School District Secession in East Baton Rouge

Caitlin Moroney

Abstract

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Proposal

I am interested in examining the relationships between school performance, race, and socioeconomic indicators (including income and percentage of "economically disadvantaged"[1] students). Furthermore, I am interested in examining this data within the context of school district "secession."[2] I have chosen to focus on schools within East Baton Rouge Parish, Louisiana for two reasons: (1) there are stark differences among school districts with regard to school and school district performance,[3] and (2) residents in the southeast corner of the Parish recently voted to incorporate as the City of St. George with the intention of forming a new school district.[4] If successful in creating a new school district, St. George will be the fourth new district to "secede" from the original East Baton Rouge Parish School District in two decades.

I propose to investigate the following research questions:

- Is there evidence that suggests the clustering of racial groups in East Baton Rouge (EBR) Parish?
- Is there evidence of the clustering of income levels in EBR Parish?
- Is there evidence of racial stratification of income?
- Is there evidence to suggest that school performance is linked to the racial makeup of the student body, the percentage of economically disadvantaged students, and/or the percentage of students fully proficient in English?

Abstract

Introduction

School district secession in the U.S. is propelling the re-segregation of public schools and school districts across the nation.[5] Two metrics commonly used to assess segregation include (1) "exposure" or "isolation," which measure the relative proportion of racial groups in distinct geographic areas (schools, school districts, census block groups, counties, etc.), and (2) "unevenness," which is concerned with the distribution of racial groups across these geographic regions.[6]

[1] I use the Louisiana Department of Education's data on percentages of economically disadvantaged students. I have yet to find sufficient metadata explaining how they define "economically disadvantaged," but comparing current school and school district performance reports with past reports suggests that this may be the percentage of students on free or reduced lunch plans.

[2] See Lockhart (2019) for a thorough explanation of the school district "secession" phenomenon.

[3] Lussier (2019c)

[4] Vincent and Foster (2019)

[5] Lockhart (2019)

[6] Chang (2018)

Another piece of this puzzle is the racial segregation between private versus public schools. This could be a significant factor fueling the difference in racial compositions between the total populations of residential areas and their public student populations. For example, if private schools tend to have significantly higher shares of White students than public schools in the same geographic region, this may help explain why public student populations tend to be significantly less White than the total residential populations of school districts.

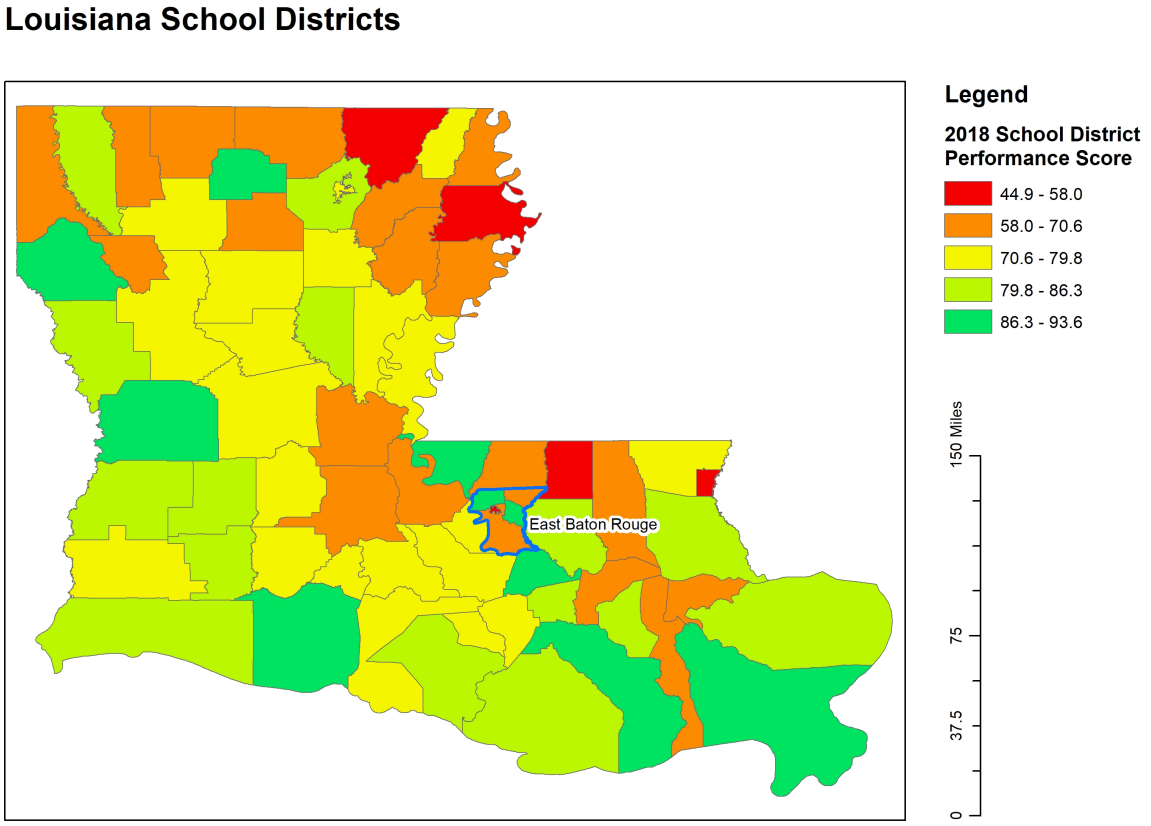


Figure 1: Louisiana school district performance for the 2017-2018 academic year. East Baton Rouge Parish is outlined in blue and labeled.

I have chosen to use East Baton Rouge Parish in Louisiana as a case study because this Parish is split into multiple school districts, which is not the case for many parishes in Louisiana (and counties across the South, generally speaking). Furthermore, there has been a marked difference in school performance among these districts, with Zachary Community School District consistently performing as the top-ranked school district in the state, Central Community School District regularly performing in the top five school districts in the state, and both East Baton Rouge Parish School District and City of Baker School District generally scoring in the bottom fifteen school districts in the state.[7] There is therefore a clear disparity among school districts in this region with respect to school quality. I am interested in investigating whether there are similar disparities among East Baton Rouge Parish school districts with regard to race and socioeconomic indicators.

East Baton Rouge Parish is no stranger to this school district "splintering" phenomenon. Originally, the entire Parish comprised a single school district, the East Baton Rouge Parish School System. Then, in 2003,

[7] ("2018 District Performance Scores and Letter Grades" 2018)

both Zachary Community School District and the City of Baker School District formed, largely based on the incorporated regions of the two pre-existing cities. In 2007, another section of the East Baton Rouge Parish School District split off to form Central Community School District in the eastern part of the Parish. The Central Community School District was allowed to form only after the region incorporated into a city.[8] In 2012 and 2013, residents of the southeast section of East Baton Rouge Parish began petitioning to form a new school district.[9] Their initial efforts ultimately fell short, but after waiting the mandated time period, the group began petitioning again in March 2018 with the intention of following Central's example: residents planned to incorporate as the City of St. George in order to subsequently form a new school district based on the incorporated region.[10] According to U.S. Census survey estimates, there were approximately 16,300 students from kindergarten through 12th grade in census tracts fully or partly included within the City of St. George boundaries, 7,700 of whom were enrolled in private schools.[11]

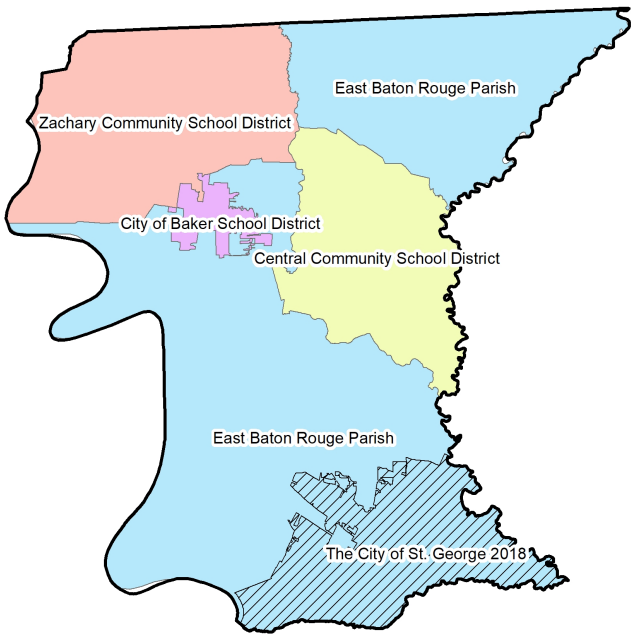


Figure 2: East Baton Rouge Parish school districts and the area of the City of St. George as proposed in 2018.

Methods

I gathered data from the Louisiana Department of Education, the U.S. Department of Education's National Center for Education Statistics, East Baton Rouge GIS Open Data, the U.S. Census Bureau, and the City of St. George's website.

Feature classes used in the final project include:

- East Baton Rouge Parish boundary (polygon)
- U.S. Census Bureau Unified School Districts for Louisiana (polygon)
- East Baton Rouge Parish schools (point)
- St. George area (polygon)

[8] Lussier (2019a)
[9] Lussier (2019a)
[10] Lussier (2019a)
[11] Lussier (2019b)

- East Baton Rouge Parish Census Block Groups (polygon)

Tabular data joined to spatial feature classes include:

- East Baton Rouge private schools' enrollment by race data for 2017-2018 academic year
- East Baton Rouge public schools' enrollment by race, school performance scores, percentage of economically disadvantaged students, and percentage of fully English proficient students data for 2017-2018 academic year
- School district enrollment by race and school district performance scores for 2017-2018 academic year

After downloading these various data sources, I then performed the following operations: data cleaning, file format conversion, new field calculation, attribute table editing, table joining, clipping, selecting by location, and selecting by attribute. I cleaned the tabular data extensively in R and converted the .xls files to .csv files so as to prevent significant issues in importing the data into my ArcMap project. For the City of St. George polygon layer, I downloaded the KML file from Google Maps linked on the St. George website; I then used ArcCatalog to convert the KML file to a layer package I could import into ArcMap. Once I added the layers in ArcMap and created a geodatabase for the project in which I saved the various files, I began calculating new fields based on existing variables in the attribute tables. Namely, I calculated the percentage of White students and the percentage of non-White students for each school and school district in the Louisiana Department of Education data tables. I joined the Louisiana Department of Education school enrollment and performance data table and the National Center for Education Statistics private school data to the East Baton Rouge Parish schools point feature class, keeping only the records with corresponding matches (colleges and universities, for example, were included in the East Baton Rouge Parish schools layer, but they were not relevant to my analysis). I clipped the U.S. Census Bureau Unified School Districts for Louisiana to only select those within the East Baton Rouge Parish boundary. Then, I joined the Louisiana Department of Education school district performance data table to the school districts feature class. This was only possible after I started an editing session and edited values in the "School System" field of the tabular data to ensure that the names matched exactly with the names used in the East Baton Rouge Parish school districts feature class (for example, the "City of Baker School District" does not match "Baker City School District" even though they refer to the same school district).

I conduct two analyses, one taking the census block groups as the units for analysis and one taking the schools as the units for analysis.

Census Block Groups

For the census block groups, I focus on median household income and the percentage of the population that identifies solely as White. I construct a spatial weights matrix using Queen's case first-order such that each census block group's neighbors are its immediately adjacent census block groups.

- Local Moran's I
- Local Moran's I with EB rates
- Bivariate Local Moran's I

Schools

To address my research questions focused on schools, I investigate the relationships between school performance scores, the percentage of the student body that identifies as White, the percentage of students who are economically disadvantaged, the percentage of students who are fully proficient in English, and the size of the school (as measured by the total number of non-pre-kindergarten students). I construct a spatial weights matrix using the distance band approach, where the threshold is set such that every point has at least one neighbor; I also apply inverse distance weighting.

I conduct two regressions, one with the percentage of economically disadvantaged students as the response variable, and the second with school performance scores as the response variable. Using GeoDa, I begin with

ordinary least squares (OLS) regression and select the spatial weights matrix in order to view the spatial diagnostics. Based on the regression output, I then determine whether spatial regression is appropriate. If so, I apply either the spatial lag model or the spatial error model.

Exploratory Data Analysis

Median Household Income

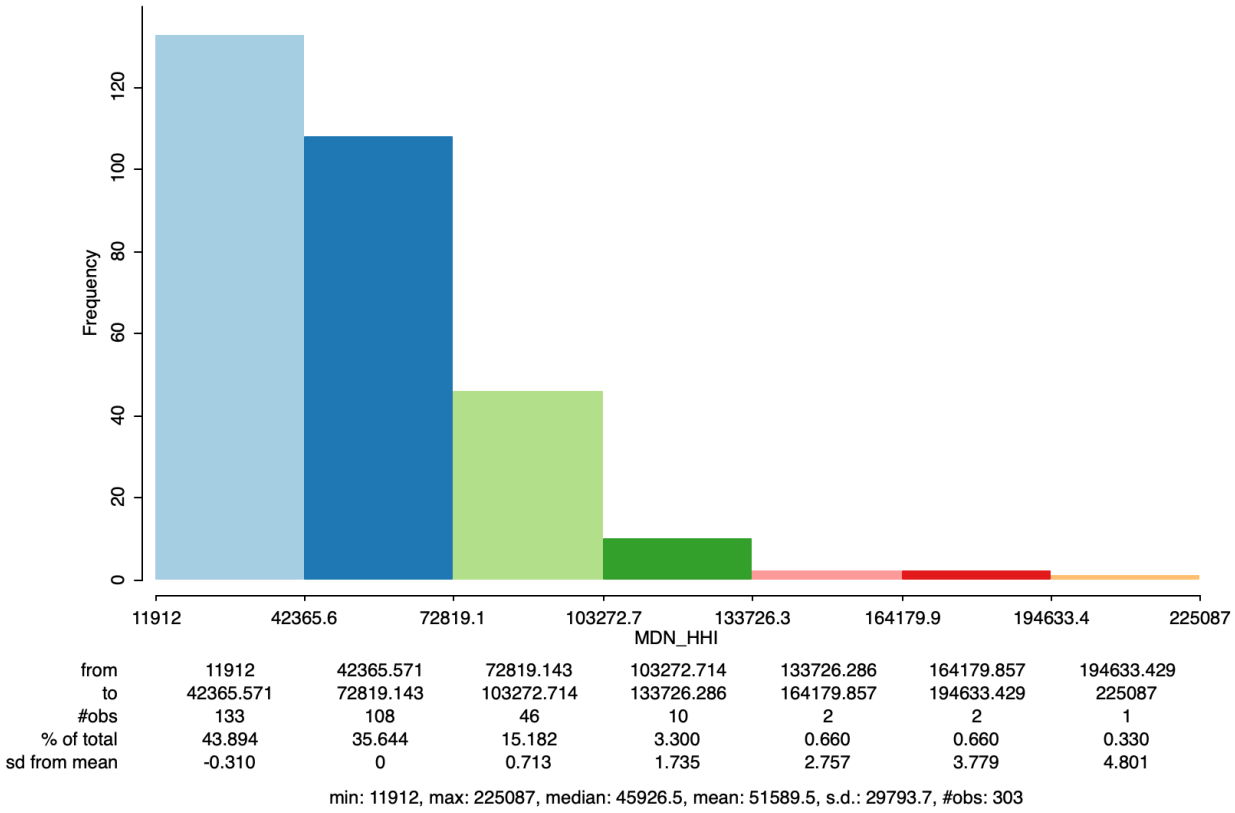


Figure 3: Histogram of median household income.

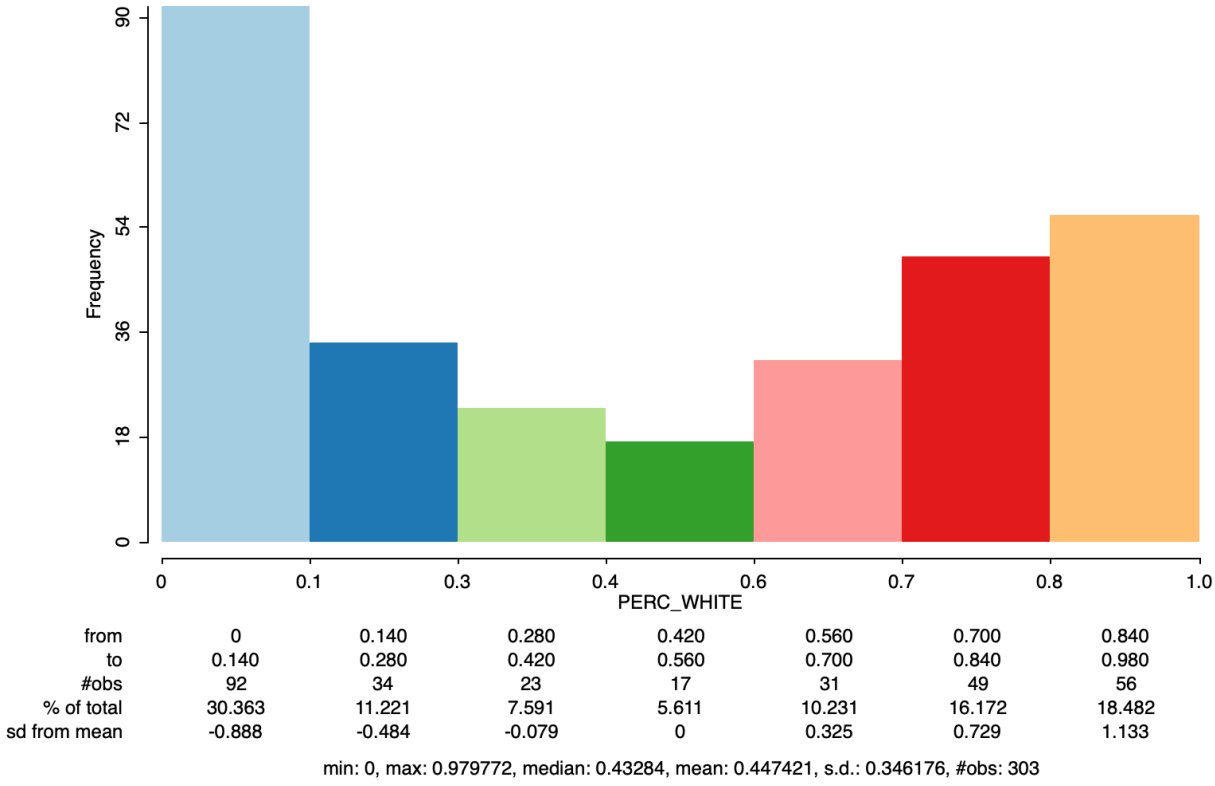
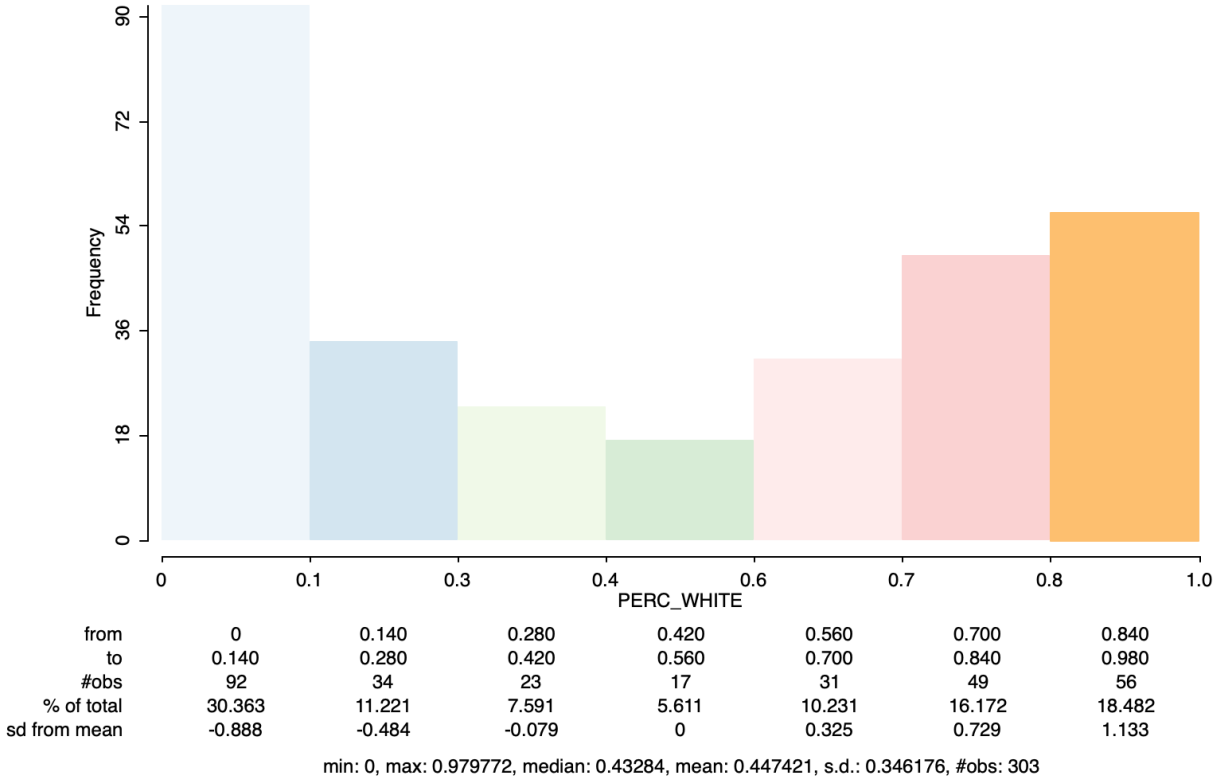


Figure 4: Histogram of population percentage white.



from	0	0.140	0.280	0.420	0.560	0.700	0.840
to	0.140	0.280	0.420	0.560	0.700	0.840	0.980
#obs	92	34	23	17	31	49	56
% of total	30.363	11.221	7.591	5.611	10.231	16.172	18.482
sd from mean	-0.888	-0.484	-0.079	0	0.325	0.729	1.133

min: 0, max: 0.979772, median: 0.43284, mean: 0.447421, s.d.: 0.346176, #obs: 303

Figure 5: Histogram of population percentage white.

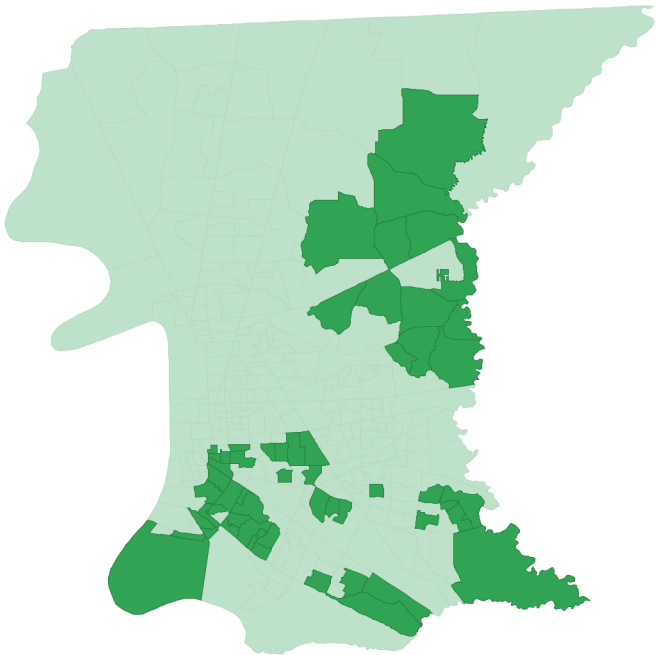


Figure 6: Map of census block groups with the most population percentage white.

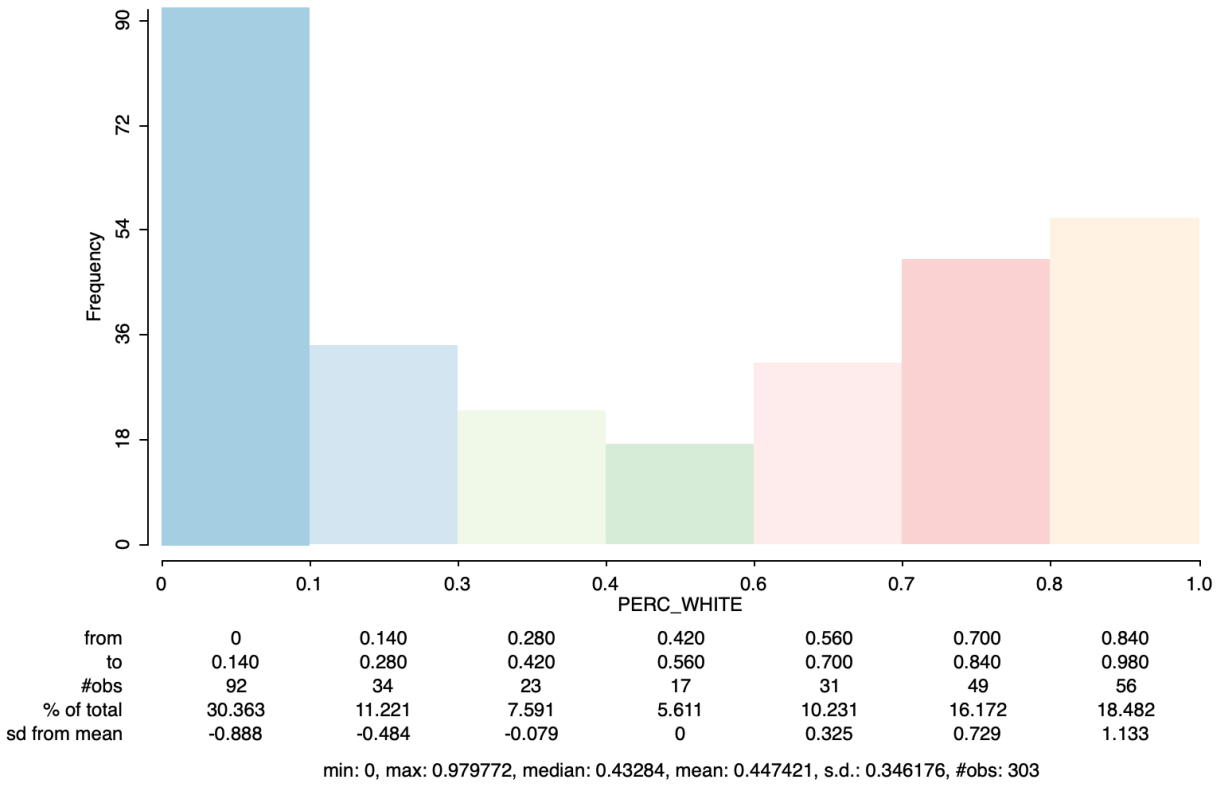


Figure 7: Histogram of population percentage white.

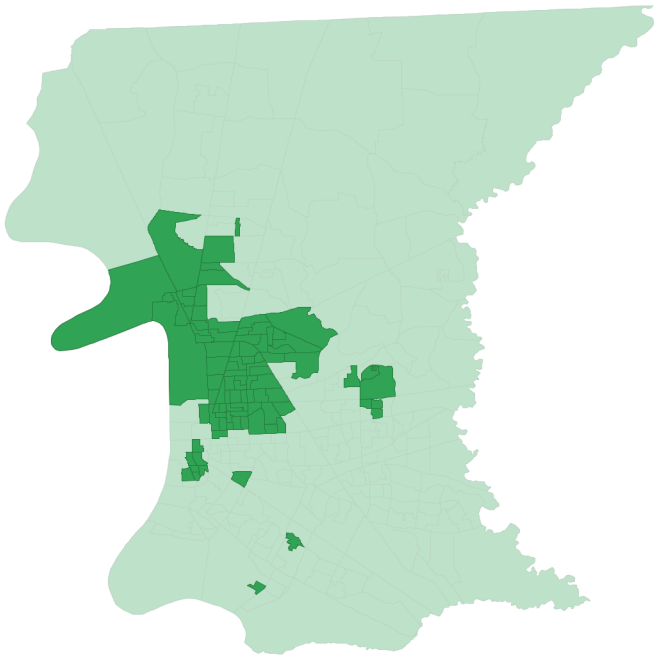


Figure 8: Map of census block groups with the least population percentage white.

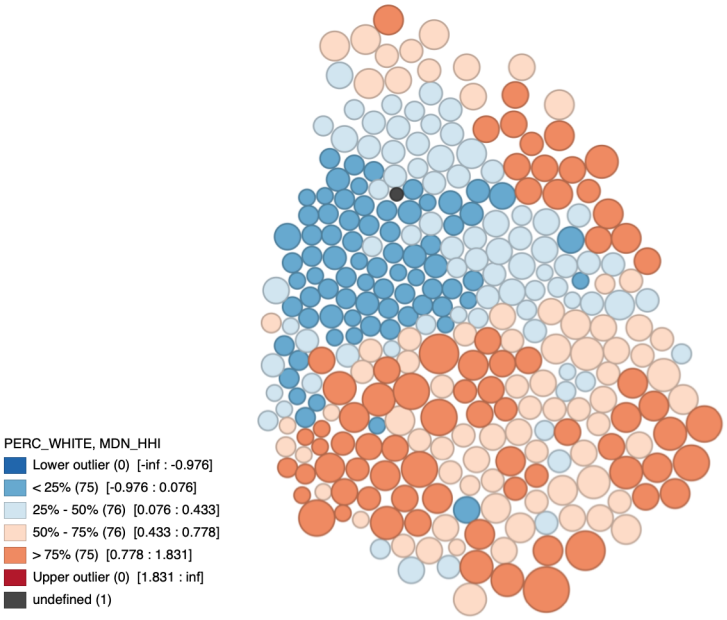


Figure 9: Cartogram of census block groups colored by the population percentage white with size annotating median household income.

Population Percentage White

Most White

Least White

Bivariate Relationships

School Performance Scores

Results

Local Moran's I

Median Household Income

Here, we see statistically significant evidence of clustering in the southwestern and southeastern parts of the Parish.

The general trend indicates spatial autocorrelation, as is evident in the LISA scatter plot and the cluster map. In the southeastern foot of the Parish (where the City of St. George lies), we see significant clustering of census block groups with a higher-than-average median household income. In the central western area, we see mostly low-low clusters, indicating census block groups with lower-than-average median household income surrounded by neighboring census block groups with lower-than-average median household income.

While there are a handful of high-low and low-high outliers, most of the significant census block groups show evidence of spatial autocorrelation. As mentioned above, the large pocket of high-high clustering overlaps

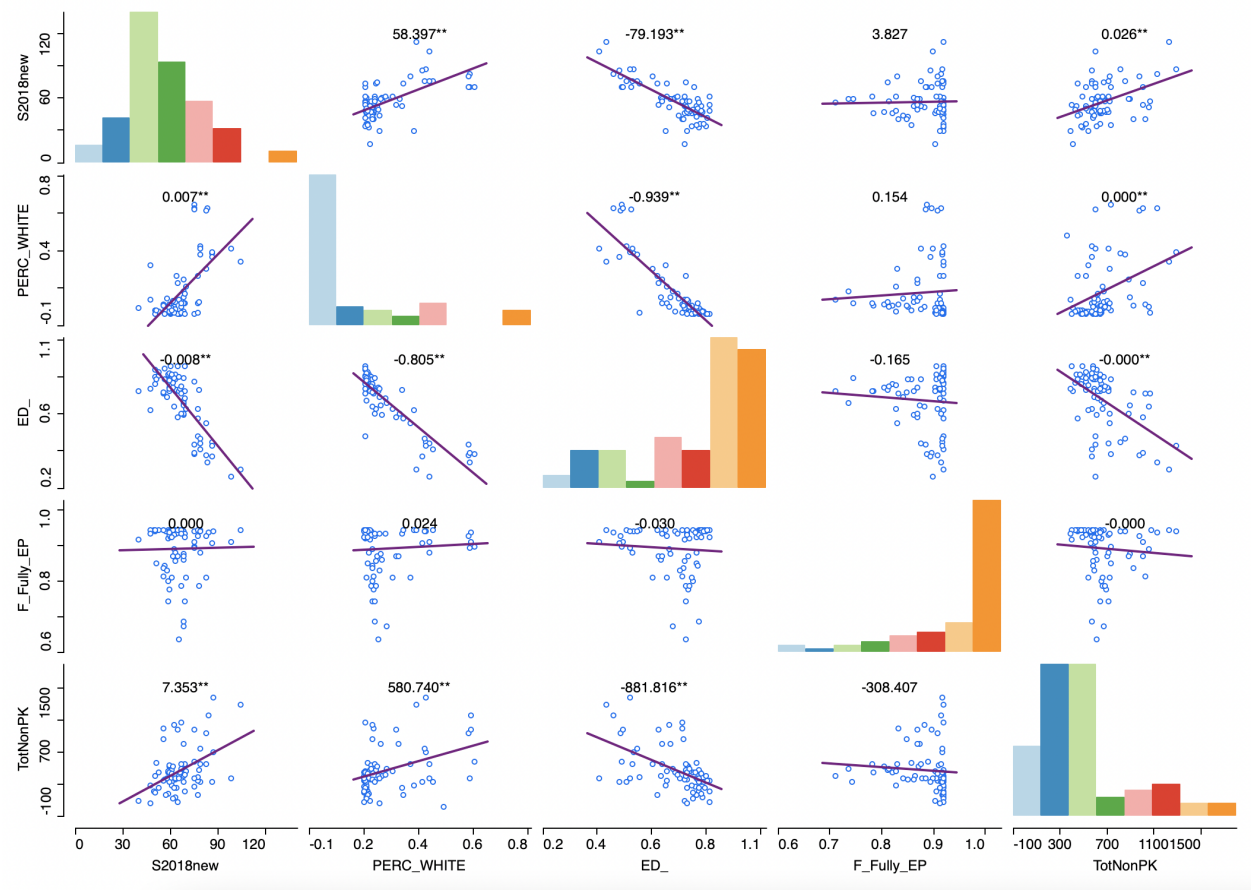


Figure 10: Scatter plot matrix of 2017-2018 school performance scores, percentage of student body that is white, percentage of students who are economically disadvantaged, percentage of students who are fully proficient in English, and total number of non-Pre-Kindergarten students for public elementary, middle, and high schools in EBR Parish.

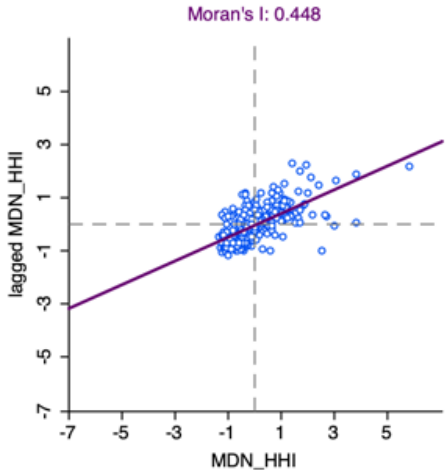


Figure 11: Lagged median household income versus median household income.

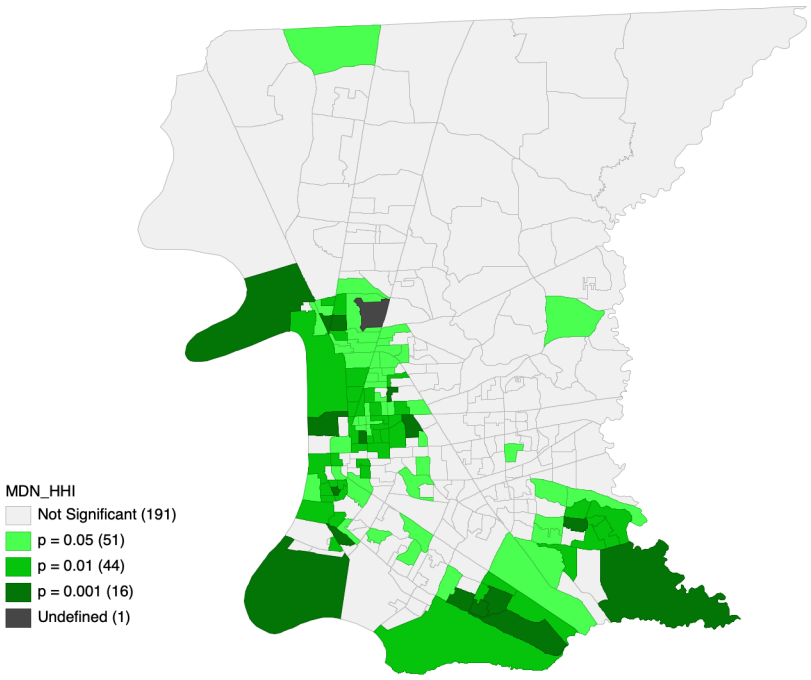


Figure 12: Significance map.

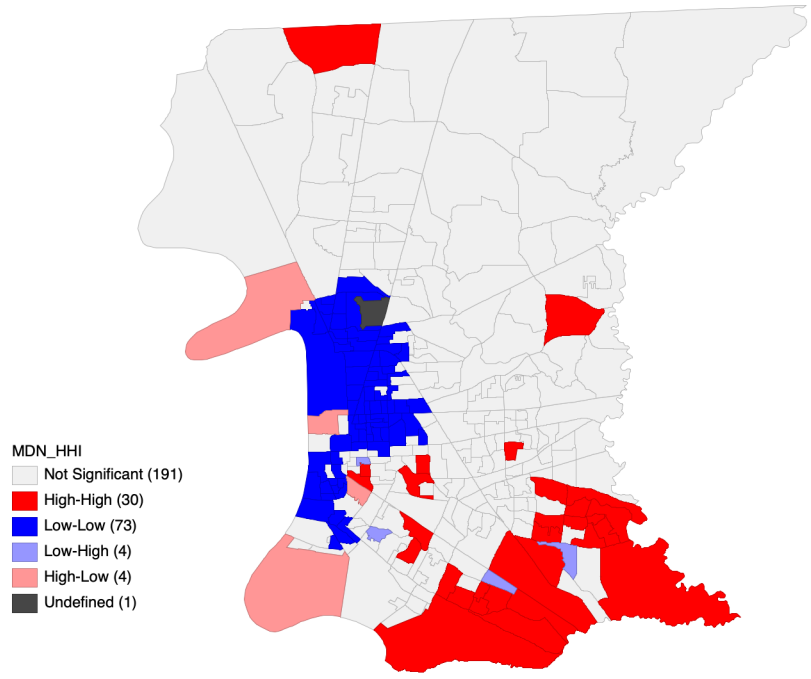


Figure 13: Cluster map.

largely with the City of St. George, whereas the low-low clusters are in the more densely populated part of the Parish which falls within East Baton Rouge Parish School District.

Population Percentage White

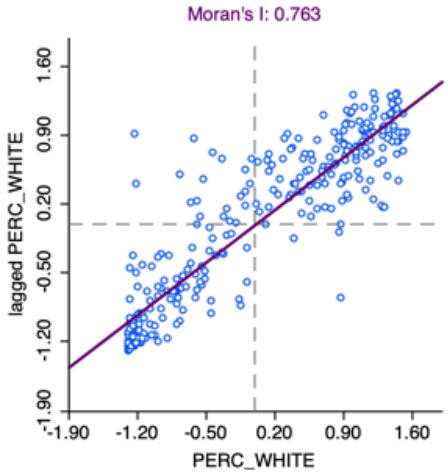


Figure 14: Lagged population percentage white versus population percentage white.

Here, we see statistically significant evidence of clustering in the southwestern and southeastern parts of the Parish.

The general trend indicates spatial autocorrelation, as is evident in the LISA scatter plot and the cluster map. In the southern and northeastern parts of the Parish, we see significant clustering of census block groups with a higher-than-average percentage of the population that is white. In the central western area, we see mostly low-low clusters, indicating census block groups with a lower-than-average percentage of the population that is white surrounded by neighboring census block groups with a lower-than-average percentage of the population that is white.

While there are a handful of statistically significant low-high outliers, most of the significant census block groups show strong evidence of spatial autocorrelation. The high-high clusters overlap to some extent with the City of St. George and Central Community School District. The low-low cluster is in the more densely populated part of the Parish which falls within East Baton Rouge Parish School District.

Local Moran's I with EB rates

Because the percentage of the population that is white is a proportion, it is possible that my first analysis suffered from the identification of spurious outliers. This is due to the fact that variables that are rates or proportions have inherent variance instability. When features have different population sizes, features with smaller populations have more variable rates than features with larger populations.

With EB standardization, the rates are adjusted so that rates for features with small populations are pulled closer to the overall average more so than the rates for features with large populations. Note that when the base populations across all features are relatively similar (meaning there is little variance), using local Moran's with EB rates may not be necessary. Although census block groups are statistically designed to contain roughly the same number of people, I redo the Local Moran's I analysis for the percentage of the population that identifies solely as white, applying the Empirical Bayes rate correction.

Here, we see statistically significant evidence of clustering in most parts of the Parish.

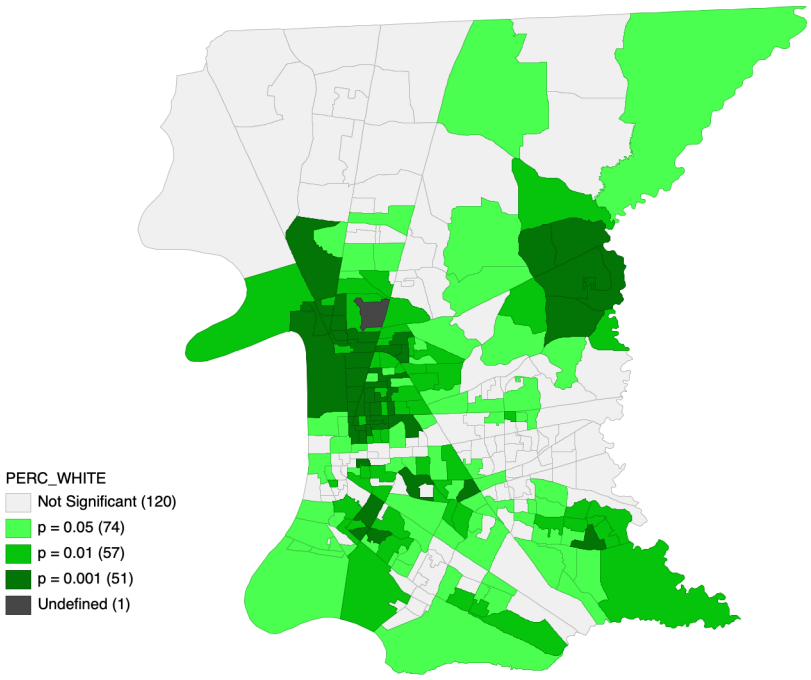


Figure 15: Significance map.

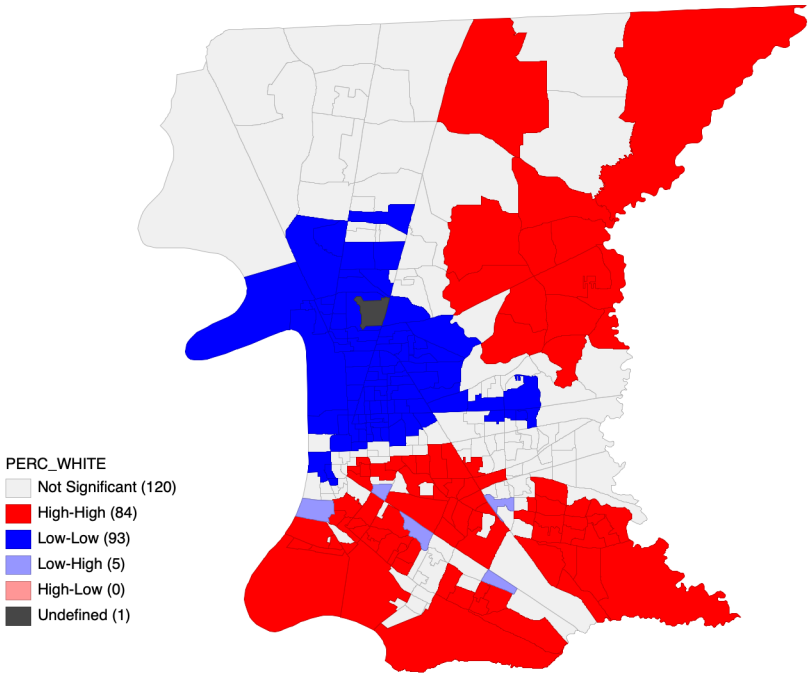


Figure 16: Cluster map.

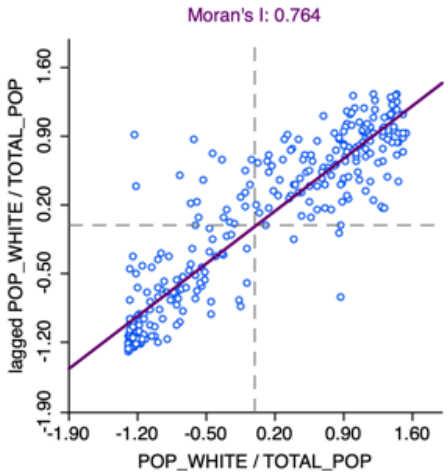


Figure 17: Lagged population percentage white versus population percentage white.

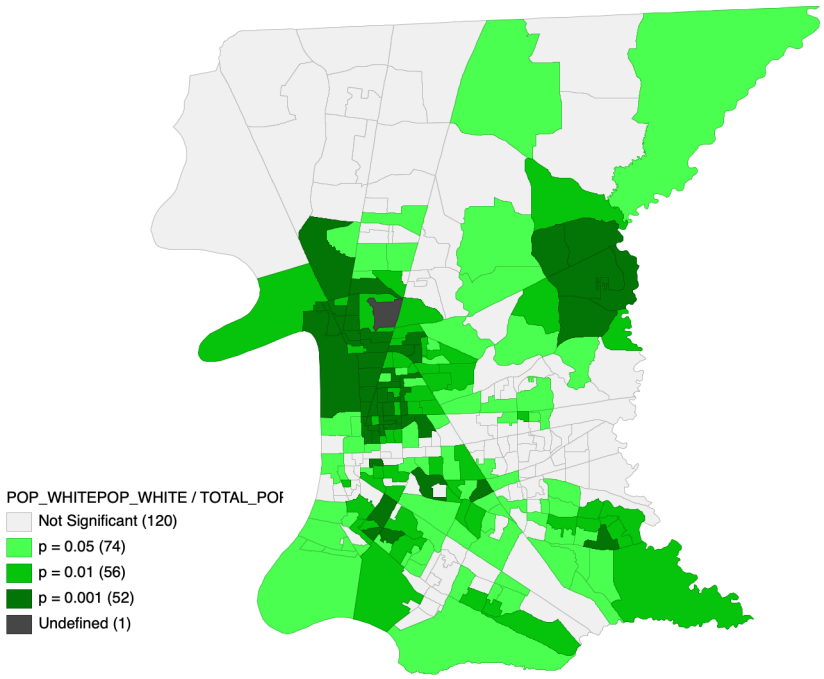


Figure 18: Significance map.

The general trend indicates spatial autocorrelation, as is evident in the LISA scatter plot and the cluster map. In the southern and northeastern parts of the Parish, we again see significant clustering of census block groups with a higher-than-average percentage of the population that is white. In the central western area, we see mostly low-low clusters, indicating census block groups with a lower-than-average percentage of the population that is white surrounded by neighboring census block groups with a lower-than-average percentage of the population that is white.

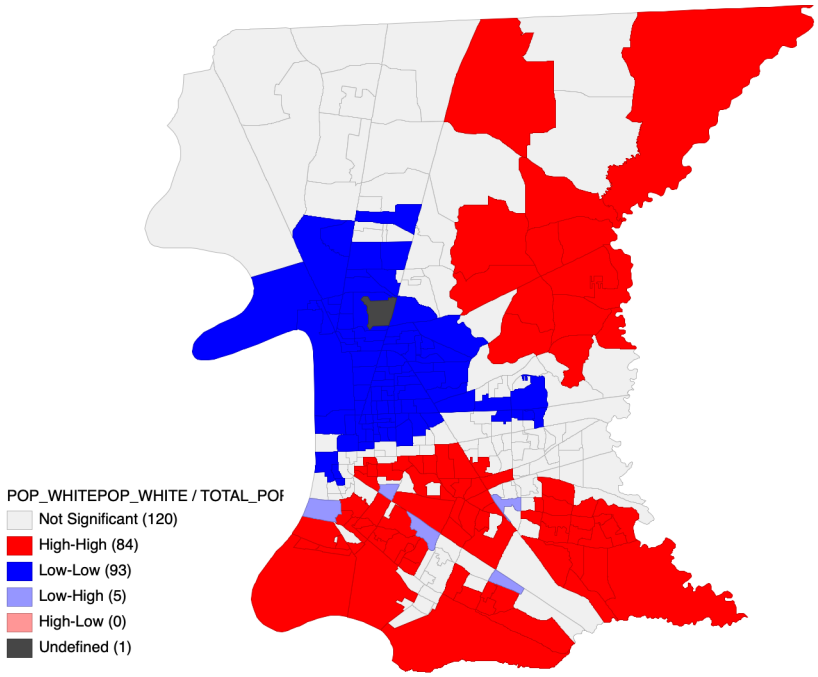


Figure 19: Cluster map.

In other words, the Local Moran's I with EB rates produces identical to the regular Local Moran's I analysis of this variable. As mentioned above, this is not surprising given that there is unlikely to be significant variance in the census block group populations by design.

Bivariate Local Moran's I

The bivariate Local Moran's I allows us to compare the spatial distribution of two variables, X and Y (in this case, X is median household income, and Y is population percentage white). For a contiguous feature set of polygons we can compare the value of X at the i^{th} feature to the values of Y at the neighboring features, $N(i)$.

This analysis allows us to determine whether there is a statistically significant relationship between X and Y for each feature in the analysis.

Here, we see statistically significant evidence of clustering in most of the Parish, aside from the northwest corner.

The general trend indicates spatial autocorrelation, as is evident in the LISA scatter plot and the cluster map. In the southern and northeastern parts of the Parish, we see significant high-high clusters. These census block groups have a higher-than-average median household income and are neighbored by census block groups with a higher-than-average percentage of the population that is white. In the central western area, we see

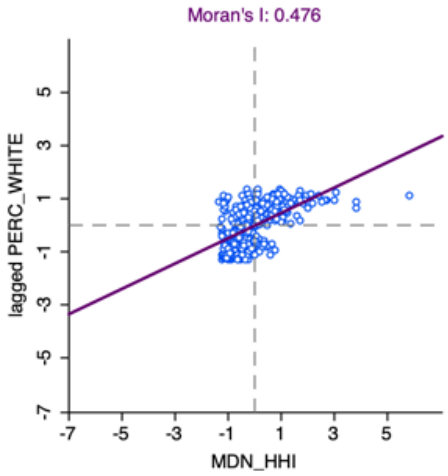


Figure 20: Lagged population percentage white versus median household income.

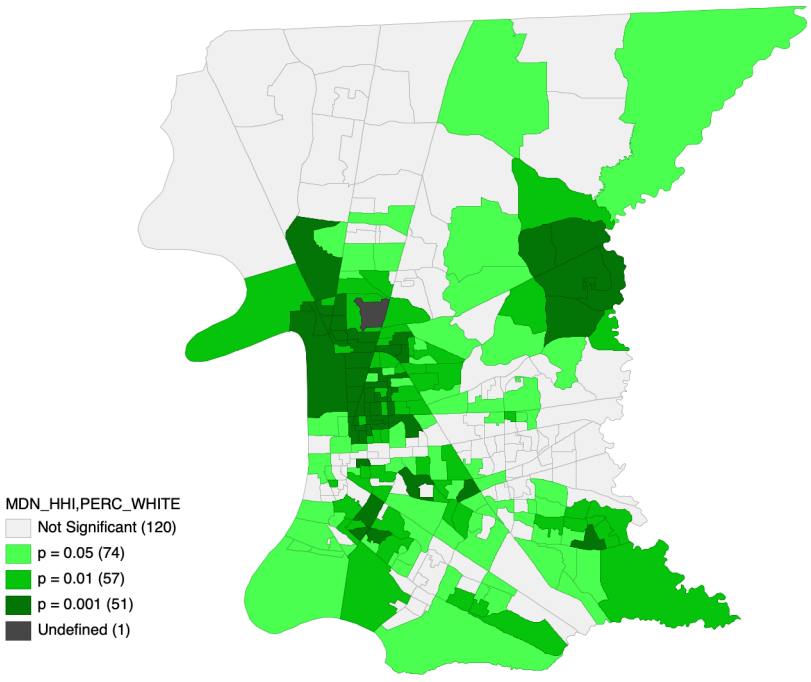


Figure 21: Significance map.

mostly low-low clusters, indicating census block groups with a lower-than-average median household income surrounded by neighboring census block groups with a lower-than-average percentage of the population that is white.

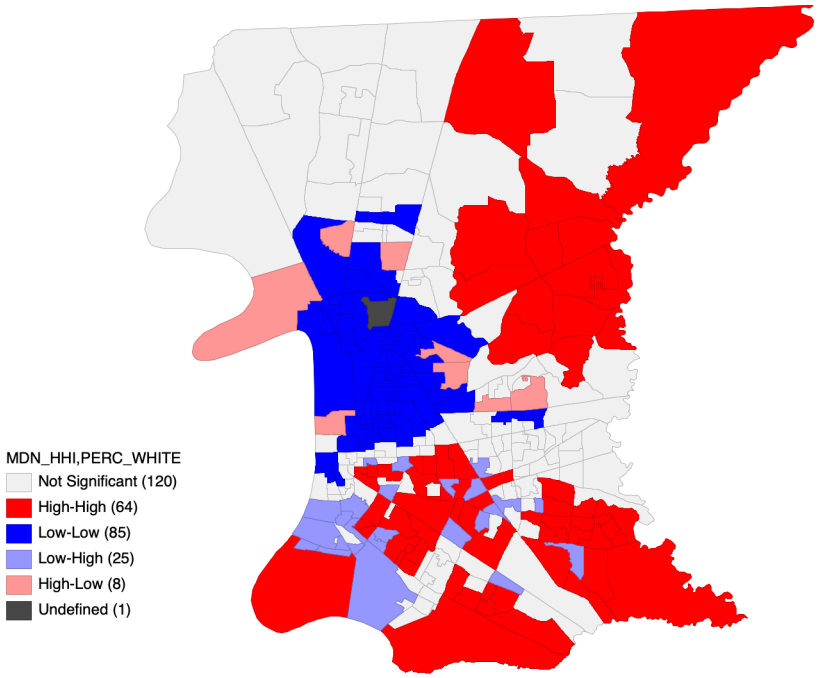


Figure 22: Cluster map.

While there are a handful of statistically significant low-high and high-low outliers, most of the significant census block groups show strong evidence of spatial autocorrelation. The high-high clusters overlap to some extent with the City of St. George and Central Community School District. The low-low cluster is in the more densely populated part of the Parish which falls within East Baton Rouge Parish School District.

OLS Regression

Spatial Regression

Discussion

Citations

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