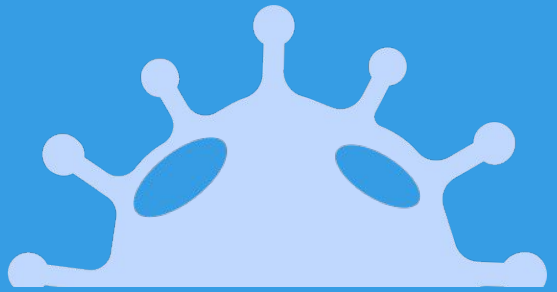

COVID-19's Impact on SAT

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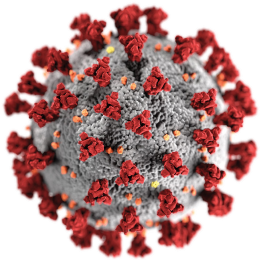
14 Sep 2022

Problem Statement

Standardised test scores (SAT) are used as a benchmark for college admissions in the USA, where high school students are required to partake in a 3-hour examination based on various knowledge. However, due to the emergence of COVID-19 in early 2020, many restrictions were imposed to restrict the spread of the virus.

This project aims to study the participation rates of SAT from 2018 to 2021 and identify if there was an impact on SAT participation rates due to COVID-19.



Datasets Used

- 2018 SAT Scores by State (provided)
- 2019 SAT Scores by State (provided)
- 2020 SAT Scores by State (additional)
- 2021 SAT Scores by State (additional)
- Absolute SAT Participation Rate 2019 - 2021 (additional)
- COVID-19 Total Cases & Death by State Over Time (additional)


Exploratory Data Analysis

Summary of Participation Rates and COVID-19 Cases

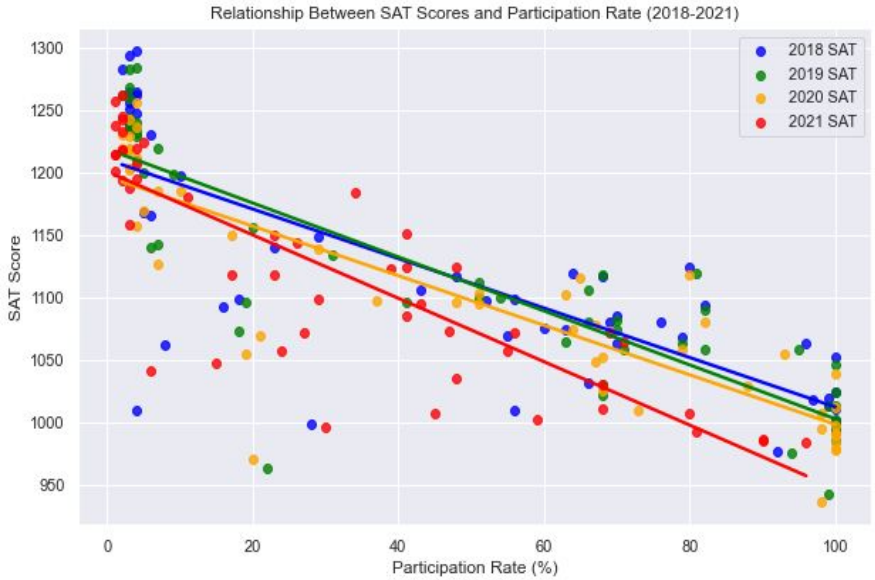
Year	Highest Participation Rates	Lowest Participation Rates
2018	1. Connecticut 2. Colorado 3. Michigan 4. Idaho 5. Delaware *(All 100%)*	1. North Dakota - *2%* 2. Mississippi - *3%* 3. South Dakota - *3%* 4. Nebraska - *3%* 5. Wyoming - *3%* (Iowa, Wisconsin - *3%*)
2019	1. Connecticut 2. Colorado 3. Illinois 4. Michigan 5. Florida (Rhode Island, Idaho, Delaware) *(All 100%)*	1. North Dakota - *2%* 2. Mississippi - *3%* 3. Wyoming - *3%* 4. Iowa - *3%* 5. Nebraska - *3%* (South Dakota, Wisconsin - *3%*)
2020	1. Connecticut 2. Colorado 3. Michigan 4. Florida 5. Rhode Island (Idaho, District of Columnbia, Delaware) *(All 100%)*	1. Wyoming - *2%* 2. North Dakota - *2%* 3. Mississippi - *3%* 4. Utah - *3%* 5. South Dakota - *3%* (Iowa, Nebraska, Wisconsin - *3%*)
2021	1. Delaware - *96%* 2. District of Columbia - *90%* 3. Idaho - *90%* 4. Florida - *81%* 5. Illinois - *80%*	1. Mississippi - *1%* 2. South Dakota - *1%* 3. Wisconsin - *1%* 4. Utah - *1%* 5. North Dakota - *1%*

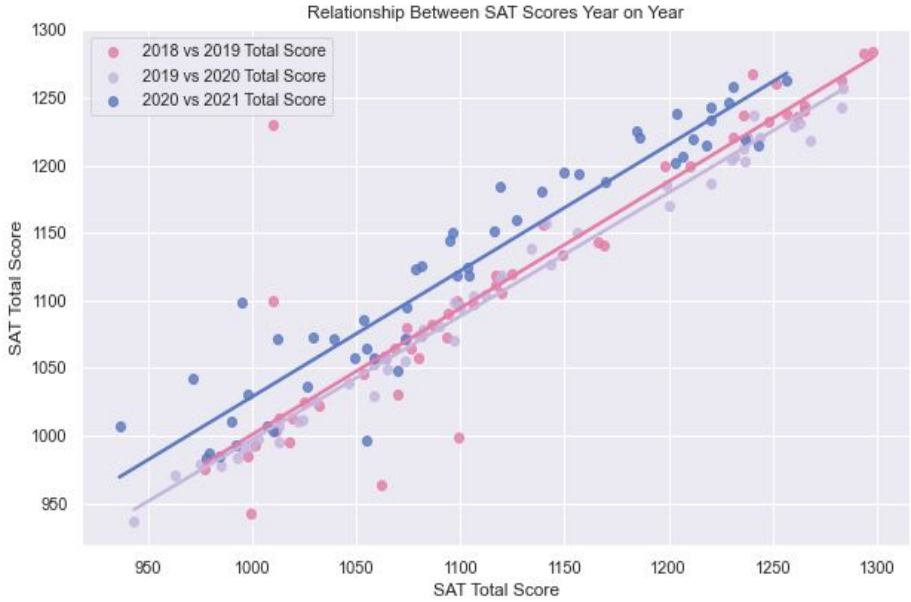
Year	Highest Covid Cases	Lowest Covid Cases	Highest Covid Deaths	Lowest Covid Deaths
2020	1. California 2. Texas 3. Florida 4. Illinois 5. Ohio	1. Vermont 2. Hawaii 3. Maine 4. District of Columbia 5. New Hampshire	1. Texas 2. California 3. Florida 4. New Jersey 5. Illinois	1. Vermont 2. Alaska 3. Hawaii 4. Maine 5. Wyoming
2021	1. California 2. Texas 3. Florida 4. Illinois 5. Pennsylvania	1. Vermont 2. District of Columbia 3. Hawaii 4. Wyoming 5. Alaska	1. California 2. Texas 3. Florida 4. Pennsylvania 5. Georgia	1. Vermont 2. Alaska 3. Hawaii 4. District of Columbia 5. Wyoming
2022	1. California 2. Texas 3. Florida 4. Illinois 5. Pennsylvania	1. Vermont 2. District of Columbia 3. Wyoming 4. South Dakota 5. North Dakota	1. California 2. Texas 3. Florida 4. Pennsylvania 5. Georgia	1. Vermont 2. Alaska 3. District of Columbia 4. Hawaii 5. Wyoming

- States with highest covid cases usually are also states with highest covid death counts and vice versa
- In 2021, none of the states hit a 100% SAT participation rate
- In 2021, participation rates dropped to a record low of 1%


Data Visualization

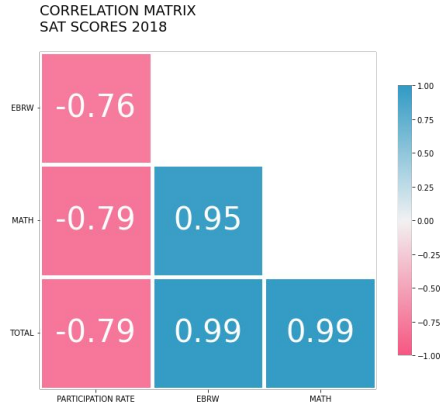
Correlation Analysis of SAT scores

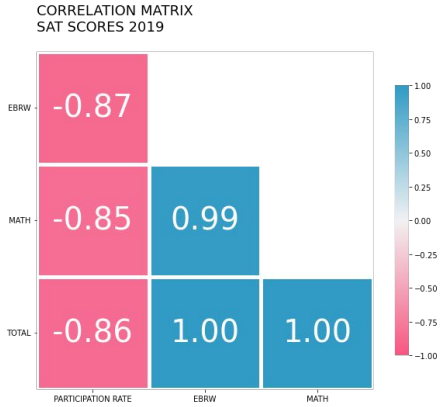


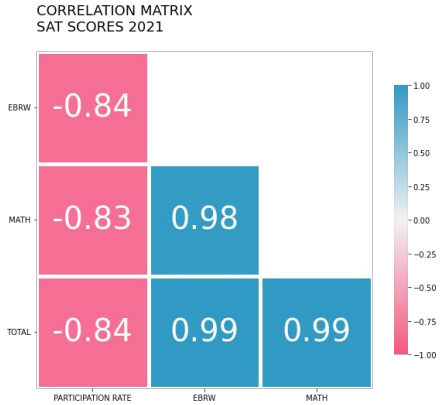


- A negative correlation can be observed between SAT Participation Rates and SAT Total Scores
  - The total average score decreases as more students are taking the test
- Total scores year on year have a strong positive correlation
  - States that did well in the previous year are likely to do well in the following year as well

Correlation Matrix of SAT Scores by Year



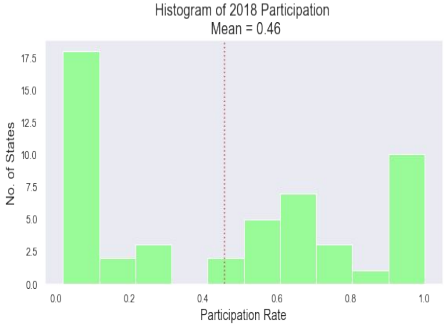


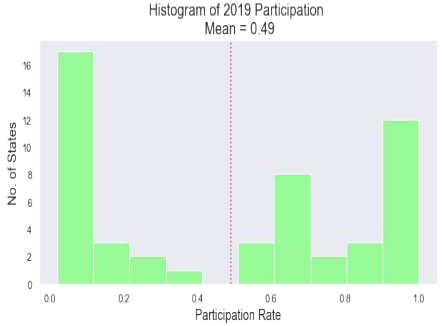


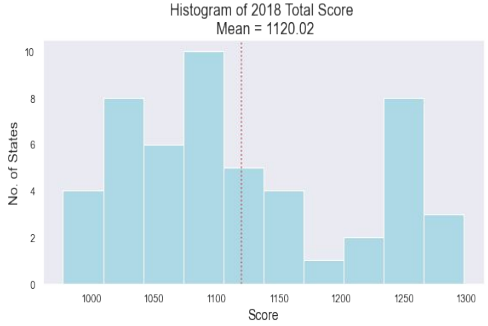
- SAT participation rates and total scores in the same year have a strong negative correlation
  - This suggests that states with higher participation rates tend to have lower total scores

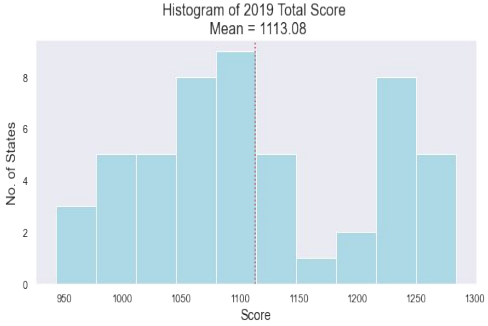
- EBRW scores, Math scores and total scores in the same year have a strong positive correlation
  - If a state does well in one subject, it is likely to do well in the other subject as well

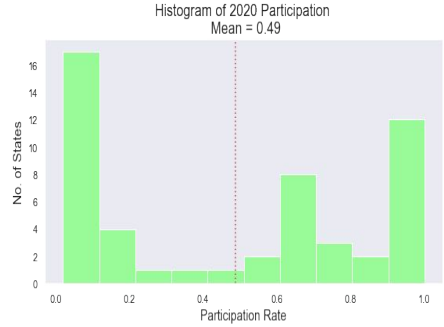
SAT 2018-2021

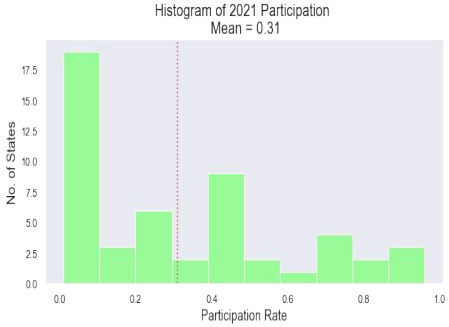


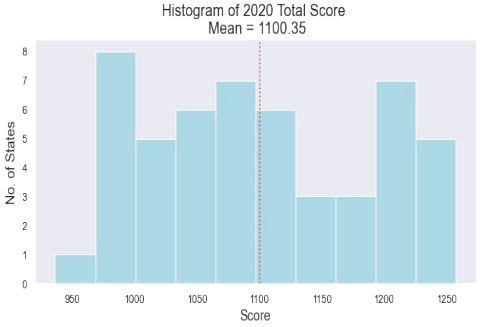


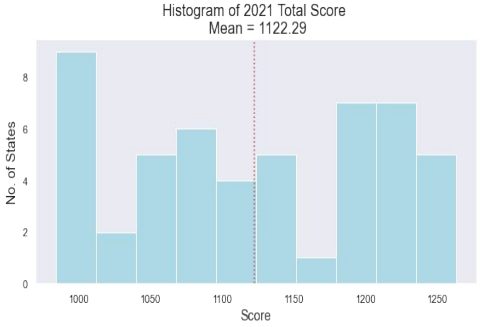






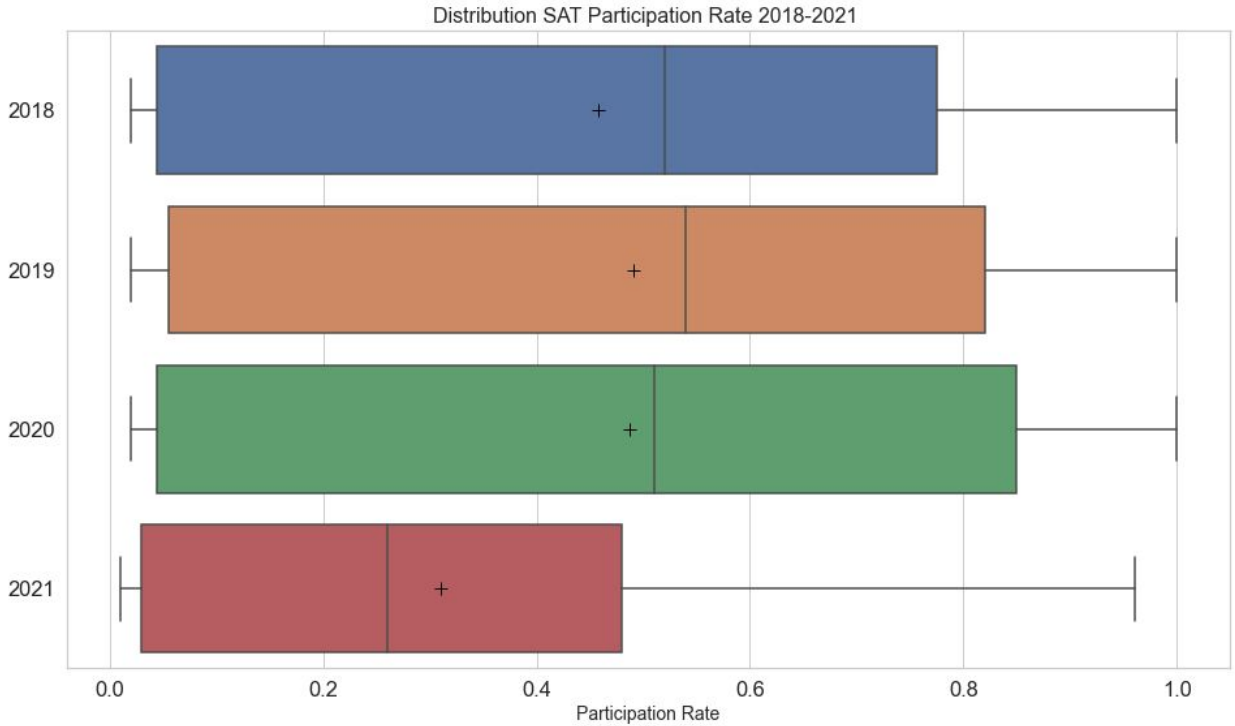




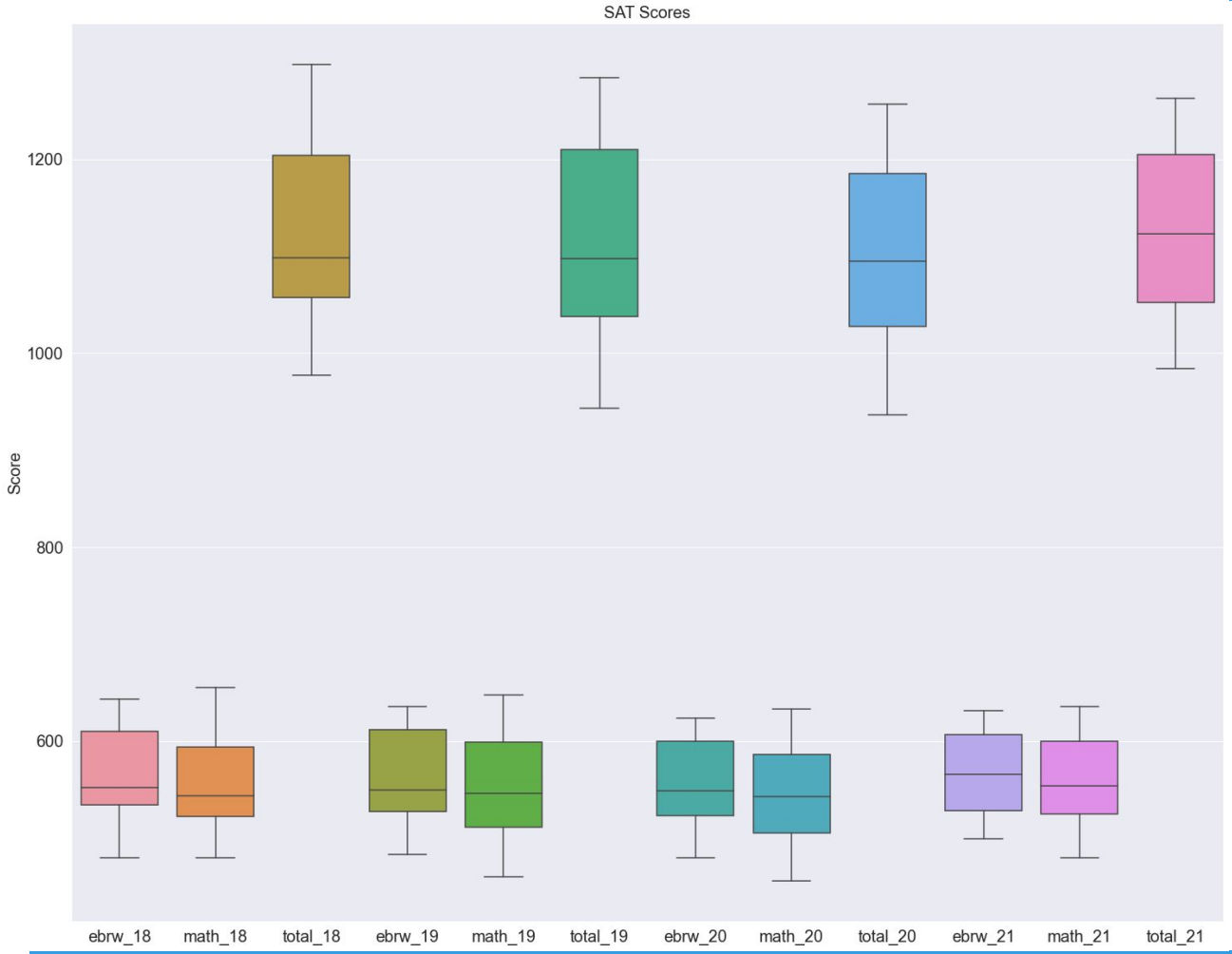


- The mean participation rates for SAT between 2018 to 2020 increased and SAT scores fall in between 2 peaks
  - Bimodal distribution
- However, 2021 showed a different pattern of observation from the previous 3 years
  - Right-skewed distribution

SAT 2018-2021

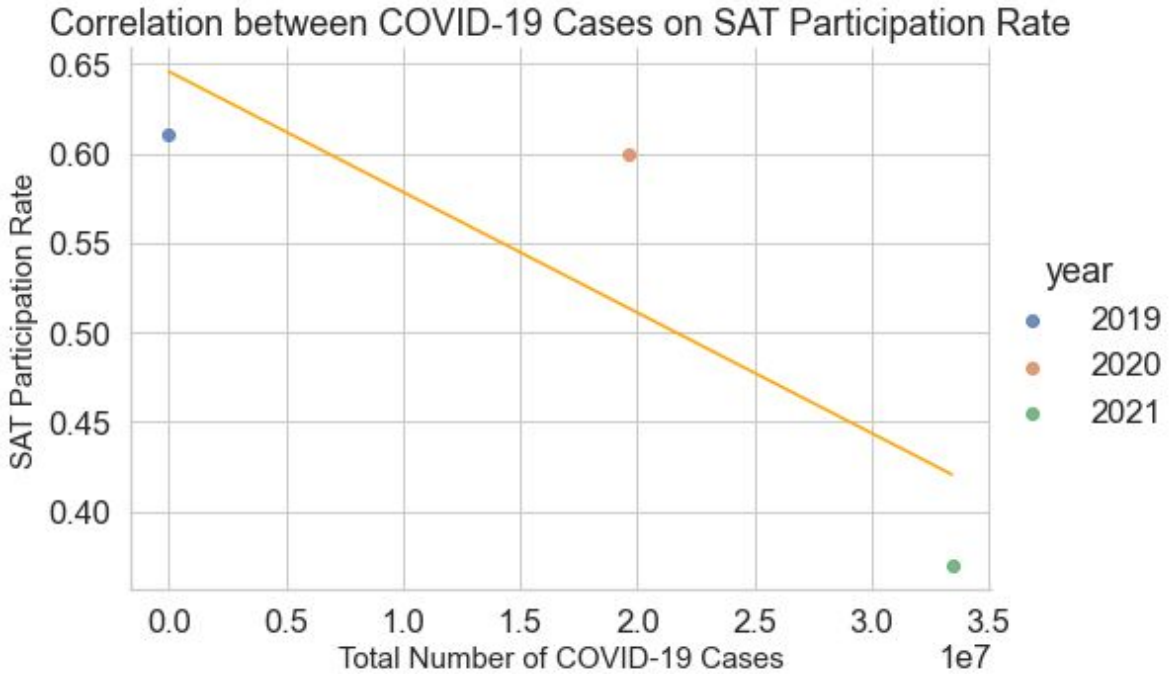


- SAT participation rates are seen to have increased from 2018 and 2020, but faced a significant drop in 2021.



SAT 2018-2021

- A subtle drop can be observed across the board between 2018 and 2020
- An increase in scores can be observed in 2021
  - This could be due to the decrease in participation rate



- Since the Pearson coefficient is -0.934, we can infer that there is a strong negative correlation between total covid cases and SAT participation rates.
- However, the p-values is 0.233 (>0.05) which indicates that the correlation is not statistically significant.
    - This could be due to the lack of data as the sample size is only 3

Conclusions & Recommendations

Conclusion

- COVID-19 could be cause of the decrease in participation rates. However, a correlation does not necessarily imply causation.
- Based on the dataset given, 93% of the universities made SAT/ACT optional for 2021 admissions due to COVID-19 restrictions and health concerns from the CDC, which would explain the drastic drop in participation in 2021.
- COVID-19 has a bigger effect on those aged 30 and above. The COVID numbers that we have may be skewed towards the higher age group resulting in no clear relationships observed.

Recommendation

- Further research should take into consideration the influence of other factors such as the median household income by state that may provide greater predictive power of SAT participation rates.
- Project is limited by the sample size, with only 3 years of study since COVID-19 is a relatively new phenomenon. Further research should be done in the following years in which COVID-19 is still prevalent.

Conclusions & Recommendations

Age group rate ratios compared to ages 18 to 29 years[1]

Rate compared to 18-29 years old[1]	0-4 years old	5-17 years old	18-29 years old	30-39 years old	40-49 years old	50-64 years old	65-74 years old	75-84 years old	85+ years old
Cases[2]	<1x	1x	Reference group	1x	1x	1x	1x	1x	1x
Hospitalization[3]	1x	<1x	Reference group	2x	2x	3x	5x	8x	10x
Death[4]	<1x	<1x	Reference group	4x	10x	25x	60x	140x	330x

All rates are relative to the 18 to 29 years age group. This group was selected as the reference group because it has accounted for the largest cumulative number of COVID-19 cases compared to other age groups. Sample interpretation: Compared with ages 18 to 29 years, the rate of death is four times higher in ages 30 to 39 years, and 330 times higher in those who are ages 85 years and older. (In the table, a rate of 1x indicates no difference compared to the 18 to 29 years age group.)

https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html

References

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- 2021 SAT Scores: https://soflotutors.com/blog/sat-scores-by-state/
- Absolute SAT Participation Rate: https://reports.collegeboard.org/sat-suite-program-results
- COVID-19 Total Cases & Death by State Over Time: https://data.cdc.gov/Case-Surveillance/United-States-COVID-19-Cases-and-Deaths-by-State-o/9mfq-cb36/data
- Risk of COVID-19 Infection by Age Group: https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html

Thank you!