Racial Performance Disparities in Missouri Schools

A visualization of Missouri

academic achievement and economic resources

Background

RESEARCH QUESTIONS

- What economic factors play in the racial disparity of of academic performance in Missouri schools?
- What are the spatial patterns of these trends?

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- Local taxpayers who vote on tax bonds that fund public education and elect school leaders.
- Administrators who allocate public funds to specific school buildings.

Data Sources

- Economic Data
  - Expenditures per student at the building level.
  - Teacher and administrator salaries.
  - Percent of students with free or reduced lunch status.
  - Teacher experience and training.
- Performance Data
  - 2019 MAP scores constructed in an index:
    - Index = percent of white students scoring at a level / The avg percent of non-white student performing at the same level
    - Score level = one of four scores (below basic, basic, proficient, advanced) in one of three subjects (English Language Arts, Math, Science)
- Location Data
  - Directory of school addresses used in a GeoCoder API to retrieve geodata.

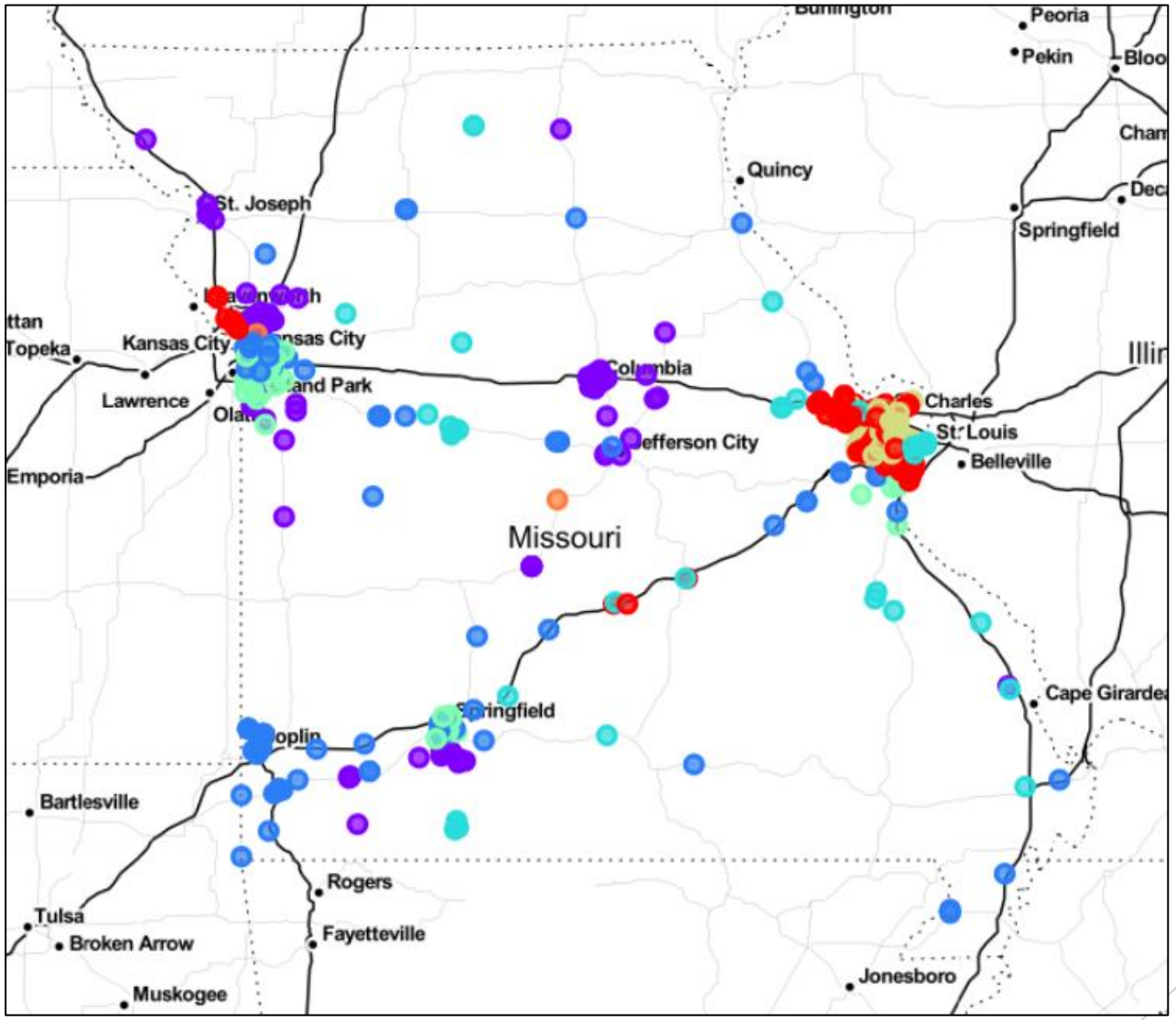
Data Analysis

1. Prepare MAP Data
    1. Find Performance index for all schools at each score level for each subject.
2. Find Spatial Data
    1. Use GeoCoder to find the coordinates of all schools from the directory of addresses.
    2. Use Folium to map coordinates and delete entries outside of the state lines.
    3. Use Foursquare to find information on the top 100 closest venues of each school within 500 meters.
3. Use K-means Clustering
    1. Merge all performance, economic, and venue data to one data frame.
    2. Run a K-means clustering algorithm to cluster schools into 7 groups.
    3. Use Folium to map all schools and label them with their cluster.

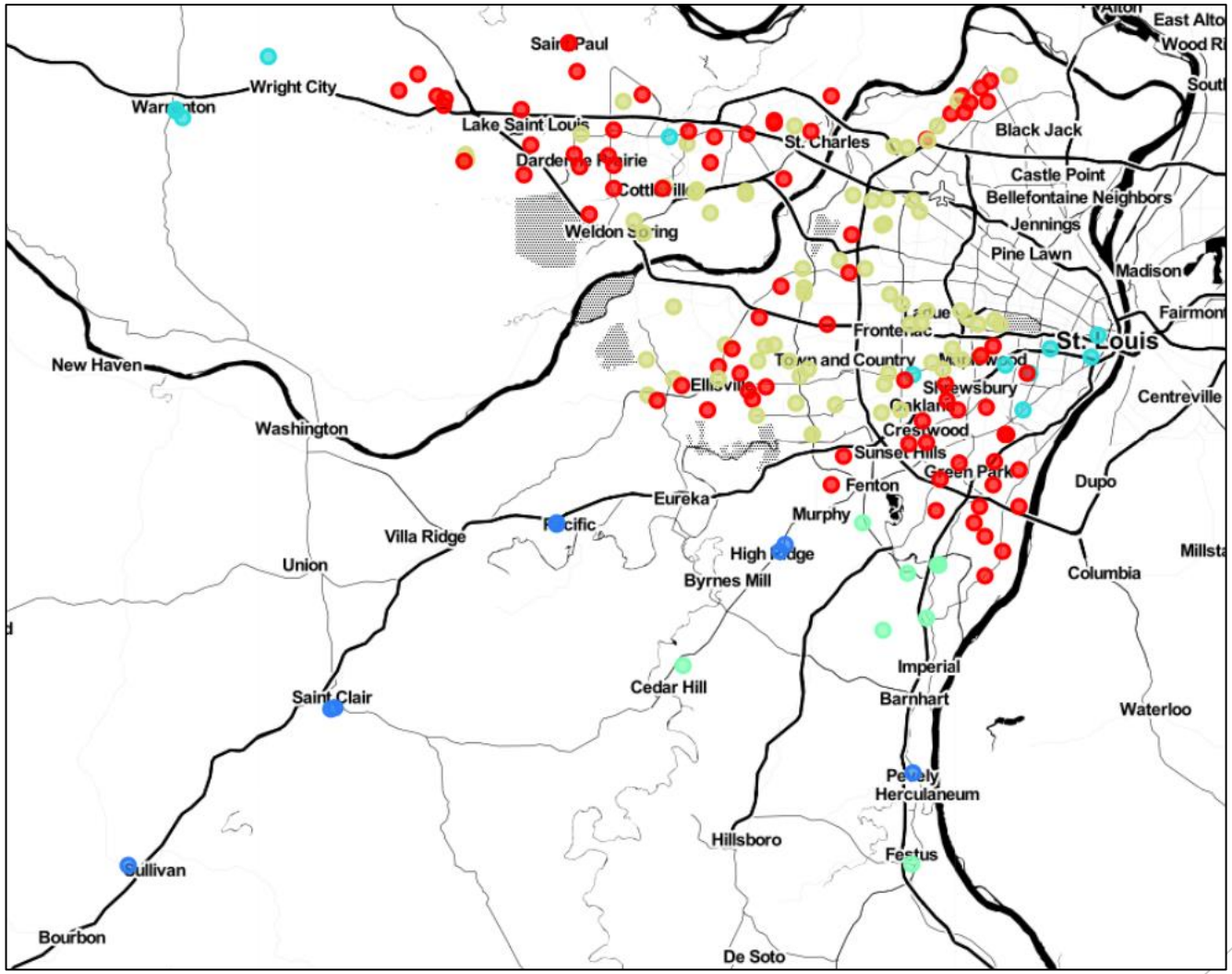
Results

Cluster Labels	Avg Under Performance Indexes	Avg Over Performance Indexes	Avg Expenditures Per Student	Avg Total Expenditures from State and Local Tax Revenue	Avg % Of Student White	Avg % Of Student with Free or Reduced Lunch	Avg Years Experience of Teachers	Avg % Of Teachers with Masters Degrees	Avg Teacher Salary	Avg Administrator Salary
5	0.62	1.49	12537.85	9392.15	62.17	24.53	14.83	82.22	67583.69	120753.79
0	0.73	1.35	10883.56	8096.82	69.42	27.49	12.84	74.29	59296.39	102287.78
3	0.78	1.57	9481.50	6421.49	73.20	54.38	11.02	46.74	45994.97	81212.68
1	0.79	1.42	10110.15	7117.88	74.71	40.47	12.96	63.23	51552.62	87799.36
4	0.79	1.56	10623.16	7223.83	59.67	56.54	12.78	64.08	54651.20	103284.19
2	0.86	1.59	9309.61	6168.01	70.94	57.89	11.53	51.39	46130.57	80229.10
6	1.36	1.10	9822.01	6260.95	64.57	63.45	10.30	47.45	45678.50	0.00

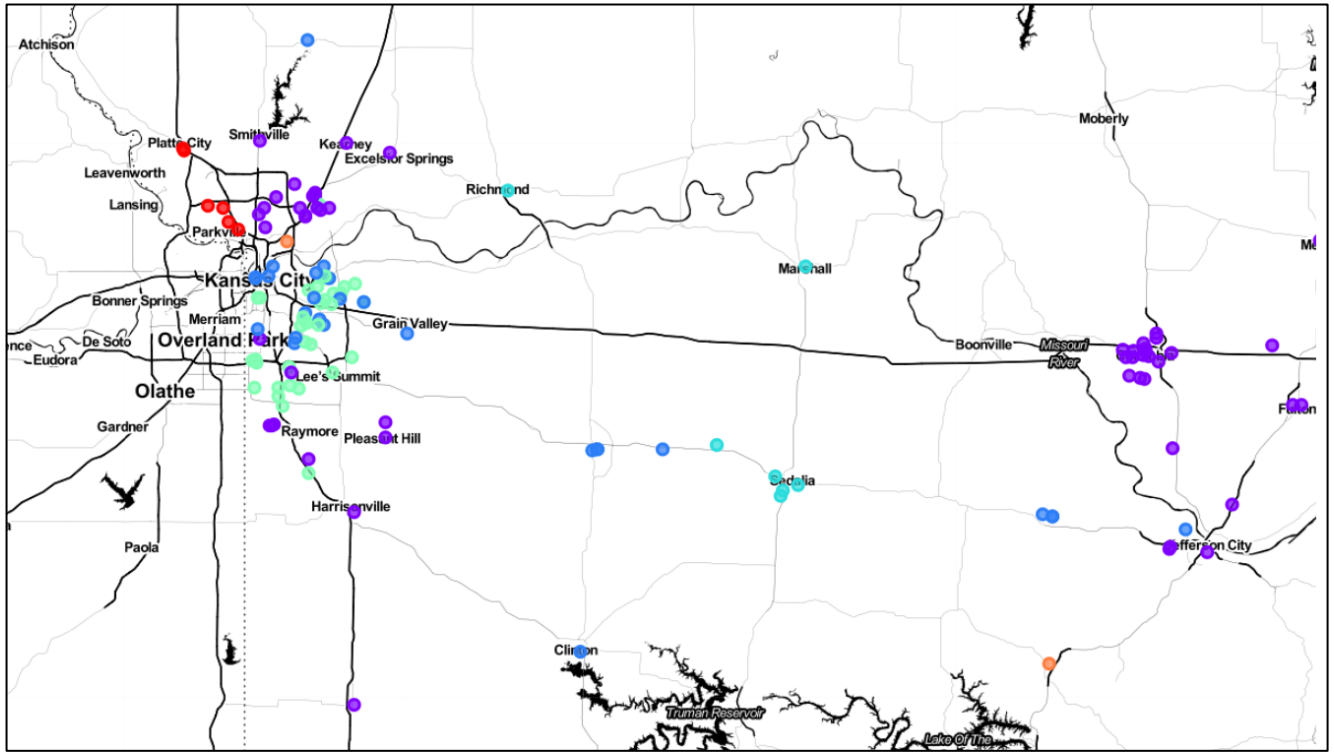
Results



Results



Results



Discussion

- Clusters where more non-white student scored below basic or basis.
  - Clusters 5 (yellow) and 0 (red)
  - These clusters had the highest expendtiures per pupil, teacher/administrator salaries, and teacher experience/training.
  - These schools were located mainly in the St. Louis area
- Clusters with a smaller racial disparity
  - Cluster 2 (purple)
  - These schools had more white students, but lower expenditures per pupil, teacher/administrator salaries, and teacher experience/training.
  - These schools were located in more rural areas.

Conclusions

RESEARCH QUESTIONS

- Schools with higher racial disparities in performance tend to have greater economic resources.
- These schools were located near large cities.

STAKEHOLDERS

- School leaders and community members need to recognize how their allocation of essential resources to schools can impact disadvantaged populations.

Conclusions

- Limited Data
  - Through data cleaning, many schools were eliminated from analysis in this project.
  - New ways of conceptualizing racial performance should be considered as well.
- Limited Analysis
  - Correlation needed to ascertain a association between performance and economic data and its direction.
  - Multivariate analysis of variance is needed to ascertain that these clusters are indeed statically different from one another.