

Racial Performance Disparities in Missouri Schools

A visualization of Missouri
academic achievement and economic resources

Background

RESEARCH QUESTIONS

- What economic factors play a role in the racial disparity 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

- All data retrieved from the Missouri Department of Elementary and Secondary Education
- 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 used to construct a performance index:
 - $\text{Index} = (\text{Percent of white students scoring at a level}) / (\text{The avg percent of non-white students performing at the same level})$
 - Score level = Any 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 was used in a GeoCoder API to retrieve geodata of each school.

Data Analysis

1. Prepare MAP Data

1. Find performance indices 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

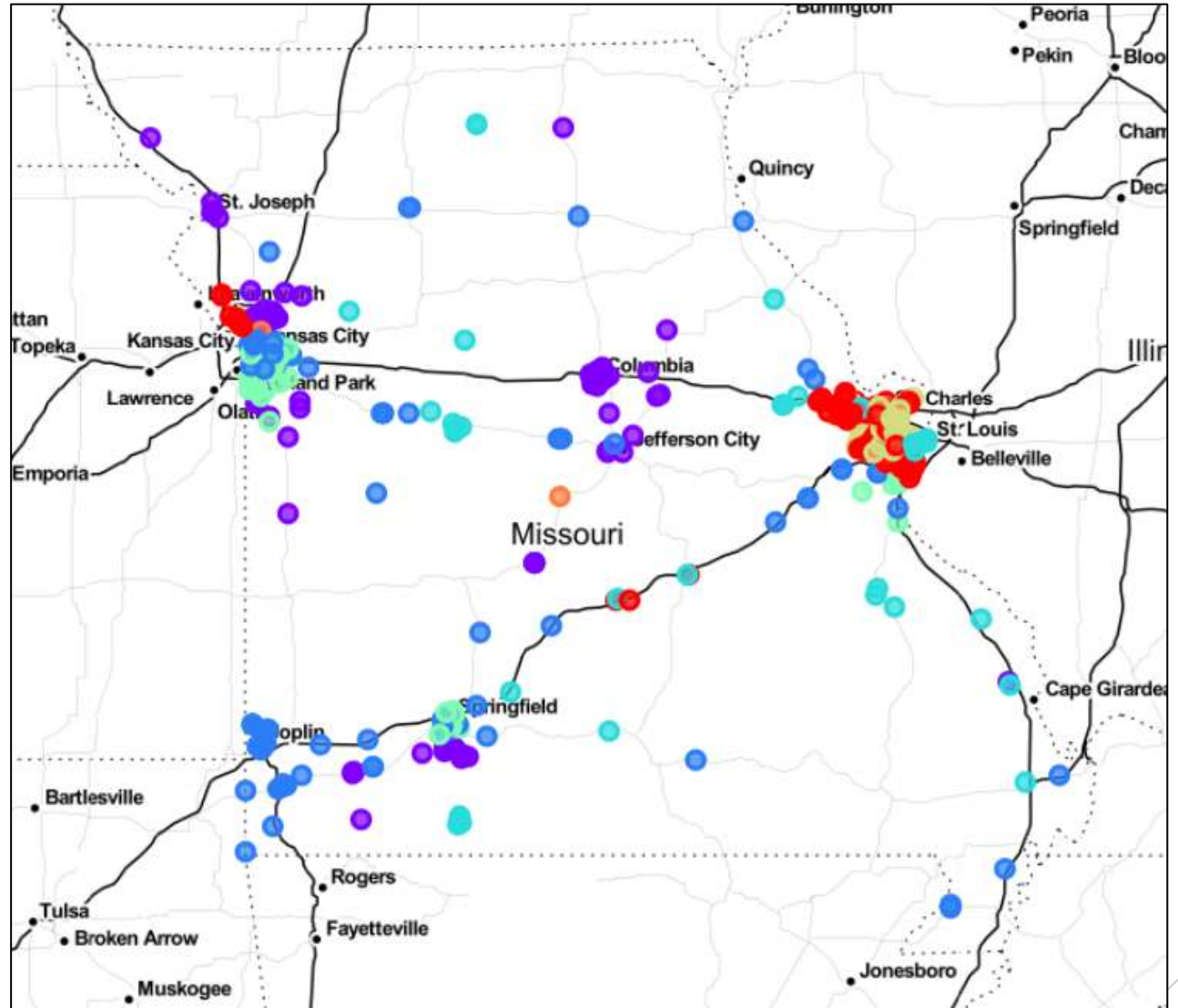
1. Merge all performance, economic, and venue data to one data frame.
2. Run a K-means clustering algorithm to cluster schools into 7 groups.
3. Use Folium to map all schools and label them with their cluster.

Results

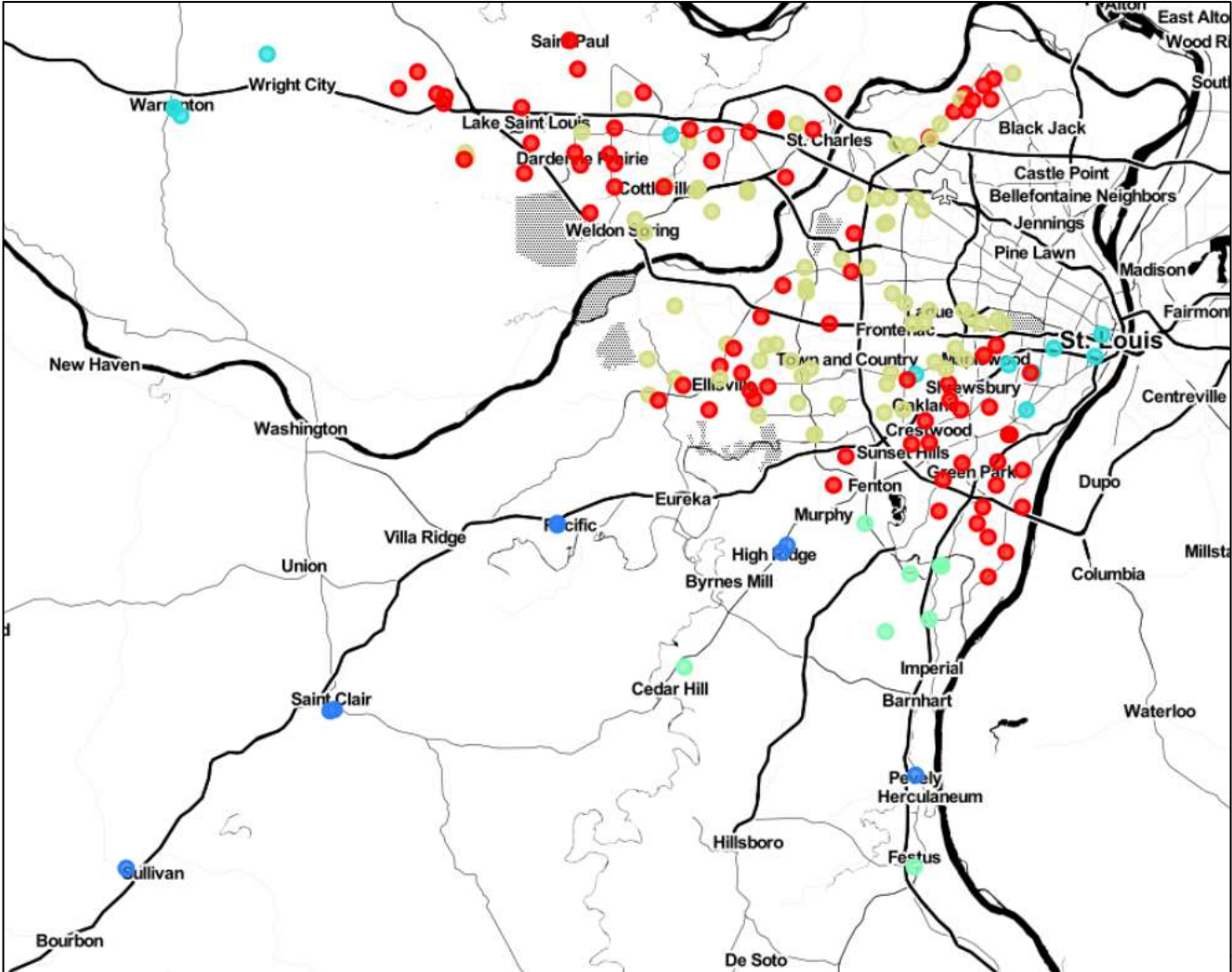
Cluster Colors	Avg Under Performance Indexes	Avg Over Performance Indexes	Avg Expenditures Per Student	Avg Total Expenditures from State and Local Tax Revenue	Avg % Of Student White	Avg % Of Student with Free or Reduced Lunch	Avg Years Experience of Teachers	Avg % Of Teachers with Masters Degrees	Avg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

Note: *Avg Under Performance Indexes* is the average performance index between all below basic and all basic performance indexes for each subject in each cluster. *Avg Over Performance Indexes* is the average performance index between all proficient and advance performance indexes for each subject in each cluster.

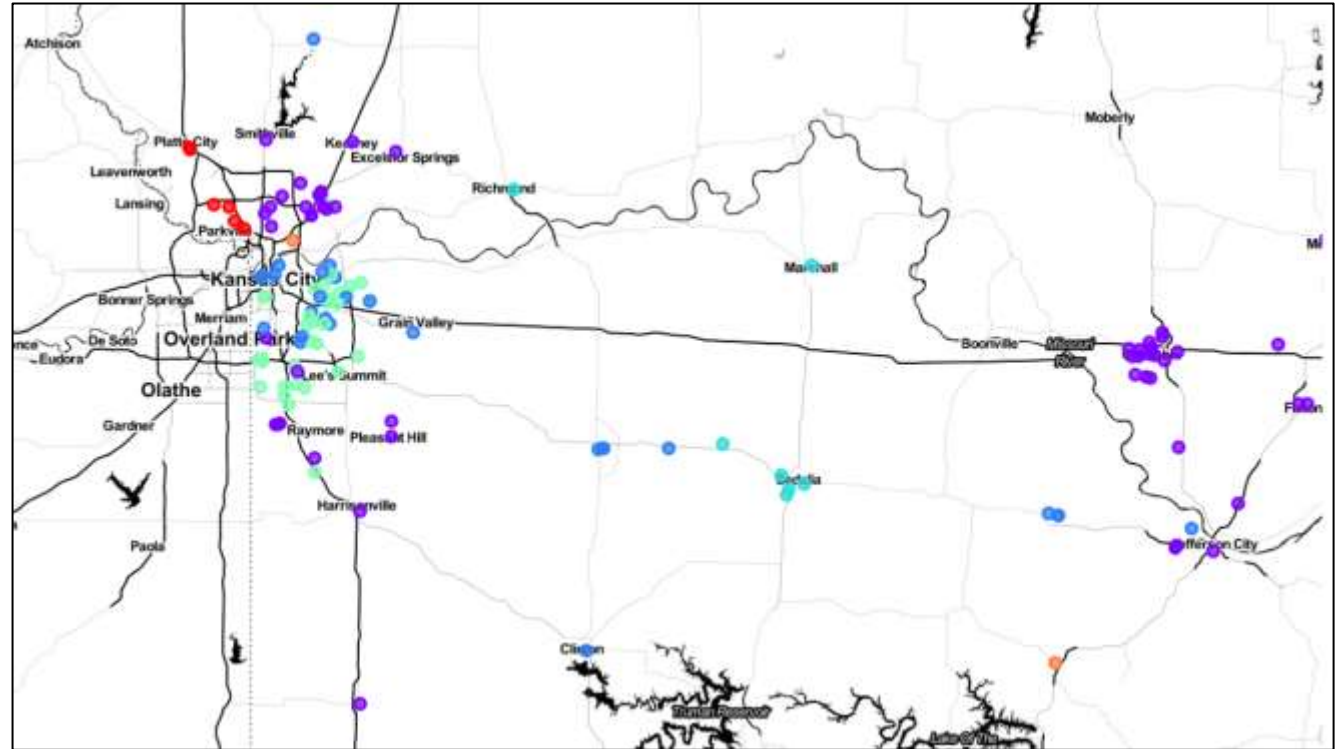
Results



Results



Results



Discussion

- Clusters where non-white students took a larger share of bellow basic scores:
 - The **yellow** and **red** clusters.
 - These clusters had the **highest expenditures per pupil, teacher/administrator salaries, and teacher experience/training.**
 - These schools were located mainly in the **St. Louis** area
- Clusters with more even shares between white and non-white students of bellow basic scores:
 - The **purple** cluster.
 - 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.
 - Schools where low scores were assigned to more non-white students than their white peers.
- These schools were located near large cities.

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- 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.
 - Other ways of conceptualizing racial performance should be considered as well.
- **Limited Analysis**
 - Correlation needed to ascertain the direction and strength of an association between performance disparity and economic data.
 - Multivariate analysis of variance is needed to check that these clusters are indeed statically different from one another.