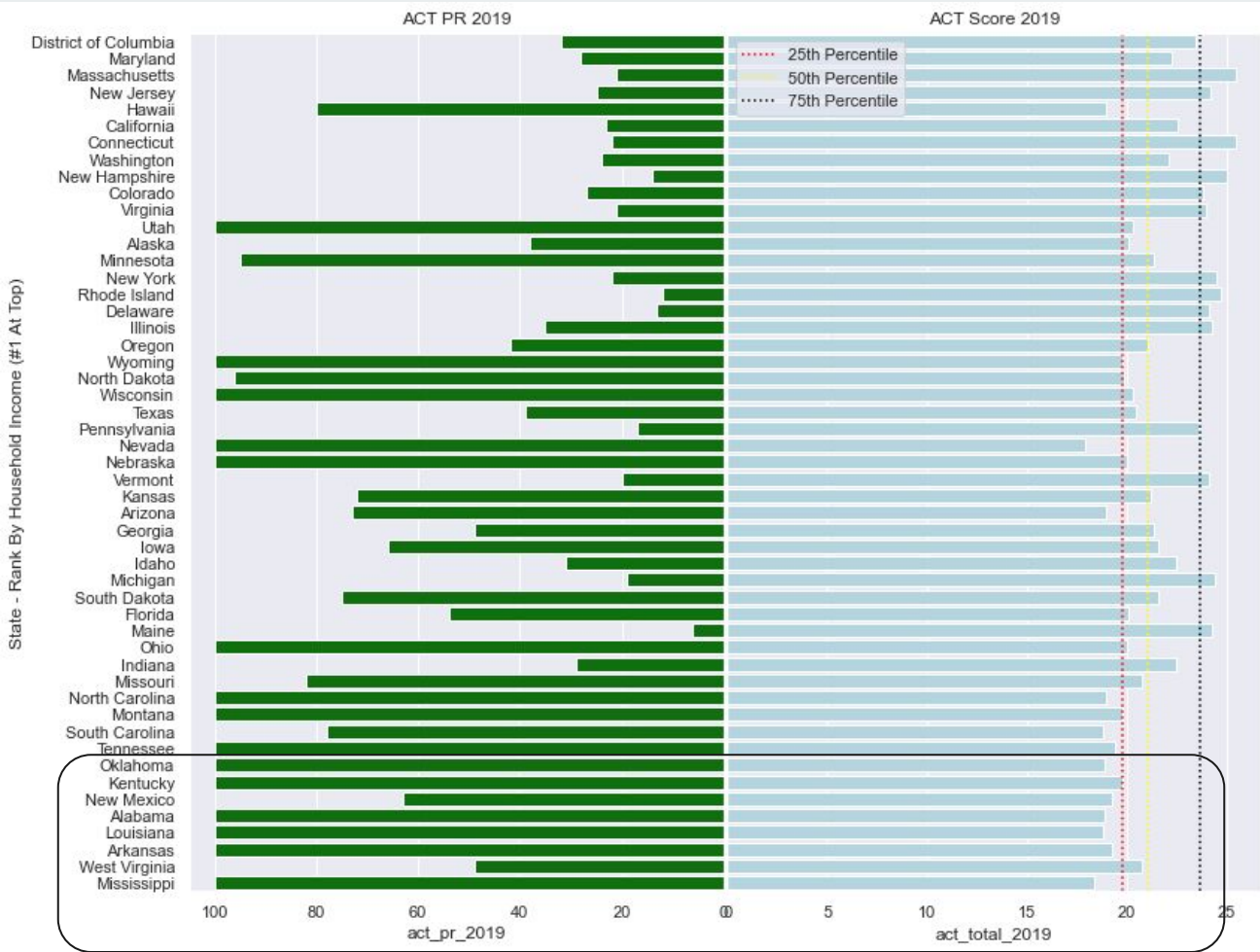
US States with “State-Administered” Policy



- Some states have policy where they will administer (requiring students to undertake) / offer SAT and ACT test. This test is usually free and covered-for in the first attempt
- Compared to the previous slide, this policy seems to be effective in ensuring students' participation in SAT / ACT

2 states (Hawaii and Alaska) aren't displayed in this picture, for readability purposes

Key Insight for HouseHold Income



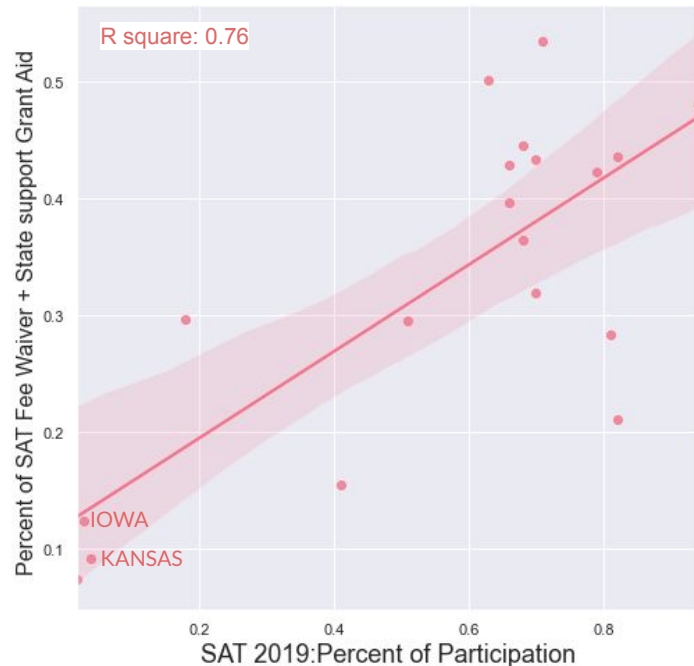
Why aid for ACT for Mississippi , Arkansas , Louisiana , Alabama, Kentucky , Oklahoma?

- They have lowest household median income
- High Participation Rate but low score

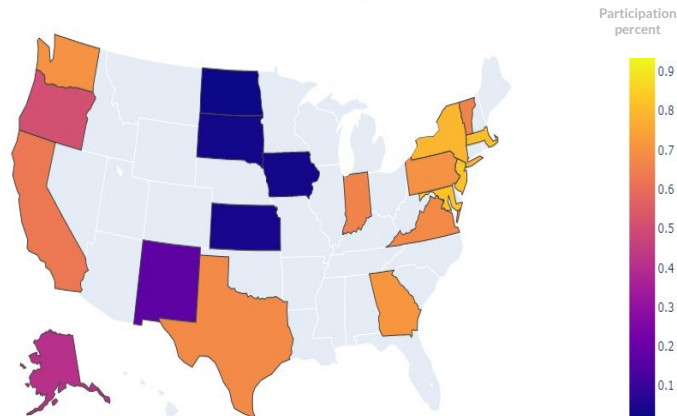
* Ranked from Wealthiest from the top

Key Insight for Financial Grants

Percent of SAT 2019 Participation vs Percent of SAT Fee Waiver used + State support Grant Aid for Undergrad



SAT 2019 Participation Percent for States - Excluding mandatory/free SAT or ACT states



Analysed the states that have less than 100% participation for ACT/SAT

- ❑ SAT Participation percent shows Good correlation to SAT Fee Waiver used+State support Grant Aid for Undergrad
- ❑ Recommend to focus on Fee waiver/Grant Aid support for low participating states **IOWA & KANSAS**

Recommendations

01

What?

Support state-level effort towards administering tests to students

Where?

Iowa, Kansas and South Dakota

Target Result

To increase combined (SAT & ACT) test participation from <80% to 100%

02

What?

Provide financial aid to household aiming to take ACT

Where?

Mississippi , Arkansas , Louisiana , Alabama, Kentucky , Oklahoma

Target Result

To increase their ACT mean score towards the 25% by 2021

03

What?

Fee waiver and state grant

Where?

Iowa , Kansas

Target Result

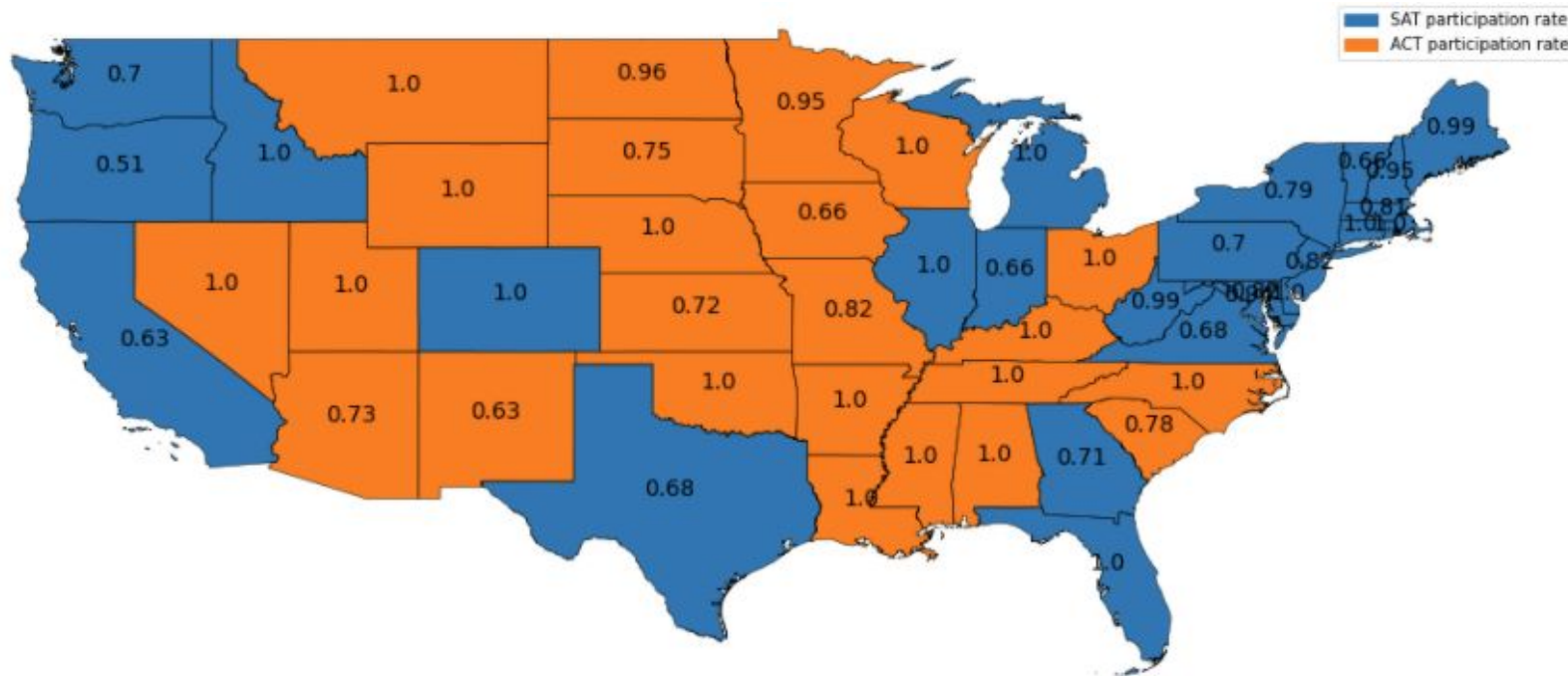
To increase their SAT Participation from <5% to min. 30%

Question & Answer Session

Appendix

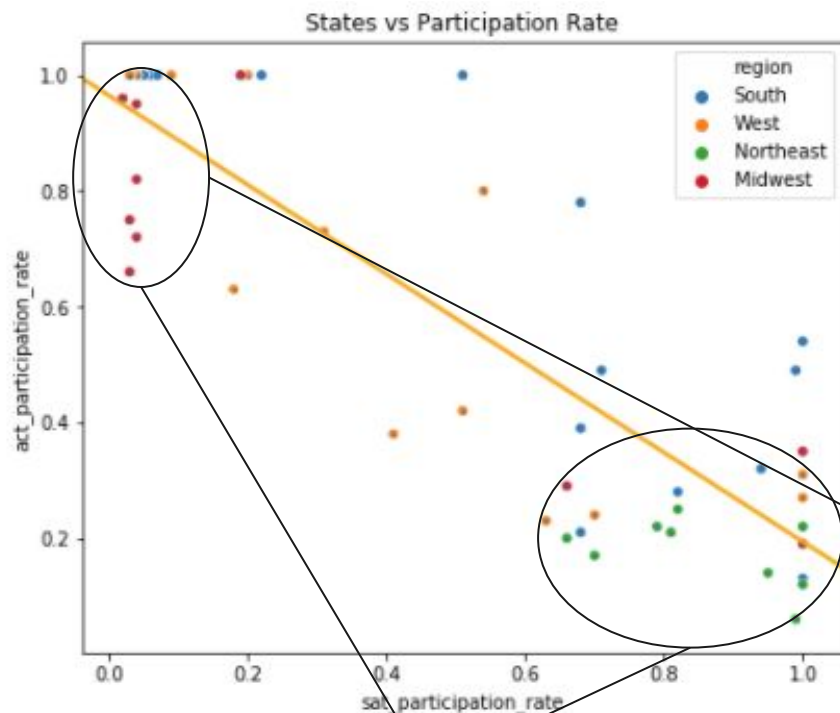
Appendix A - Additional Slides For States Study

US States & Their More Popular Test

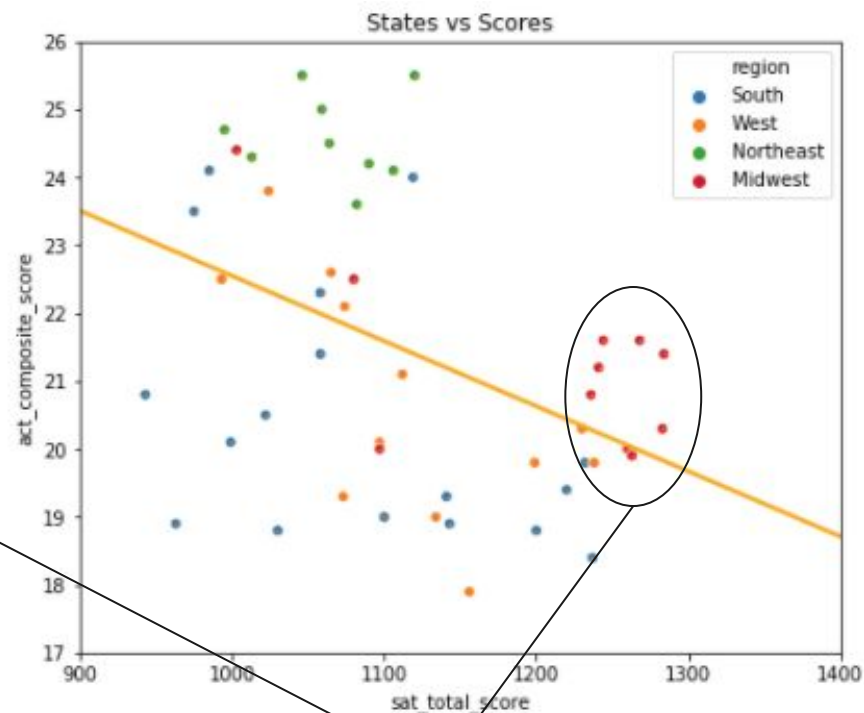


- In 2019, there are 8 states with 100% SAT participations and 15 states with 100% ACT participations
- There is roughly an equal distribution of states where ACT or SAT is the more dominant test. However, where SAT is more dominant, their number doesn't quite hit close to 100% participation

Inverse Correlation of Participation Rates and Scores

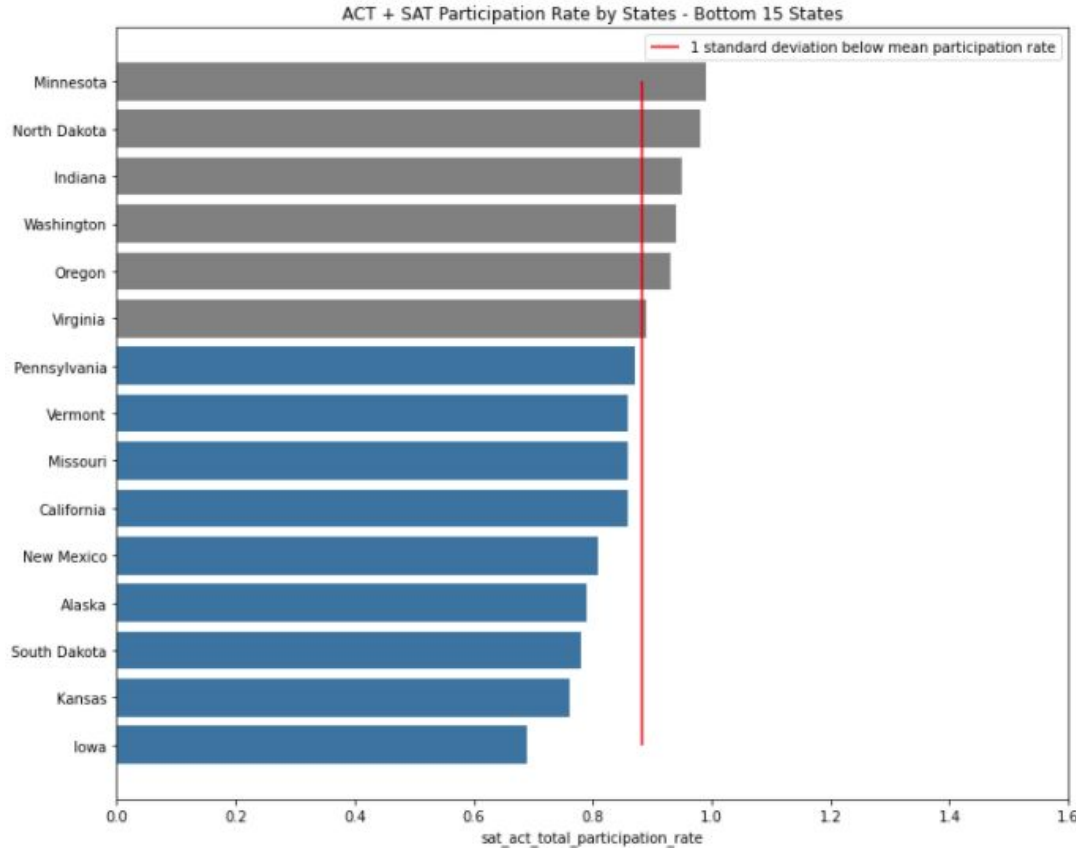


There is an inverse correlation between **ACT and SAT participation rate**, i.e. states cluster around the top-left and bottom-right corners



There is an inverse correlation between **participation rate and scores of the same test**, e.g. Midwest states who have high ACT participation rate scores much mid-low range of ACT (in bottom-right of the second graph)

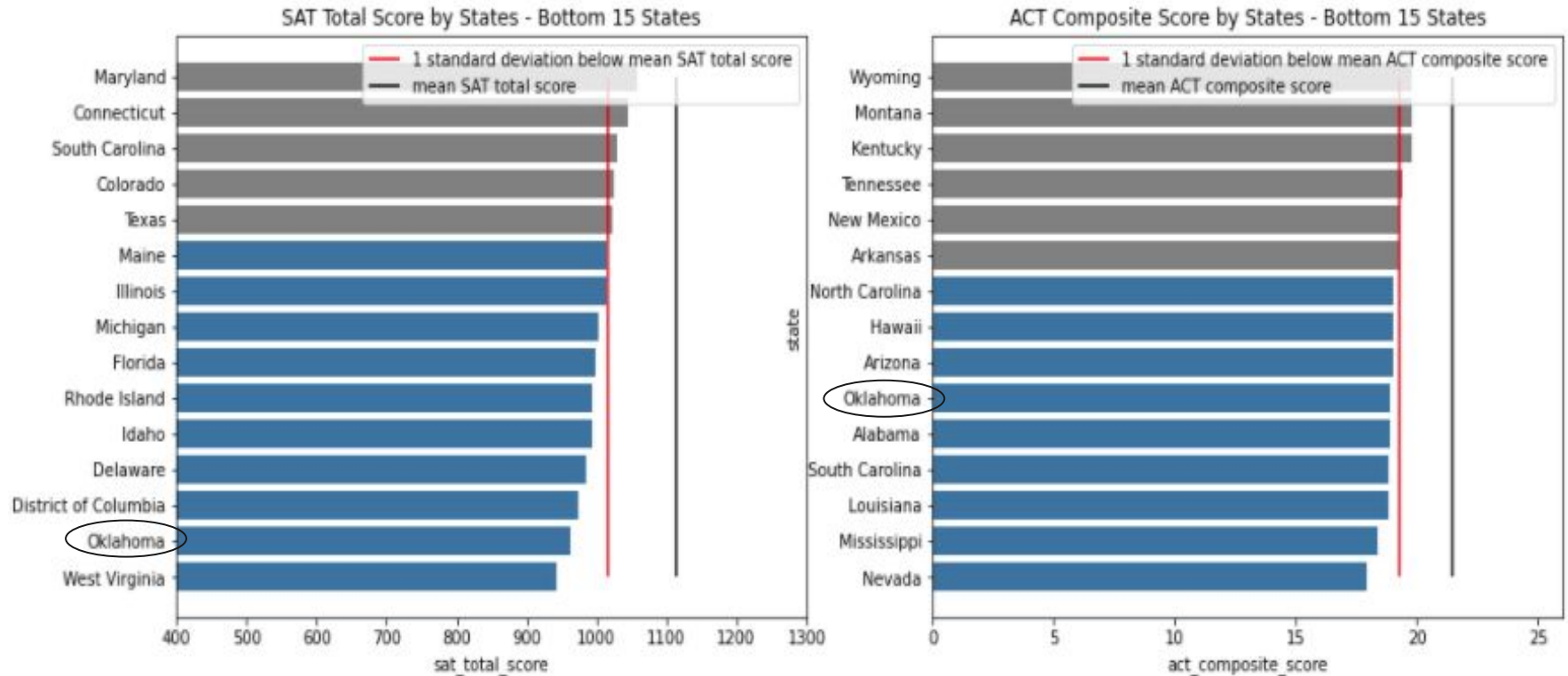
SAT + ACT Combined Participation Rates - Bottom 15 States



Each of the 9 states in blue have a combined SAT + ACT participation rates < 1 standard deviation below the average SAT + ACT combined participation rates.

What this means is that these states are lagging behind in terms of test participations

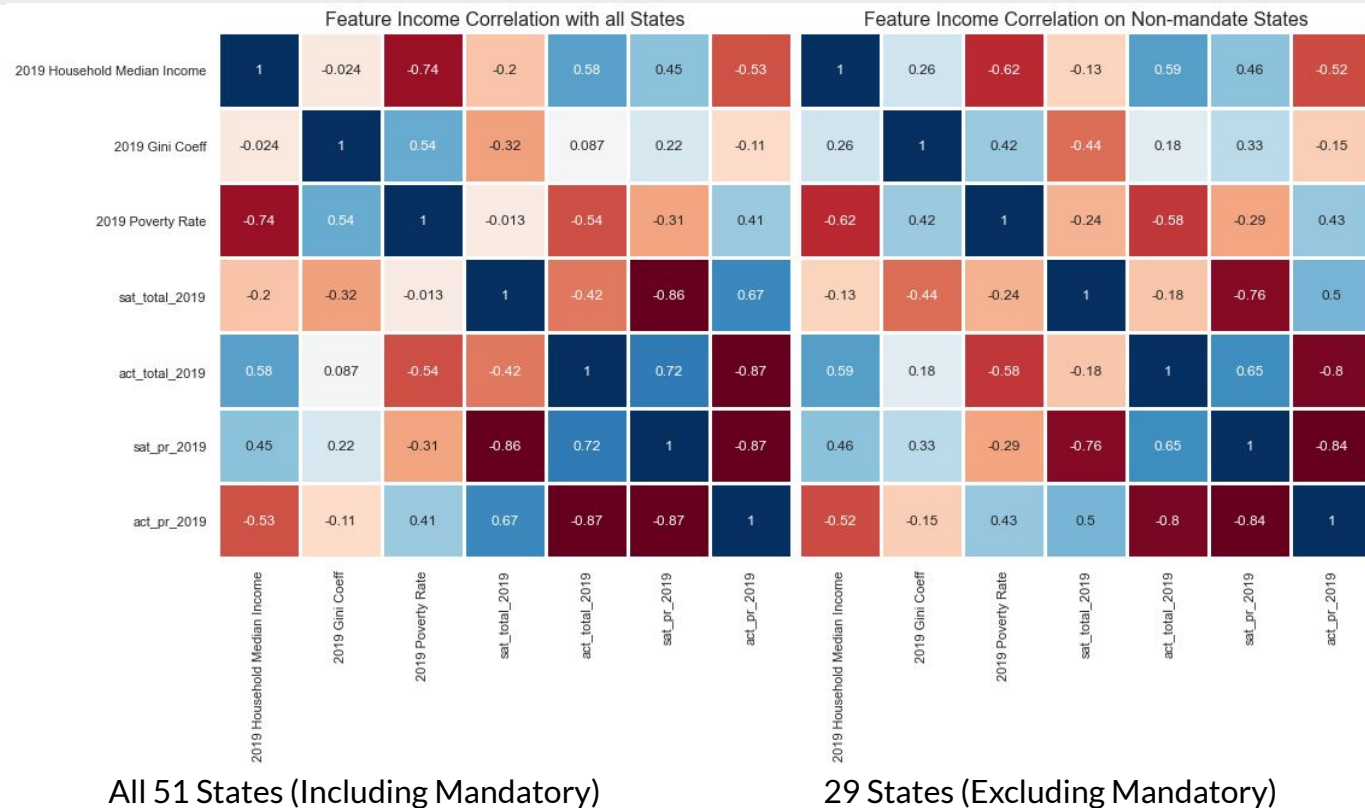
SAT Total Score / ACT Composite Score - Bottom 15 States



The state 'Oklahoma' is lagging behind the other states in terms of both ACT and SAT scores.

Appendix B - Additional Slides for Household Income, Poverty Rate and Gini Coeff

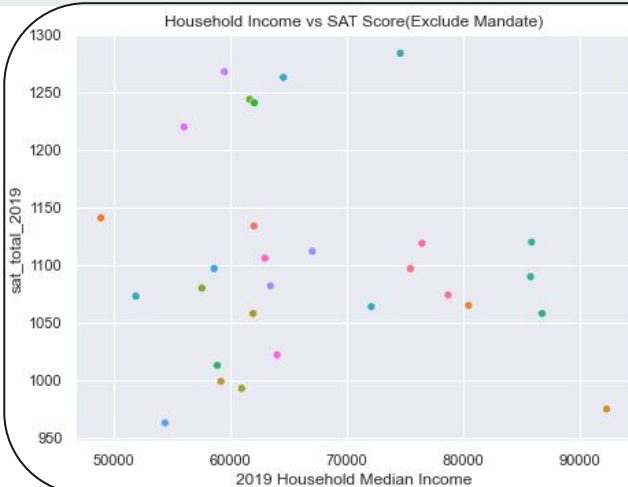
Income features - Correlation Study



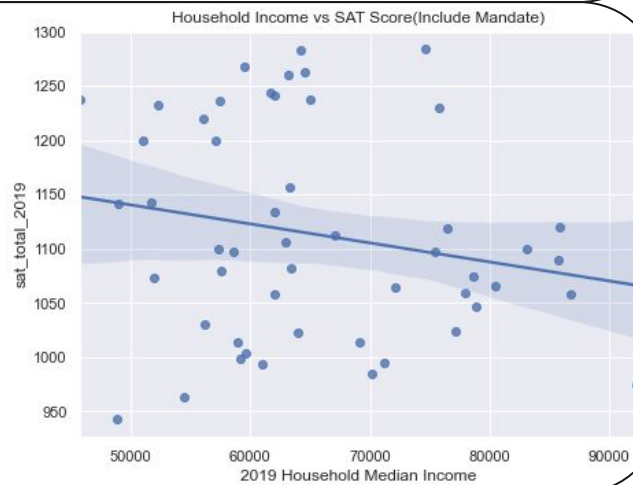
Key Insights:

- Poverty Rate & Household Income have Strong impact on ACT Score ~0.6 but not SAT
- Poverty Rate and Household income have relatively strong correlation with each other, therefore we will just take 1 of these 2 to further study

SAT Score 2019



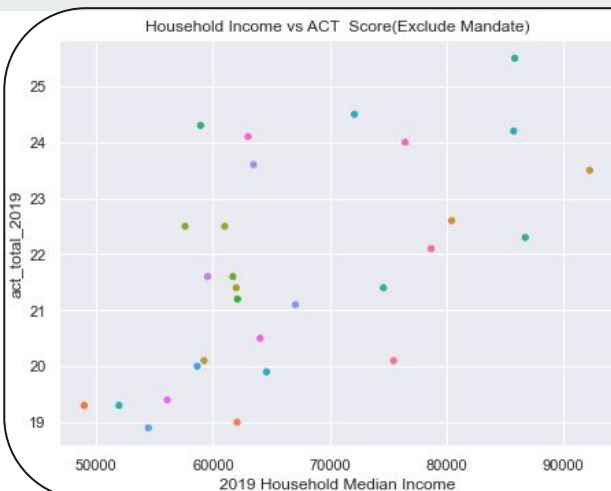
29 States (Excluding Mandatory)



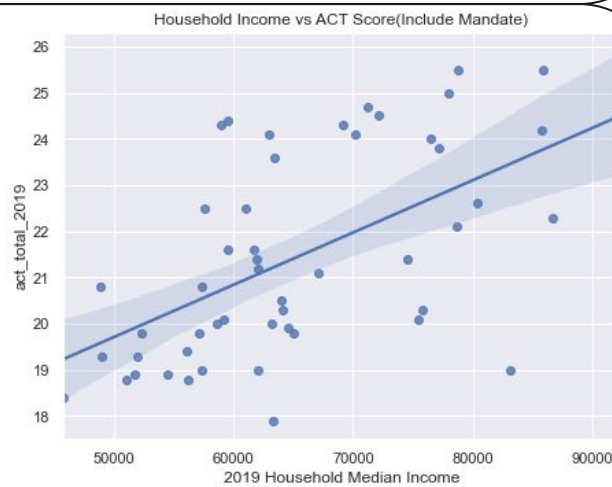
All 51 States (Including Mandatory)

Key Insights:
Lower Income Perform better in SAT
Household Income does not impact SAT Score

ACT Score 2019



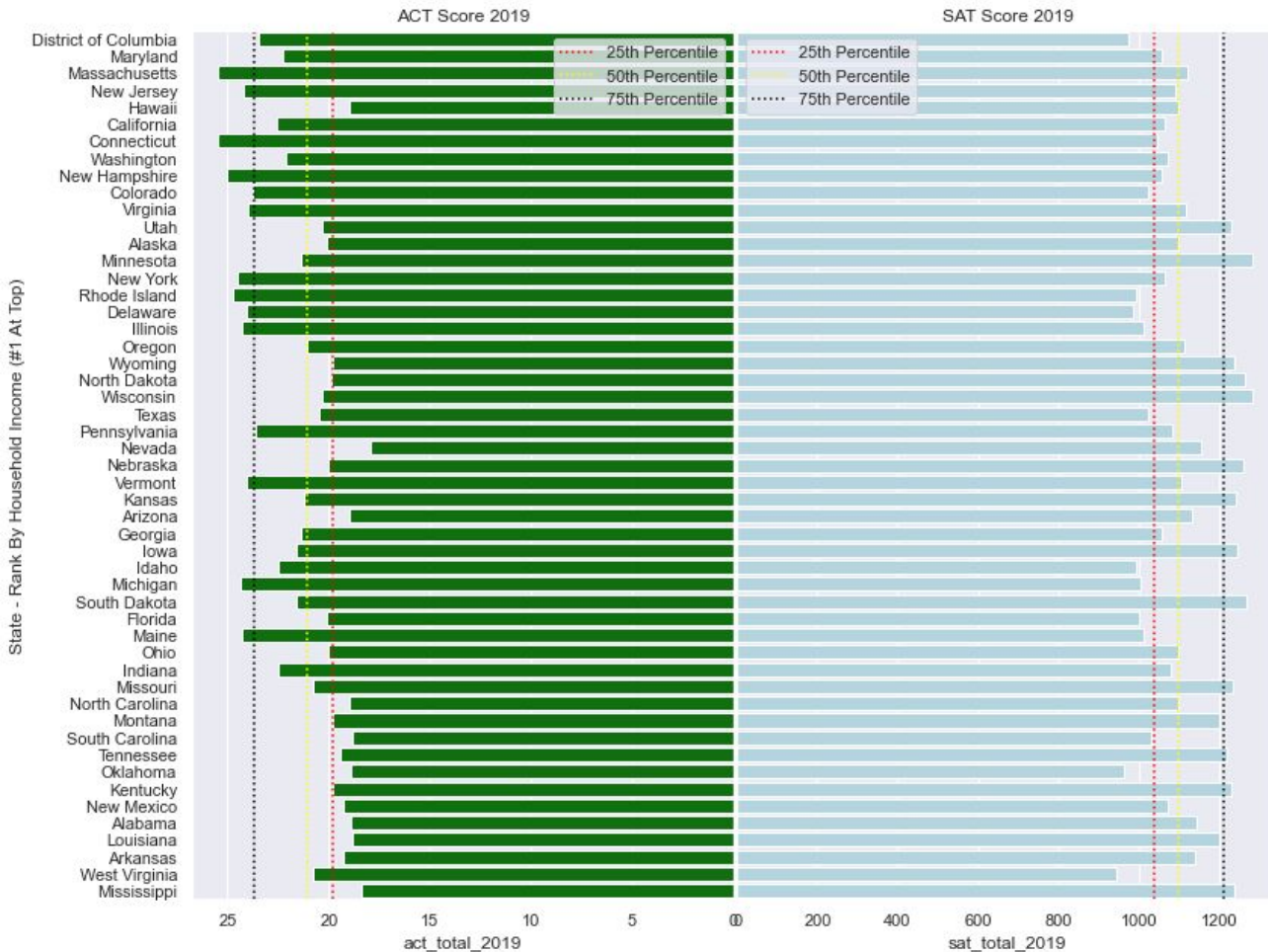
29 States (Excluding Mandatory)



All 51 States (Including Mandatory)

Key Insights:
Lower Income perform not so well
in ACT

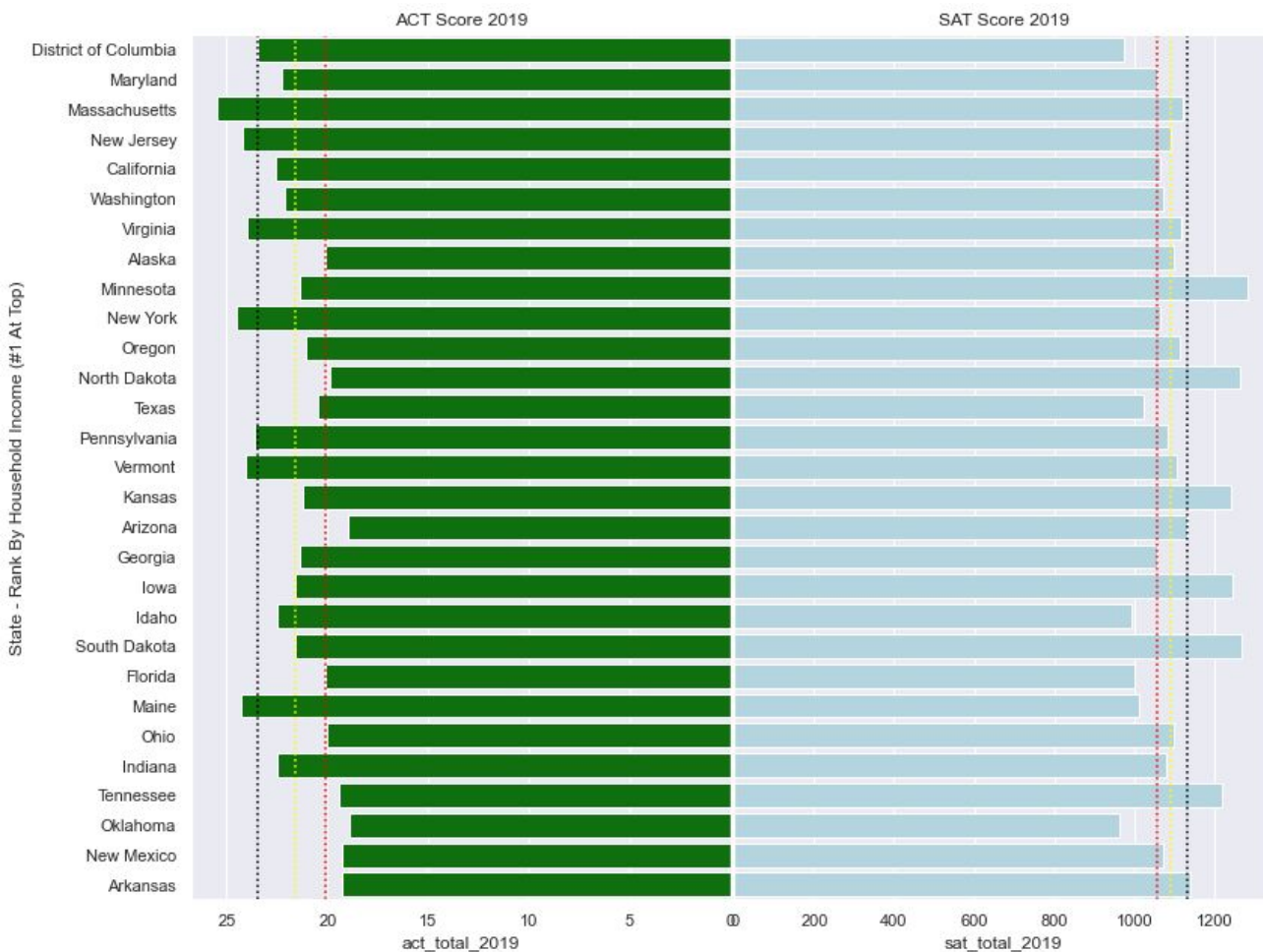
ACT vs SAT Score 2019 - All State



Key Insights:

- Lower Income perform not so well in ACT.
- Consider all State , based on the bottom 12 median income state, only **1 of 12** state score above the 25% for ACT while **9/12** state score above the 25% percentile for SAT.

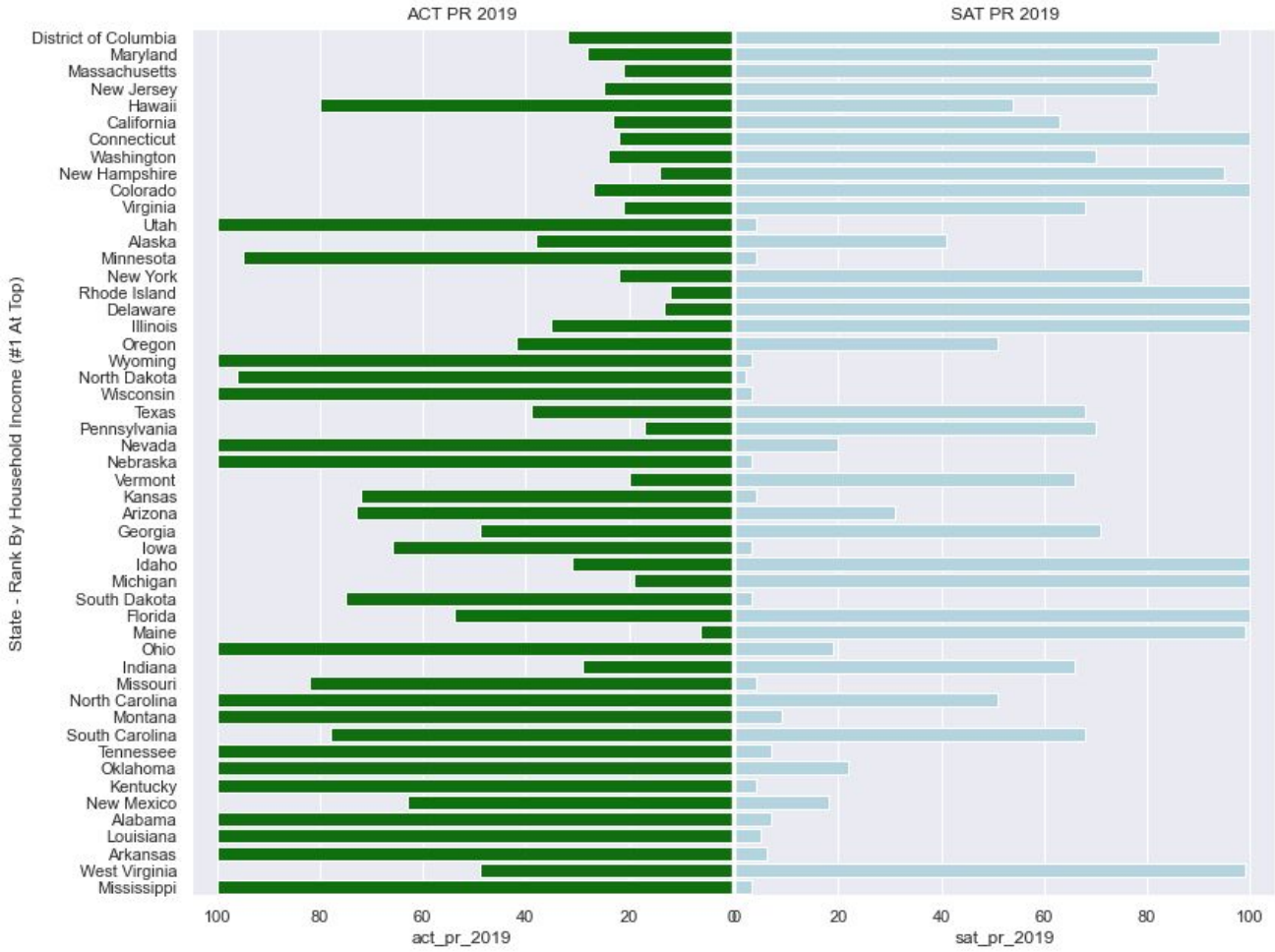
ACT vs SAT Score 2019 - Non -mandatory State



Key Insights:

- Lower Income perform not so well in ACT
- Consider only non-mandatory state, based on the bottom 5 median income state, only 1/5 state score above the 25% for ACT while 4/5 state score above the 25% percentile for SAT.

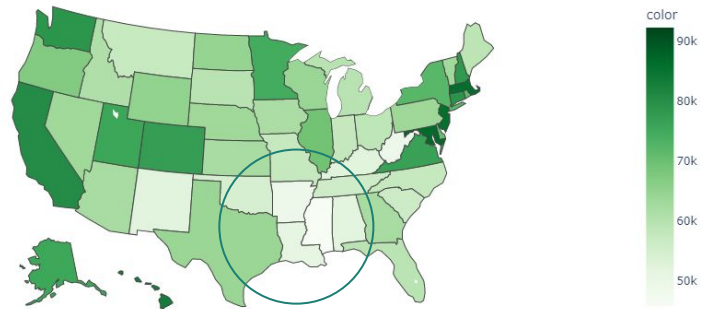
ACT vs SAT Participation Rate



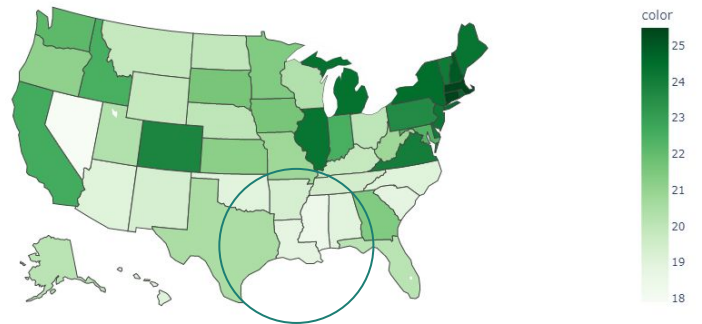
Key Insights:
State with lower median income generally take ACT

ACT Score vs ACT Participation Rate

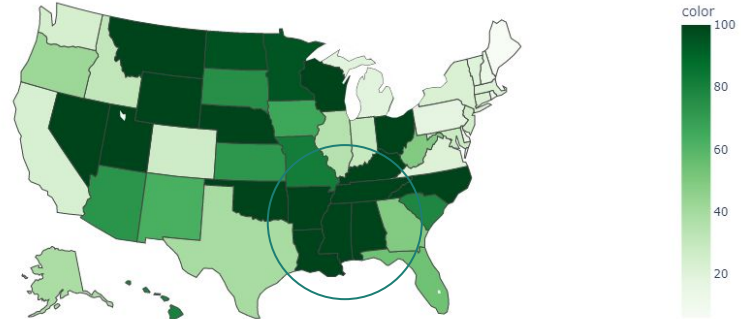
Median Household Income 2019



ACT Score 2019



ACT Participation Rate 2019

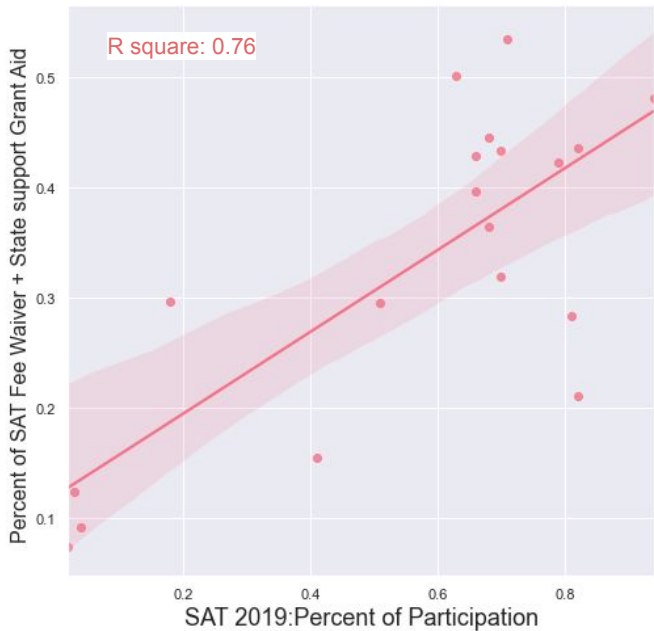


Appendix C - Additional Slides for Financial Grant

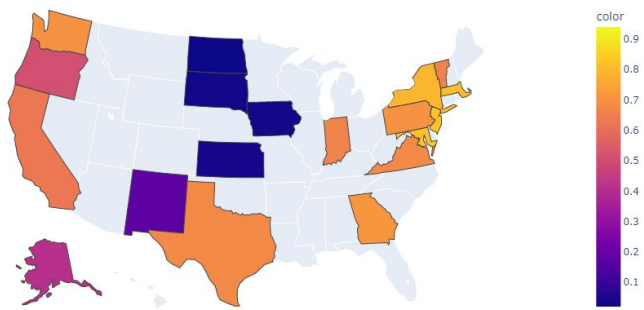
Financial Grants

Percentile	Participation_SAT_2019
0.25	0.055
0.50	0.540
0.75	0.820

Percent of SAT 2019 Participation vs Percent of SAT Fee Waiver used + State support Grant Aid for Undergrad



SAT 2019 Participation Percent for States - Excluding mandatory/free SAT or ACT states

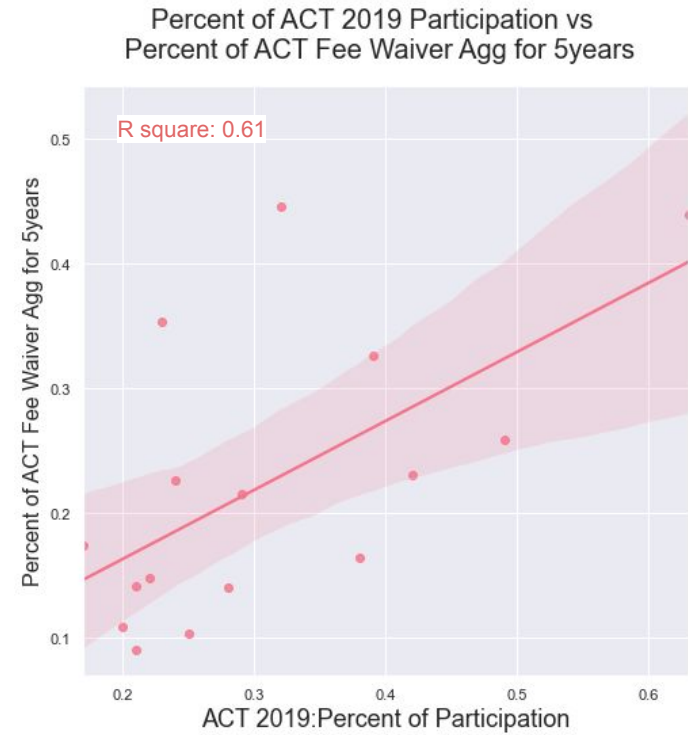


Analysed the states that have less than 100% participation for ACT/SAT

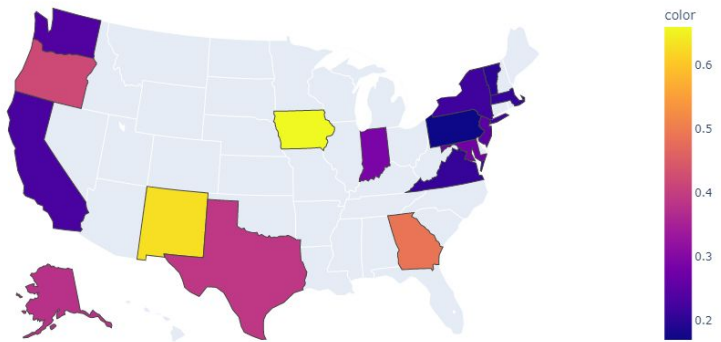
- ☐ SAT Participation percent shows Good correlation to SAT Fee Waiver percent + State support Grant Aid percent for Undergrad

Financial Grants

Participation_ACT_2019	
Percentile	
0.25	0.245
0.50	0.540
0.75	1.000



ACT 2019 Participation Percent for States - Excluding mandatory/free SAT or ACT states + 3 outlier states

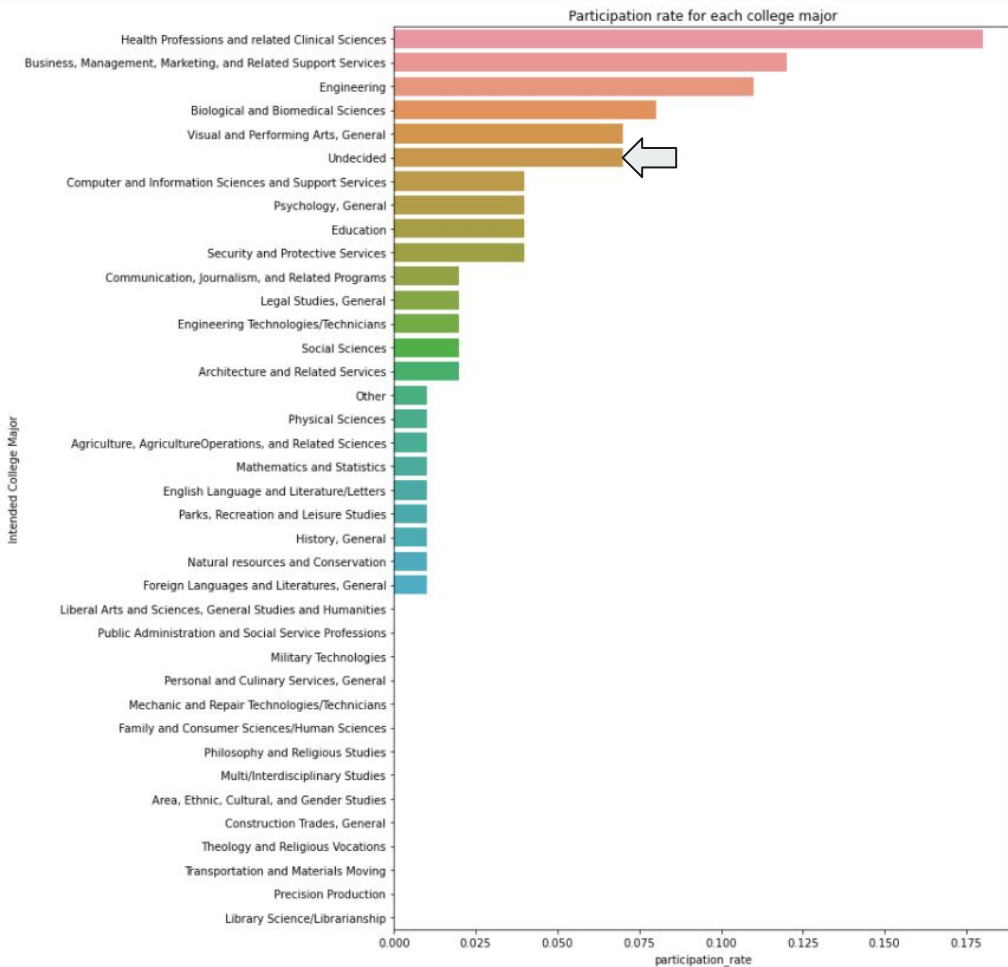


Analysed the states that have less than 100% participation for ACT/SAT excluding outlier states Kansas, Northdakota, Southdakota

❑ ACT Participation percent shows Good correlation to ACT Fee Waiver percent

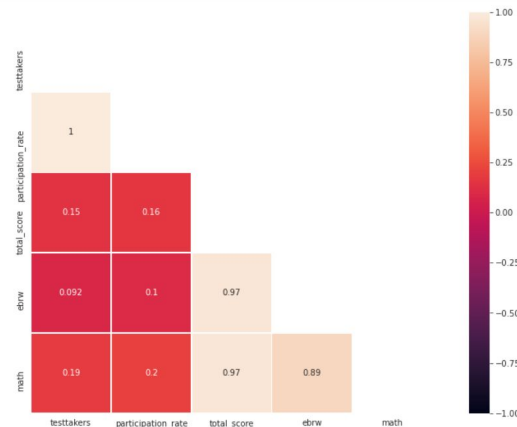
Appendix D - Additional Slides for College Major

SAT participation by College Majors

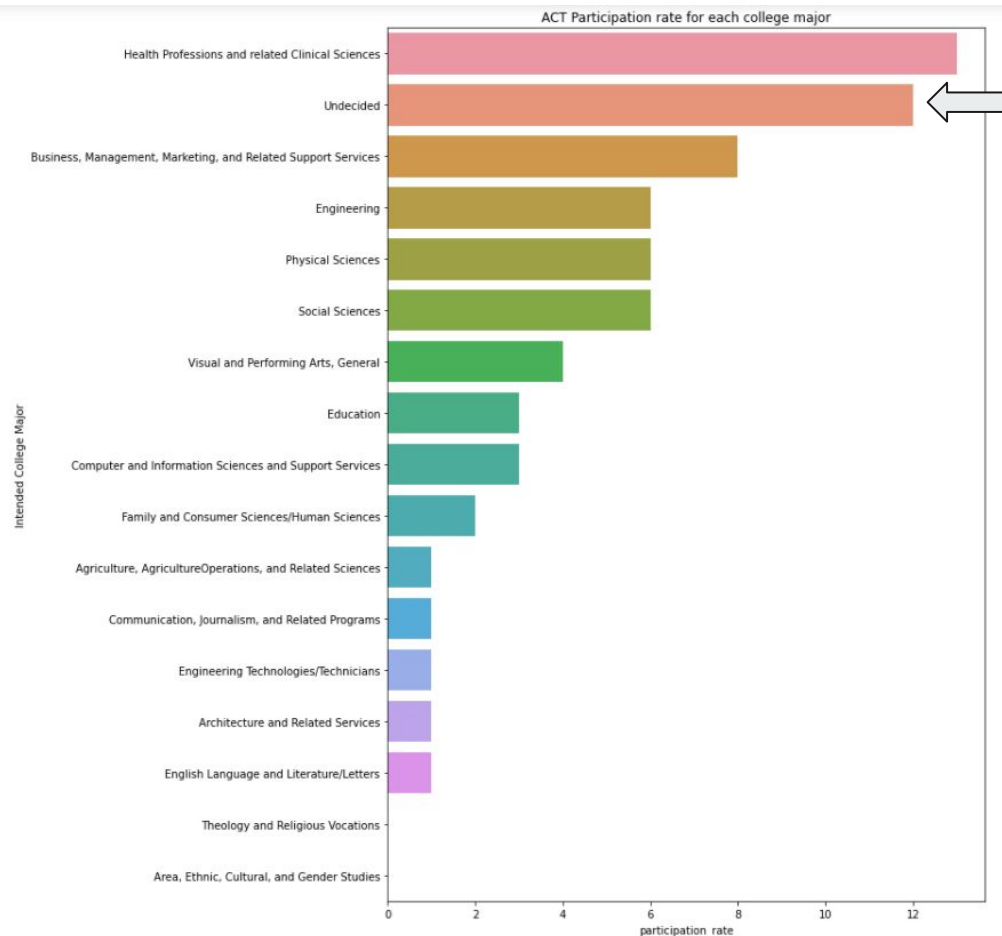


Key Insights

- Students who are Undecided ranked 6th in SAT.
- Health Professions, Business, Engineering ranked top 3



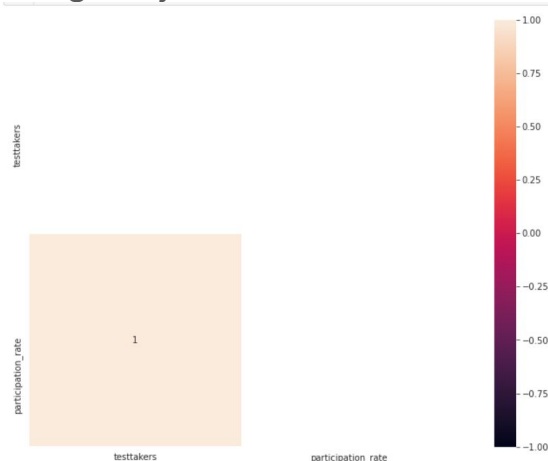
ACT Participation By Intended College Major



Key Insights

Students who are Undecided ranked 2nd for ACT

-Health Professions, Business and Engineering ranked top few based of ACT Participation by Intended College Major



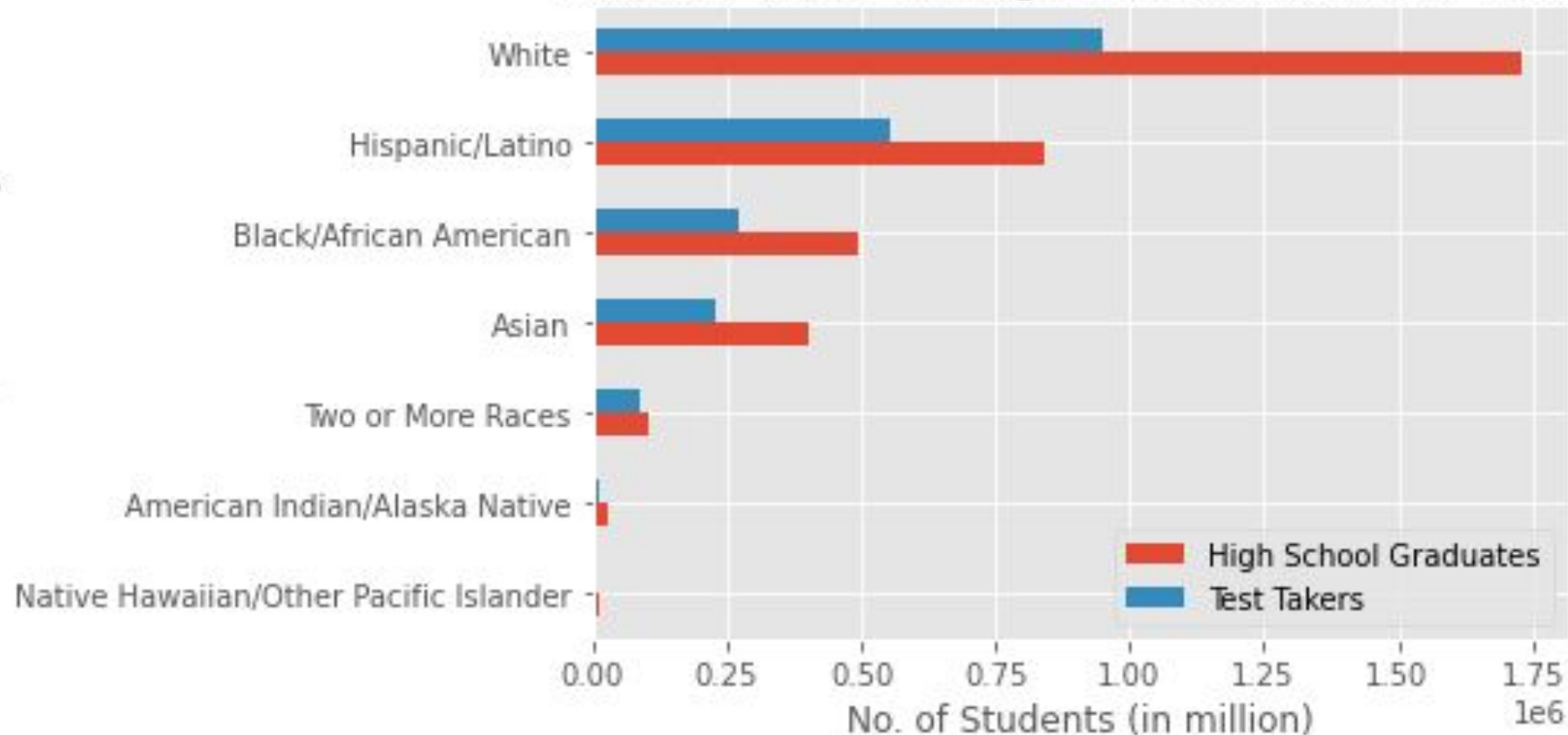
Recommendations based on college major

- To provide necessary support to students prior to taking the SAT/ACT test so that they are able to realise areas or fields that they are interested in or that they are excellent at

Appendix E - Additional Slides for Races

SAT Test Takers vs. High School Graduates - 2019

Race / Nationality



Parent's Highest Qualification - by State

