An Exploratory Spatial Analysis of Race and Poverty in the

Springfield, Missouri Metropolitan Statistical Area

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Abstract

Race-based segregation has colored the social fabric of the United States since before the founding of the republic. There is ample literature that examines the intersection of race, poverty and other social issues. However, most research is at the state and national level or appears to have focused on the largest or most prominent cities in the nation. These studies have generally been aspatial in nature. Moreover, there seems to have been few, if any, spatial studies of the Springfield, Missouri area focused on poverty, race, and other social indicators. This study sought to ascertain whether there is evidence of spatial processes associated with race, poverty, and other social indicators in the Springfield, Missouri metropolitan statistical area. The results of the analysis based on census tracts indicated mild to moderate levels of global and local spatial autocorrelation for all the variables used in the analysis.

Keywords: race; poverty; segregation; spatial analysis; Springfield, Missouri

**Introduction**

Race-based segregation rooted in the practice of slavery has colored the social fabric of the United States since before the founding of the republic. Sociologists have studied the topic extensively and illuminated its effects on various populations. Many of these effects persist to the present day.

Poverty is of particular interest for this study. There is ample literature that examines the intersection of poverty, race, and other social issues. However, most research is at the state and national level or appears to have focused on the largest or most prominent cities in the nation. Moreover, these studies have generally been aspatial in nature. That is, they seem to assume that space does not matter and therefore ignore spatial considerations in the analysis. Moreover, there seems to have been few, if any, spatial studies of the Springfield, Missouri area focused on poverty, race, and other social indicators.

Located in the southwestern corner of the state of Missouri (Figure 1), the Springfield, Missouri metropolitan statistical area (MSA) is a worthwhile locale to study race and poverty for several reasons. Springfield, Missouri is the third largest city in the state of Missouri (U.S. Census Bureau, 2018). It is the seat of government for Greene County (“County of Greene,” n.d.; Wood, 2011). The Springfield Public Schools System is the largest school district in Missouri (Missouri Department of Elementary and Secondary Education, n.d.). Moreover, the city of Springfield, Missouri has played an important role in the development of the current social order for both the state of Missouri and the nation going back to the American Civil War when both the Confederacy and the Union considered Springfield a strategic location and control over the region seesawed between them (Wood, 2011). As such, examining race and poverty in the Springfield, Missouri area will help expand our overall understanding of these social issues.

Like politics, all social issues are local. However, economic research on poverty has primarily been at the national level. The history and structure of a location greatly influence the social issues and needed mechanism for addressing them (Blank, 2005). Race-based segregation rooted in the historical practice of slavery has had a profound impact on the social order of the United States. It’s likely that various locales across the nation have experienced their own distinct flavor of racial segregation resulting in variations of the social issues, such as poverty, that are currently manifested within each region. There is a need for scholarly research that stresses the role of place in poverty and various other social issues (Blank).

The unique social, demographic, and spatial characteristics and history of the Springfield, Missouri area have likely influenced the social issues the region currently experiences. However, most studies of social issues ignore the spatial component. This study seeks to ascertain whether there is evidence of spatial processes associated with poverty, race, and other social indicators in the Springfield, Missouri metropolitan statistical area.

**Literature Review**

There is ample literature about that focuses on race, poverty, and various social issues (Danziger & Gattschalk, 1987; Gaskin, et al., 2014; Gebhardt, 2014; Madden, 2014; Michner, 2016; Paschall, Gershoff, & Kuhfeld, 2018; Vaughan, A., et al., 2014). However, the analyses tend to be at the national or state level. Moreover, most of the literature seems to assume that local spatial factors do not matter.

The literature about race, poverty, and various social issues in the Springfield, Missouri Metropolitan Statistical Area (MSA) is sparse, if it exists at all. Shur (2012) noted the “relative silence in official narratives about how race, racism, and race relations shaped Springfield and the region” (p. 131).

Harper (2007) examined a series of lynchings and subsequent expulsions of Blacks between 1894 and 1906 in Southwest Missouri which likely influenced the current social characteristics of the Springfield, Missouri MSA to a great degree. As Harper explained, Missouri remained in the Union during the Civil War but was allowed to continue practicing slavery. However, the slave population in Missouri was concentrated along the Missouri river which runs through the central corridor of the state. Greene county, where the city of Springfield is located, was the only county in southwestern Missouri where the number of slaves reached at least 10 percent of the total population. As such, Blacks didn’t become a significant economic factor in the region. This greatly influenced how racial tension manifested itself in southwest Missouri and the Springfield area.

According to Harper (2007), a significant portion of the population in southwest Missouri was sympathetic to the Union and abolitionism. There was considerable violent Confederate guerrilla activity in the region. After the end of the Civil War, former slaves from other regions migrated to the area as did former Confederates. This set the stage for heightened racial tensions. The industrialization and modernization of the region only exacerbated the situation.

There is evidence that Blacks, particularly business people, tried to integrate into the Springfield community between 1880 and 1910 by locating businesses in the main business district and purchasing homes on integrated streets (Shur, 2012). For example, Phelps Street was apparently integrated although residential segregation was common in Springfield; however, more Whites than Blacks resided on the street (Shur, p. 119).

As Harper (2007) further explained, lynchings were a tool used by many communities throughout the South as a form of social control meant to keep the Black population in its place. But they rarely led to expulsions of entire Black populations from the community because Blacks were economically necessary. However, this was not the case in southwest Missouri. Slavery in Missouri was more domestic than economic (Seale, 2014). As such, Black labor was not as economically critical to the southwest region because there was plenty of inexpensive White labor (Harper). Consequently, mobs in southwest Missouri used lynchings as a method to expel Blacks from their communities (Sheppard, 2016) rather than simply as a tool for subordinating the Black population.

In 1880, Blacks made up about 23 percent of the population of Greene County. In 1906, there were a series of lynchings in Springfield so gruesome in nature that they made national headlines (Wood, 2012, p. 90-91). Blacks interpreted these lynchings of their brethren as a clear message that they were not welcomed in the region. They left southwest Missouri in significant numbers (Harper 2007). By 1910, the Black population in Springfield was less than 10 percent (Duran, 2017). Moreover, as Shur (2012) elucidated, Whites generally viewed Blacks through the lens of stereotypes established during slavery. This racism often led Whites to limit Black enterprise in their communities to only businesses that offered personal services to other Blacks. This history has likely had some influence on subsequent and current social dynamics within the Springfield, Missouri region.

**Data and Methods**

**Data Sources**

I obtained the data for this analysis from two primary sources. I obtained shapefiles for the state of Missouri and metropolitan and micropolitan statistical areas (MSAs) for the United States from the TIGER/line shapefile database of the U.S. Census Bureau. I obtained demographic and social data at the census tract level from SocialExplorer.com in two batches in formats suitable for manipulation in STATA. The first included sex, age, and race. The second comprised educational attainment, household income, median household income, Gini index, poverty, and health insurance (Table 1).

**Data Modifications**

I used STATA to create several interval-ratio variables (Table 2) using code that was provided by Dr. J. S. Onésiemo Sandoval. As part of the output, the code created Microsoft Excel spreadsheets with the interval-ratio variable data.

I used ESRI ArcMap 10.6.1 to merge the interval-ratio variable with the shapefile for the study area. To begin, I clipped the census tracts for the state of Missouri to the Springfield, Missouri MSA. I then used the Join function to merge each of the Microsoft Excel spreadsheets with the interval-ratio variable data to the shapefile for the Springfield, Missouri MSA using the GEOID and FIPS fields as the unique identifiers to match the data with the correct census tracts.

I inspected the Attribute Table to identify census tracts that should be removed to avoid skewing the analysis results. To do this, I sorted the total population field from low to high and inspected it for census tracts with values that were abnormally low relative to the other census tracts (i.e., census tracts with total populations less than 100 persons). I found no census tracts that warranted removal from the analysis.

As I performed the tasks necessary to modify the data, I periodically saved the results at strategic points to permanent shapefiles in a file geodatabase I created using ArcMap. I did this as a precaution to save time in case I made an error. In such an eventuality, I would not have to repeat the entire data preparation process. I projected the final shapefile to the North American Datum (NAD) 1983 Universal Transverse Mercator (UTM) zone 15N projection coordinate system.

Because administrative boundaries (e.g., census tracts) change over time and generally don’t align with social boundaries, I also used ArcMap to create a shapefile of the study area with a one square kilometer grids rather than census tracts as a point of comparison. I interpolated the total population, total Black population, total Latino population, and total White population at the census tract level to the grids. I then added variables for the percent Black population, percent Latino population, and percent White population to the Attribute Table for the shapefile and calculated them for each grid square. I saved the result as a new shapefile with the NAD 1983 UTM zone 15 projection.

**Analysis and Findings**

I used ESRI ArcMap 10.6.1 and GeoDa to analyze the data using poverty ratio as the dependent variable. I used ArcMap to create thematic maps of poverty ratio, the total population, percent Black population, and percent White population (Figures 2 through 5). The maps suggest that spatial processes are at play. Traditional statistical inference methods assume variables are randomly distributed throughout space. However, the thematic maps appear to show nonrandom distributions of racial populations and poverty within the study area.

I used the Measuring Geographic Distributions function in ArcMap to calculate the mean centers and standard deviational ellipses at one standard deviation for poverty, percent Black population, and percent White populations in the study area (Figures 6). The means centers of these variables are geographically very close to each other. The standard deviational ellipse for poverty fully encompasses that for the Black population.

I used GeoDa to analyze the spatial autocorrelation at the census tract level for the variables I intended to use in the analysis. I used the queen method first order for contiguity weights for all calculations. I chose this method because it seemed to best represent the possible social interactions in the study area.

I calculated univariate Moran’s I statistics for all potential variables for the analysis (Table 3). Except for the Theil index of inequality and no health insurance status, all variables showed a moderate level of global spatial autocorrelation. The Theil index of inequality and no health insurance status exhibited a mild degree of global spatial autocorrelation.

I calculated bivariate Moran’s I statistics for poverty, which I planned to use as the dependent variable, and the percent Black and percent White populations, which I planned to use as two of several independent variables (Tables 4). Percent Black population and percent White population exhibited a mild degree of negative spatial autocorrelation as did the education attainment index and poverty. Poverty and no health insurance status exhibited a moderate level of negative spatial autocorrelation. No health insurance status and percent Black population showed a mild level of positive spatial autocorrelation.

I also used GeoDa to examine univariate Local Indicators of Spatial Association (LISA) for the top three variables that had statistically significant global univariate Moran’s I statistics (Figures 7 through 9). The poverty ratio, education attainment index, and median household income exhibited significant numbers of census tracts with positive spatial autocorrelation that were statistically significant at the 0.01 level.

Based on these initial results, I created bivariate LISA maps for the percent Black population with poverty and the percent White population with poverty (Figures 10 and 11). Both exhibited 37 census tracts with spatial autocorrelation that was statistically significant at the 0.01 level. Most of these tracts exhibited positive spatial autocorrelation for percent Black population and poverty but negative spatial autocorrelation for Percent White population and poverty.

I examined the percent Black and percent White population based on grid polygons (Figures 12 and 13) as a point of comparison with census tracts because administrative boundaries (e.g., census tracts) change over time and generally don’t align with social boundaries. I calculated global univariate Moran’s I statistics for the percent Black population and percent White population based on grid polygons (Figure 14) and compared these results with those based on census tracts (Table 5). Using census tracts, the Moran’s I statistics indicated moderate levels of global spatial autocorrelation for both variables. Using grid polygons, the Moran’s I statistics indicated severe levels of global spatial autocorrelation for both variables.

**Conclusion**

This exploratory spatial analysis has demonstrated that spatial processes are likely present in the dynamics between race, poverty, and other social indicators in the Springfield, Missouri metropolitan statistical area. A natural next step is to examine whether there are statistically significant associations between poverty, race, and various other social indicators when accounting for spatial autocorrelation in the analysis.

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Appendix A. Tables and Figures











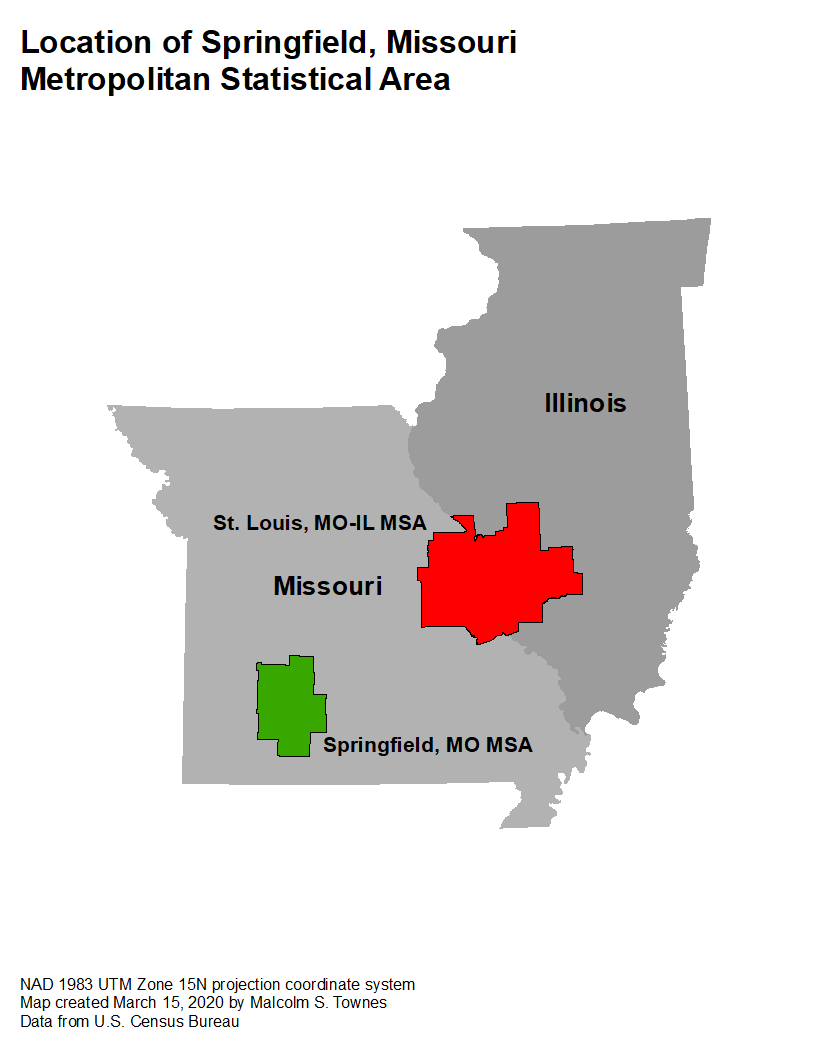


Figure 1. The Springfield, Missouri MSA is in the southwestern corner of the state of Missouri.

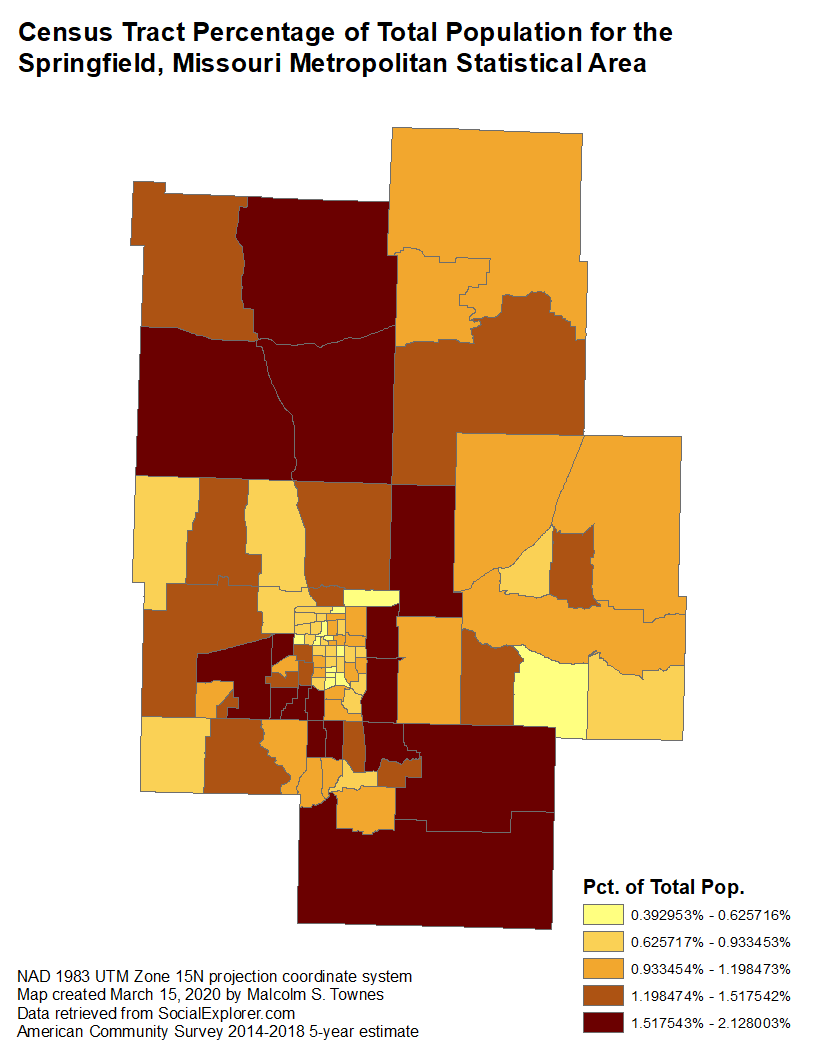


Figure 2. Distribution of population in the Springfield, Missouri Metropolitan Statistical Area.

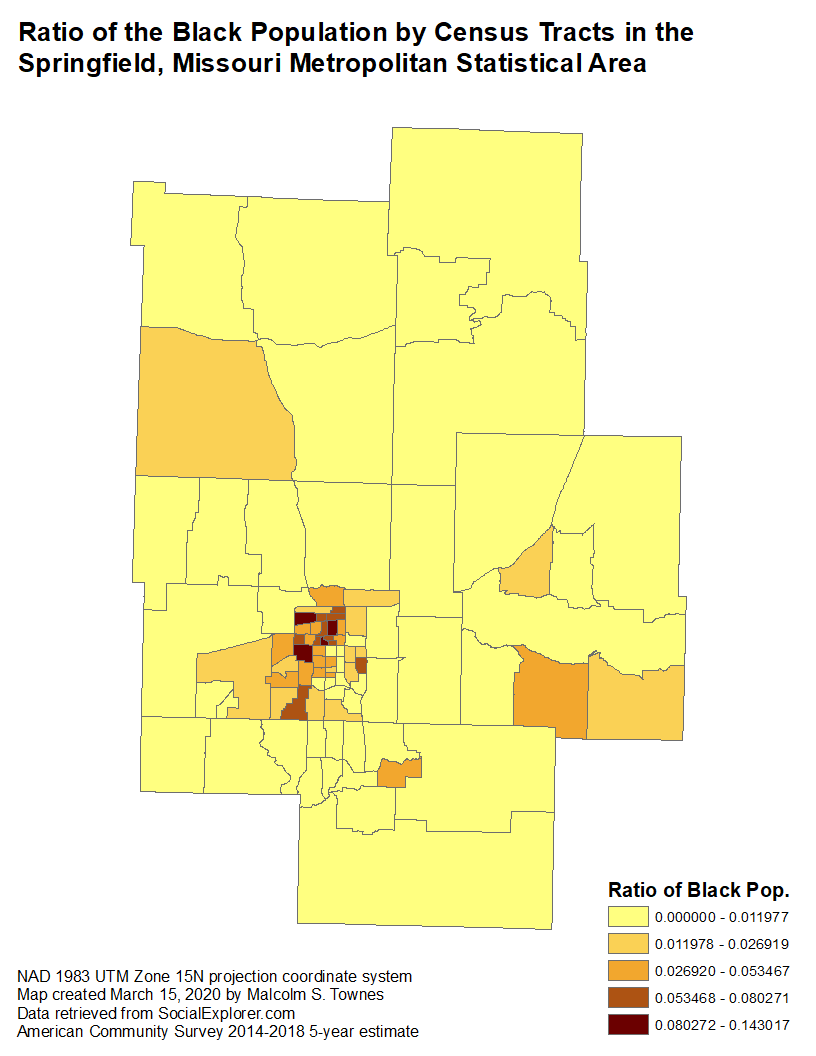


Figure 3. Percent Black population approaches the national average in only four census tracts.

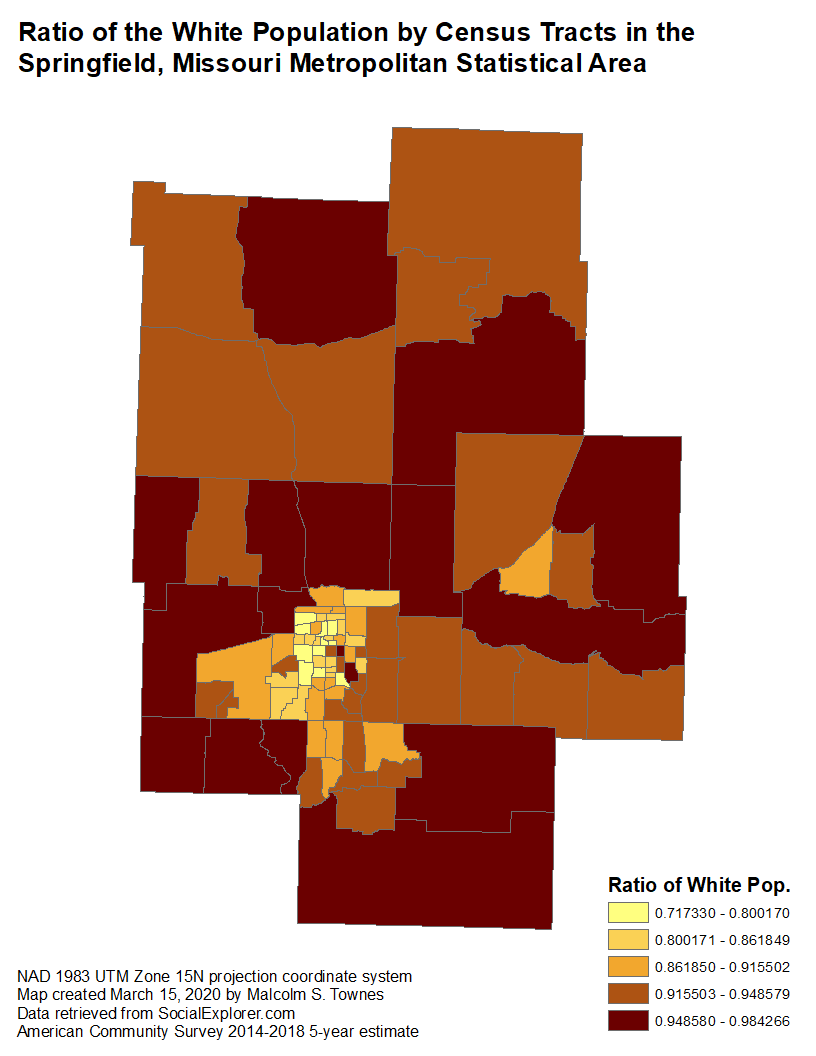


Figure 4. Greater than 85% of the population is White for the vast majority of census tracts.

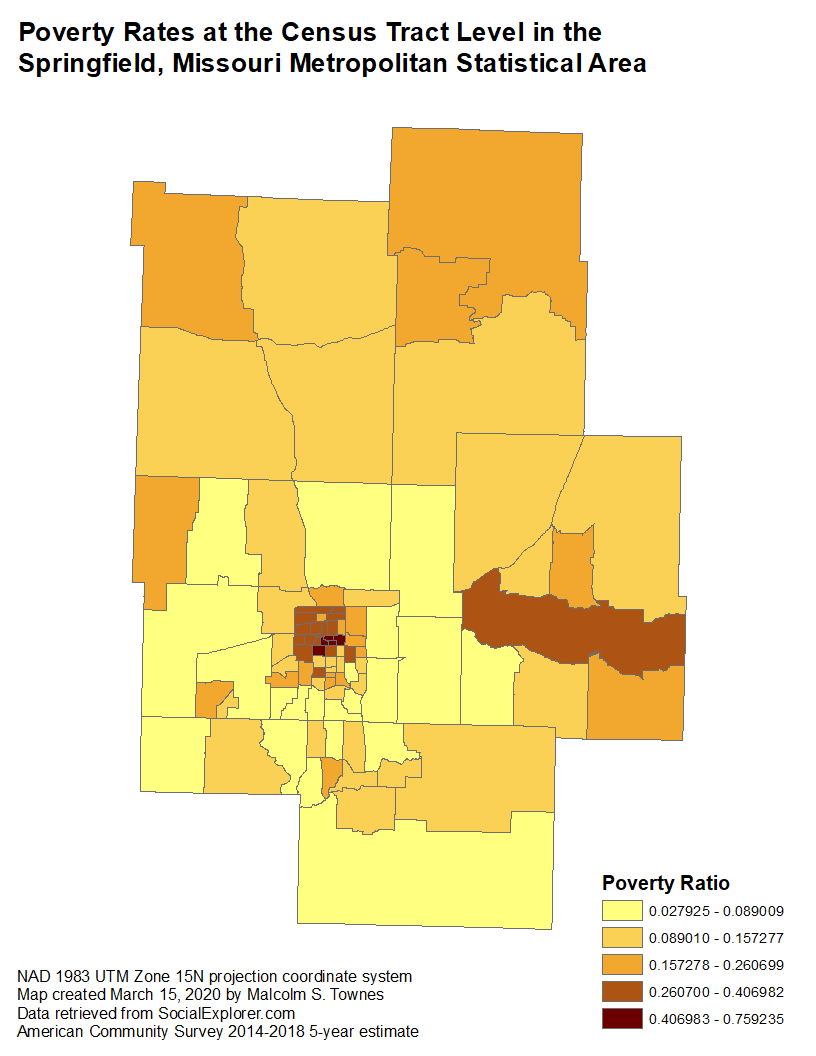


Figure 5. Highest rates of poverty are generally found close to the city of Springfield, Missouri.

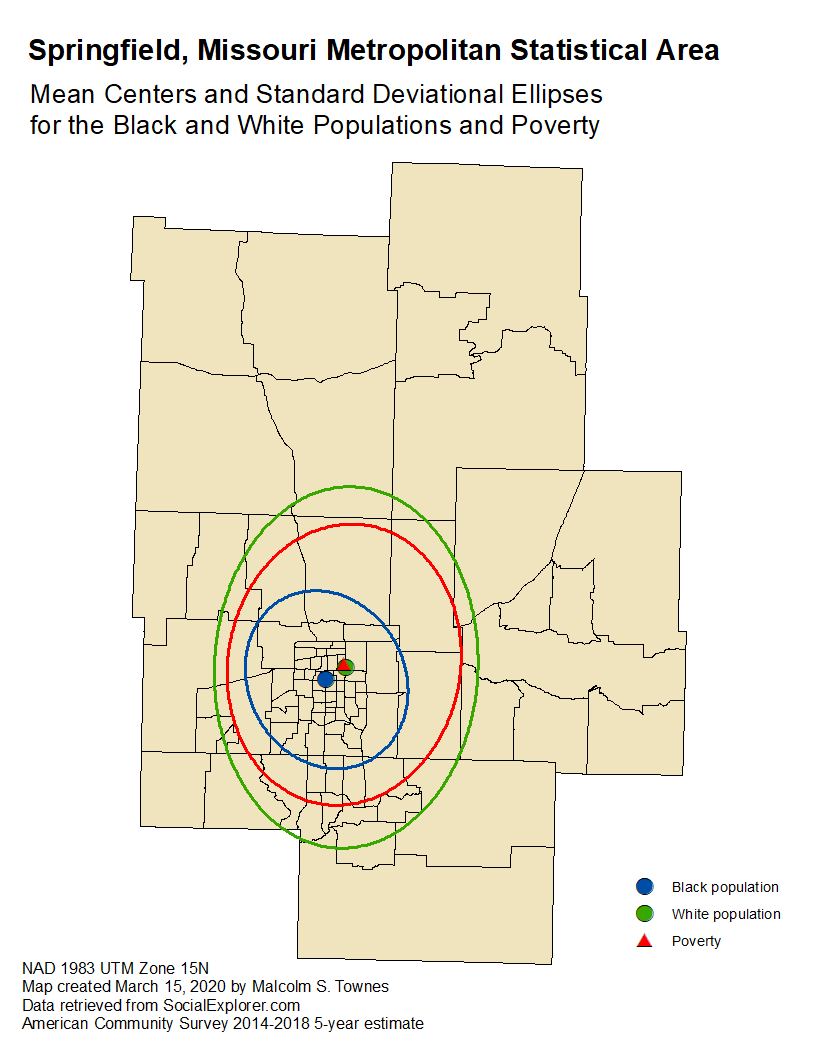
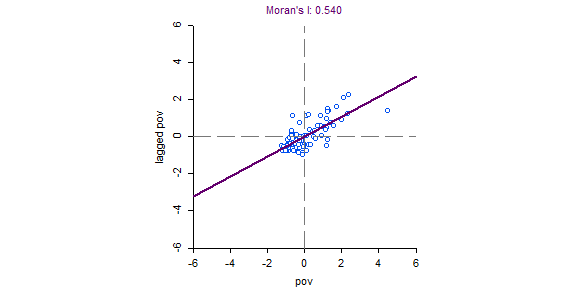
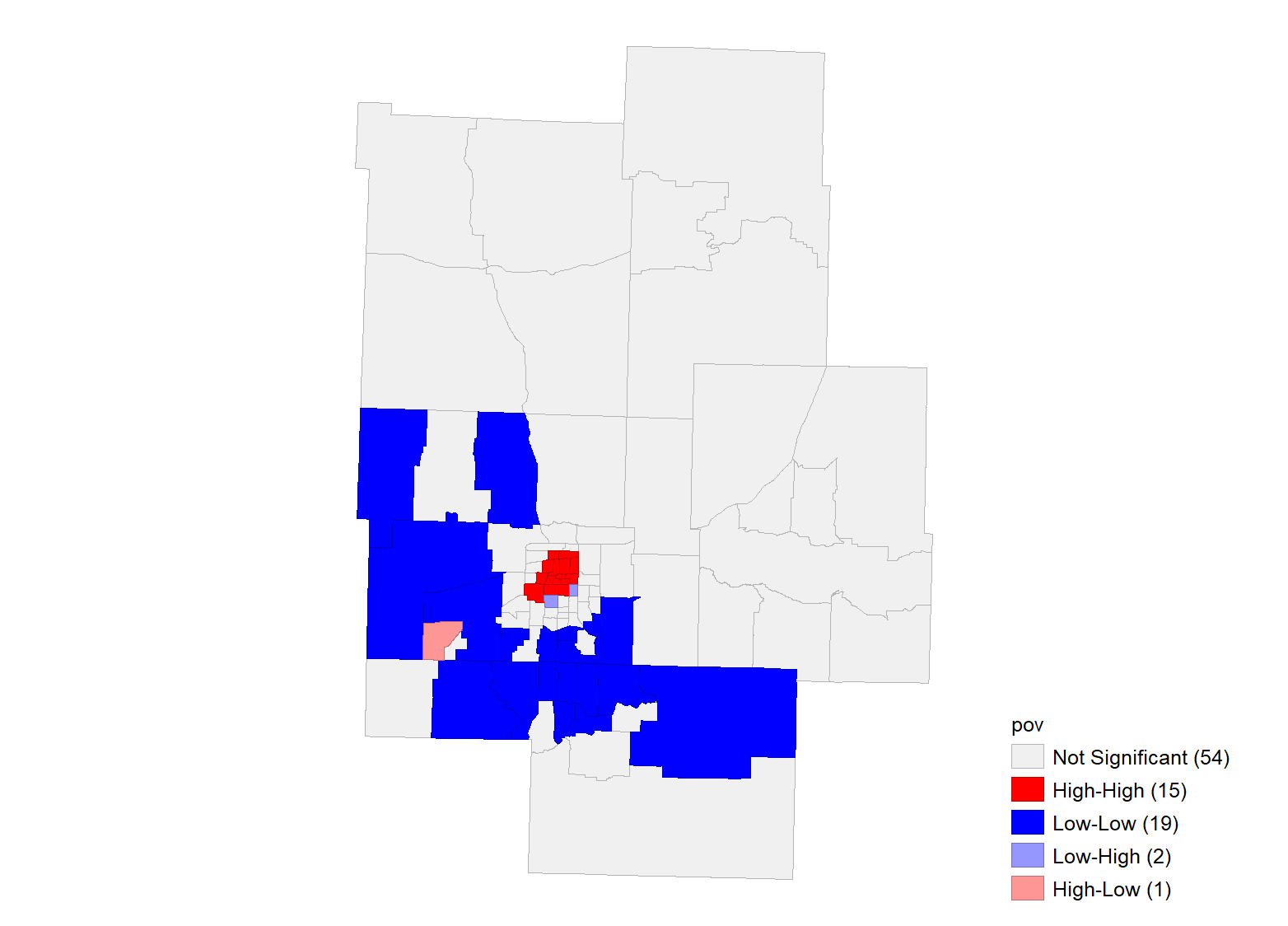
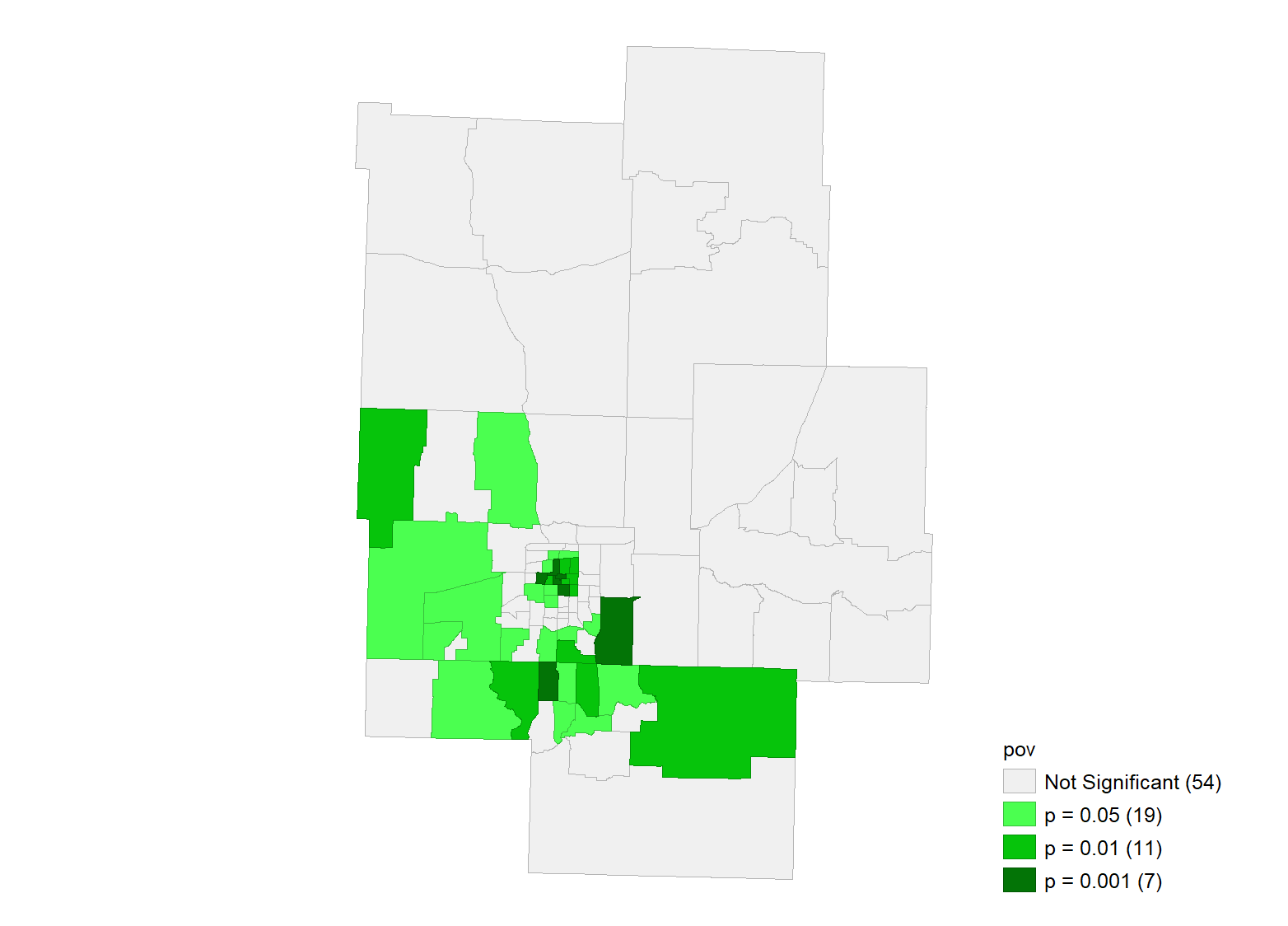


Figure 6. Spatial descriptive statistics for poverty ratio, Black population, and White population.

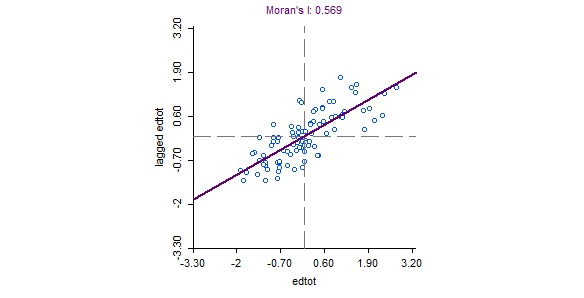


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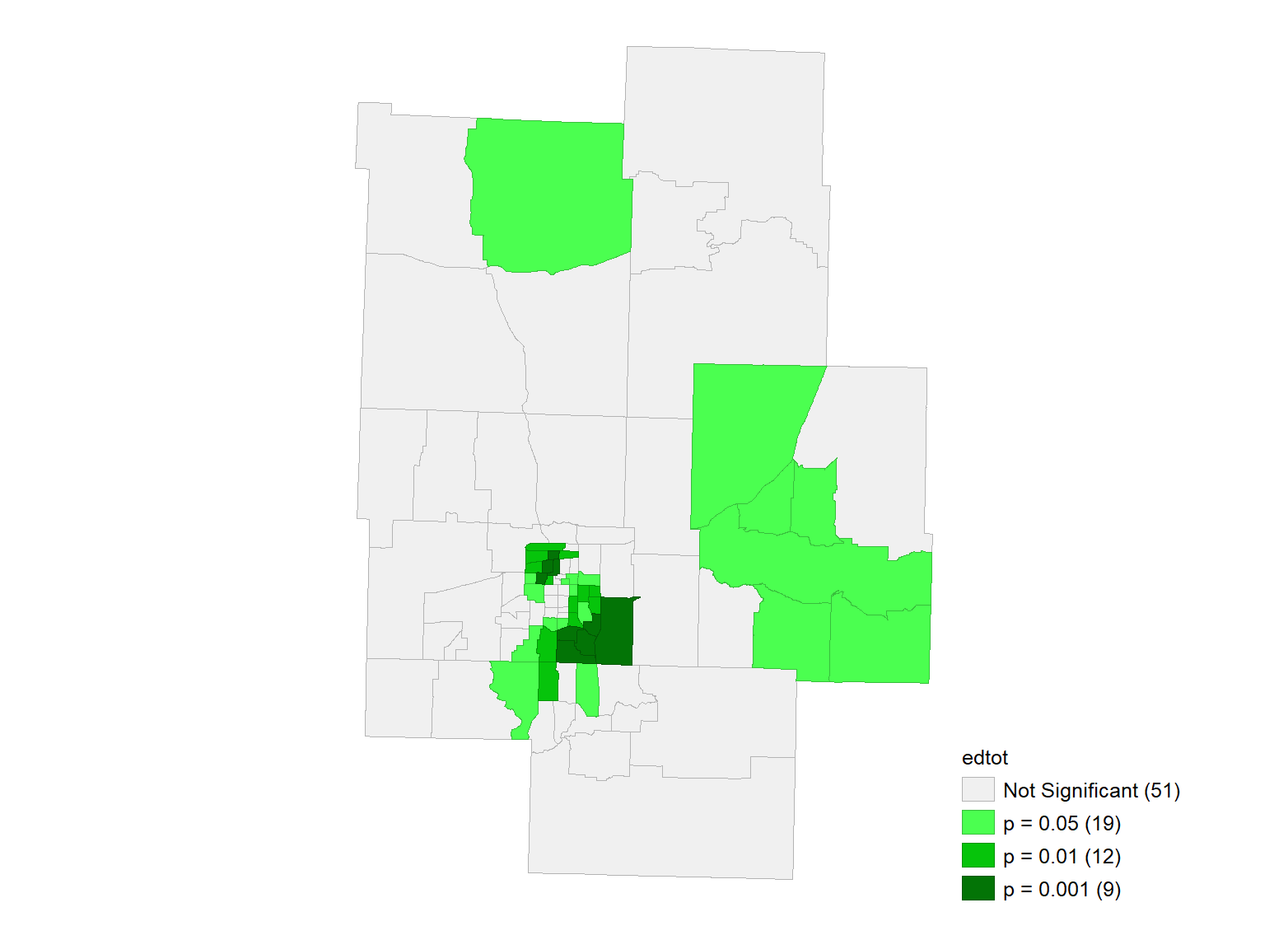
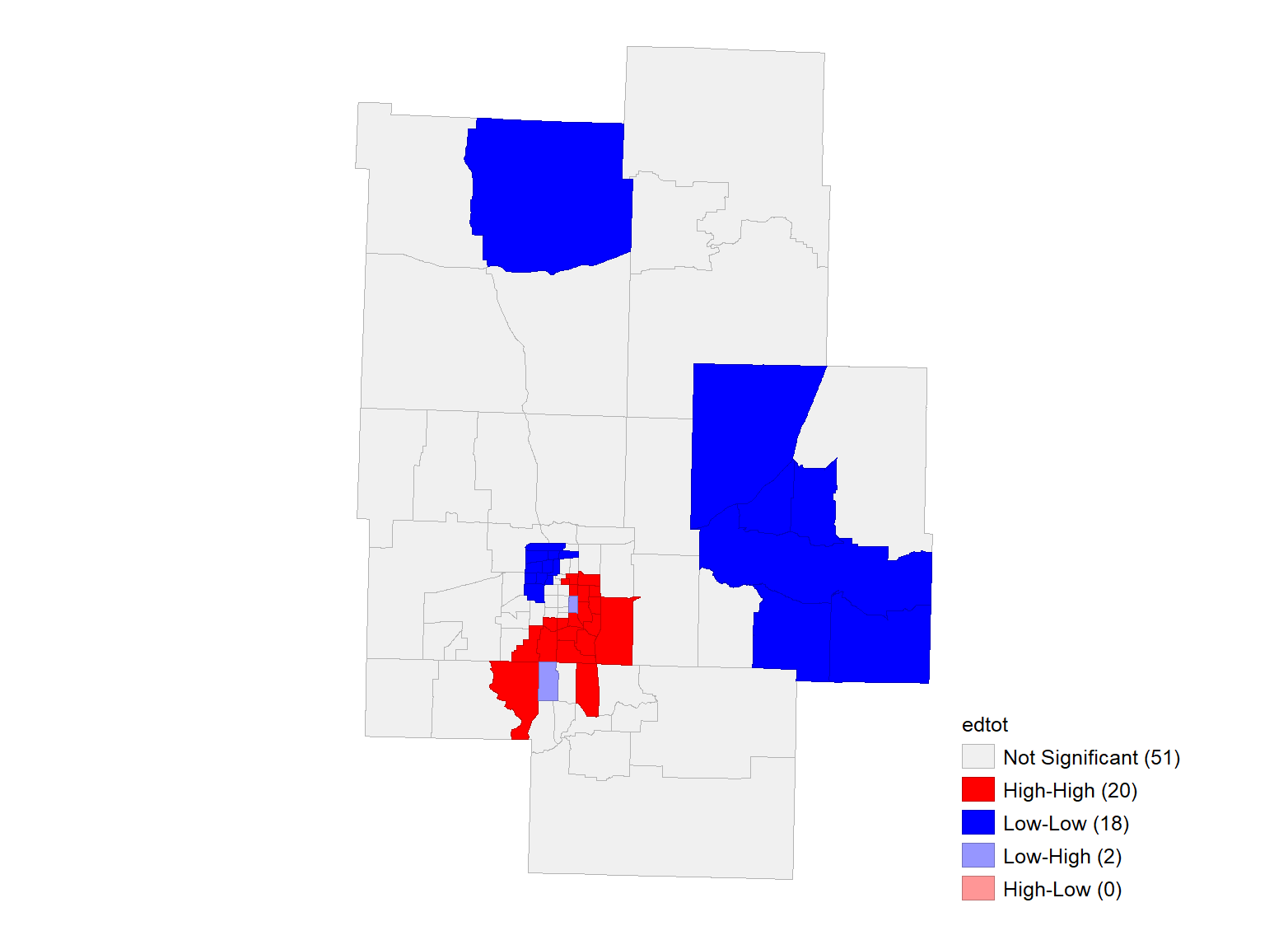
 

(b) (c)

Figure 7. Global spatial autocorrelation for poverty ratio at the census tract level.

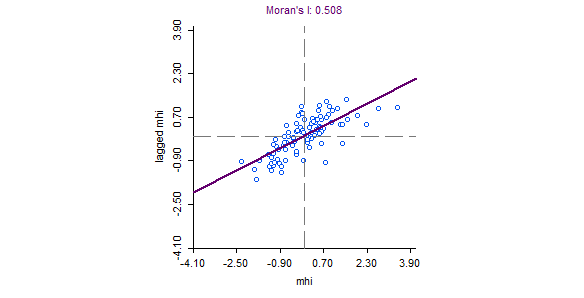


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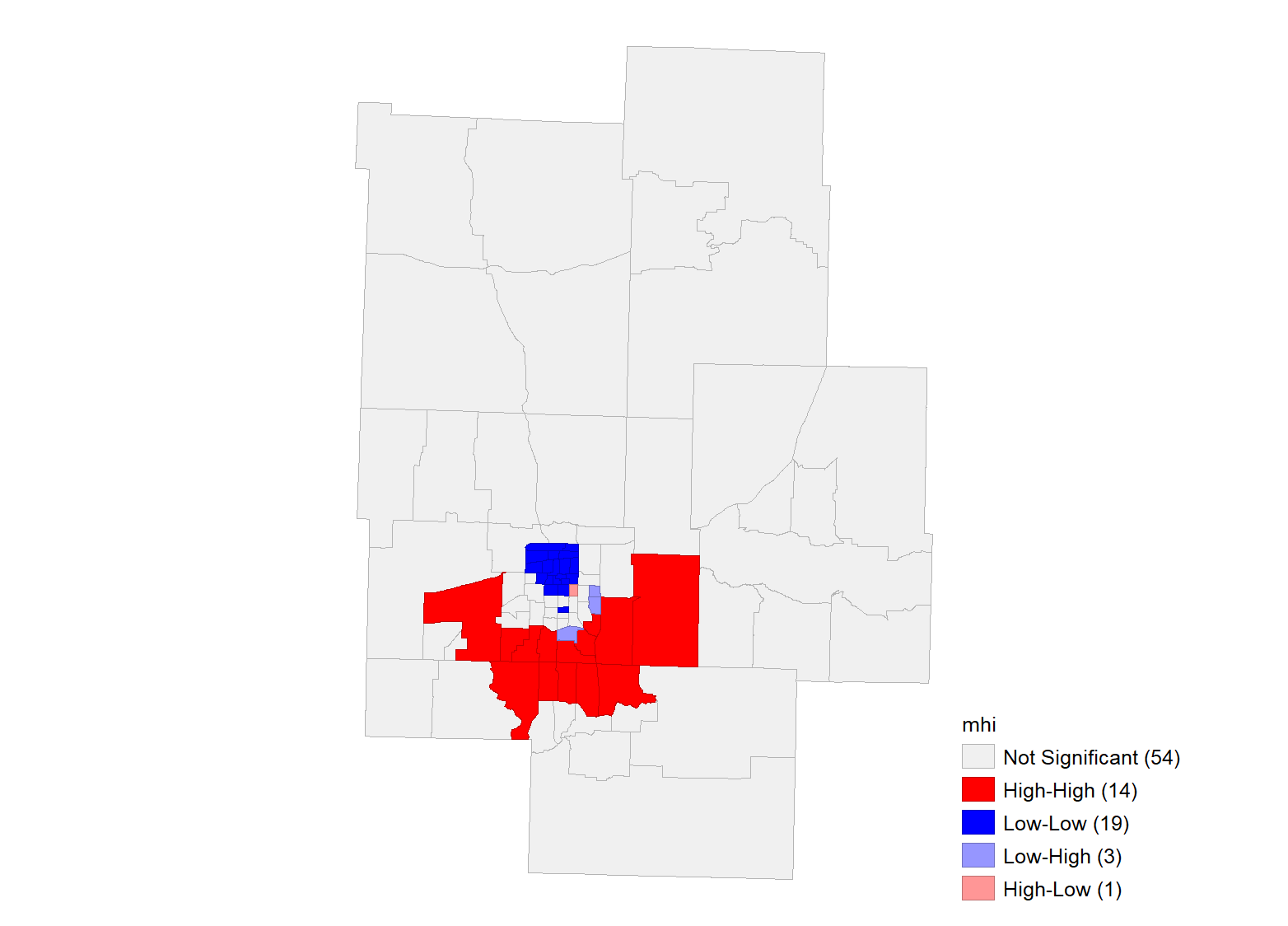
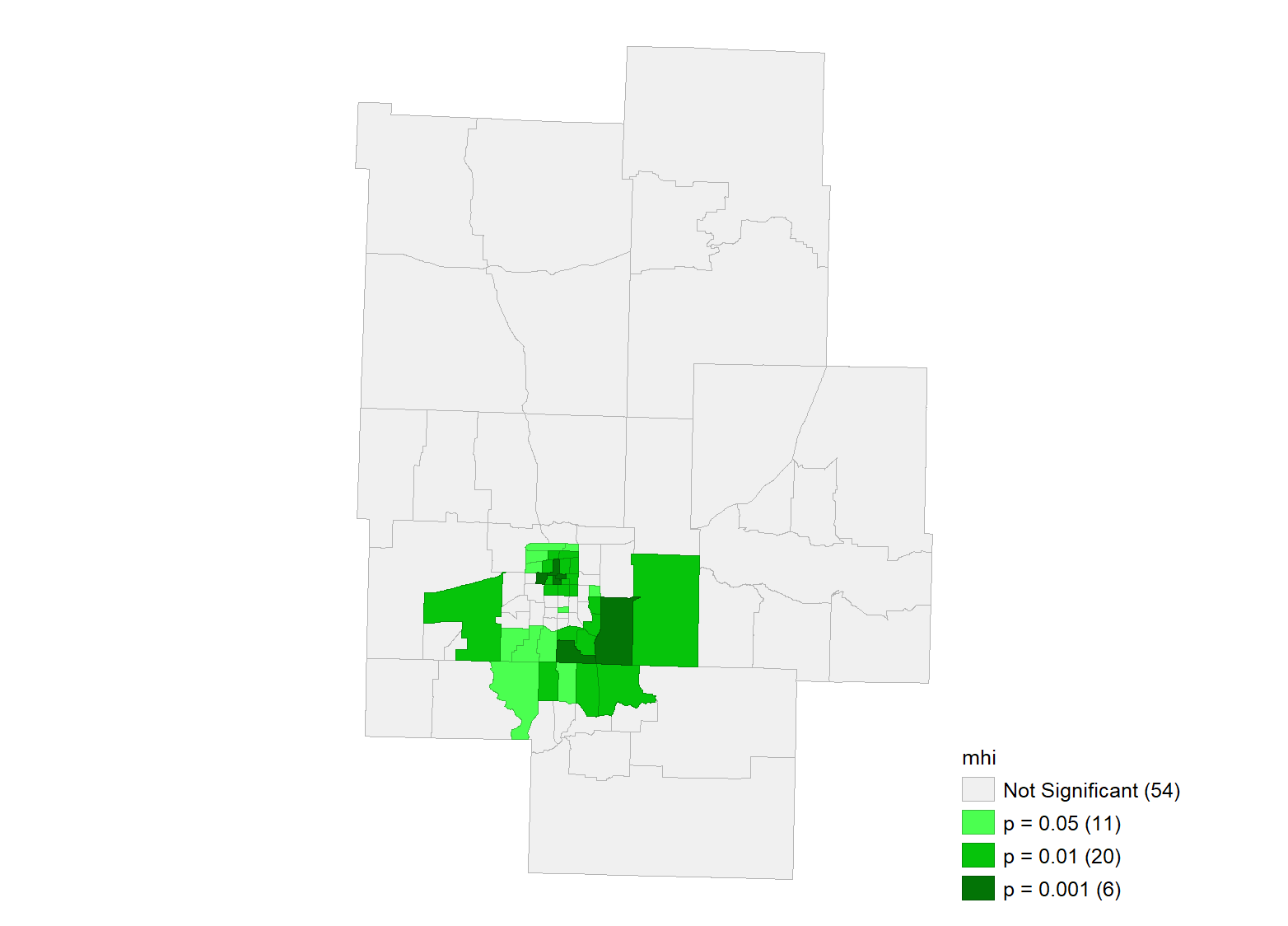


(b) (c)

Figure 8. Global spatial autocorrelation for education attainment index at the census tract level.

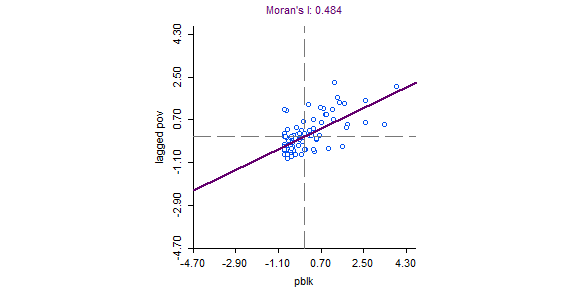


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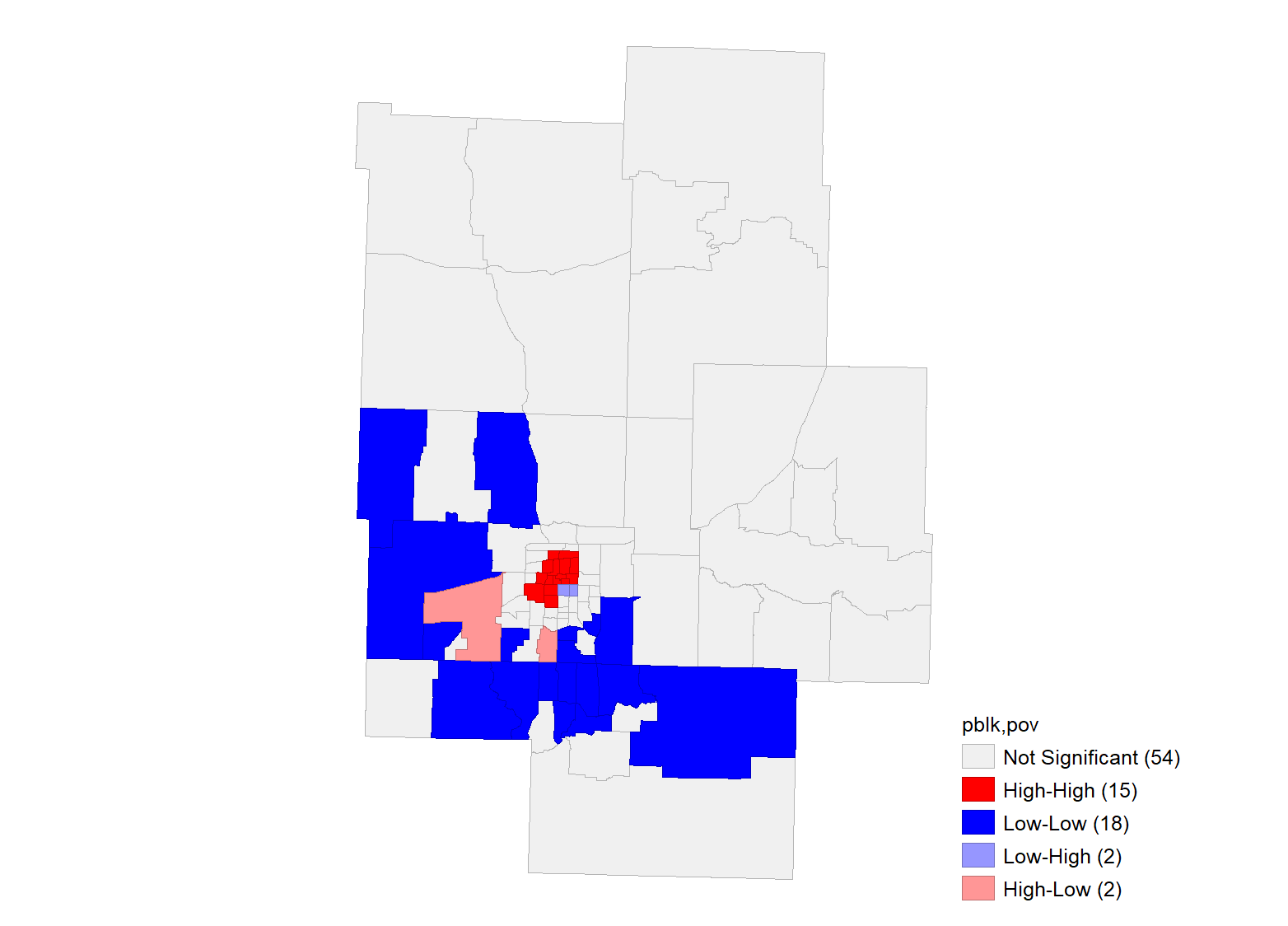
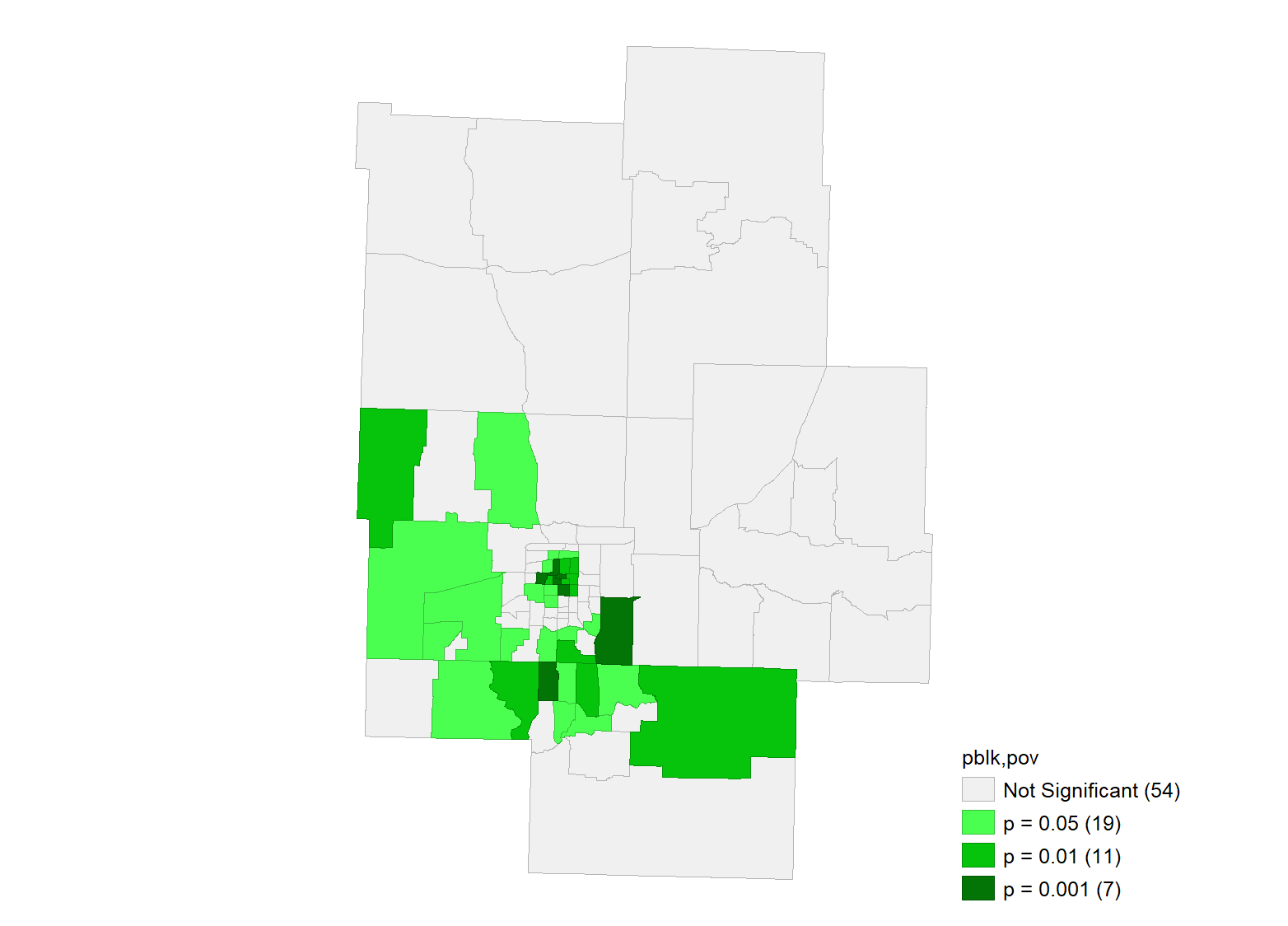
 

(b) (c)

Figure 9. Global spatial autocorrelation for mean household income at the census tract level.

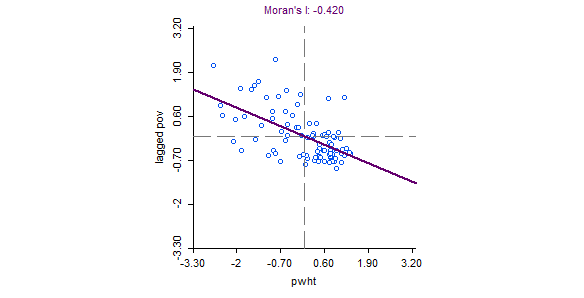


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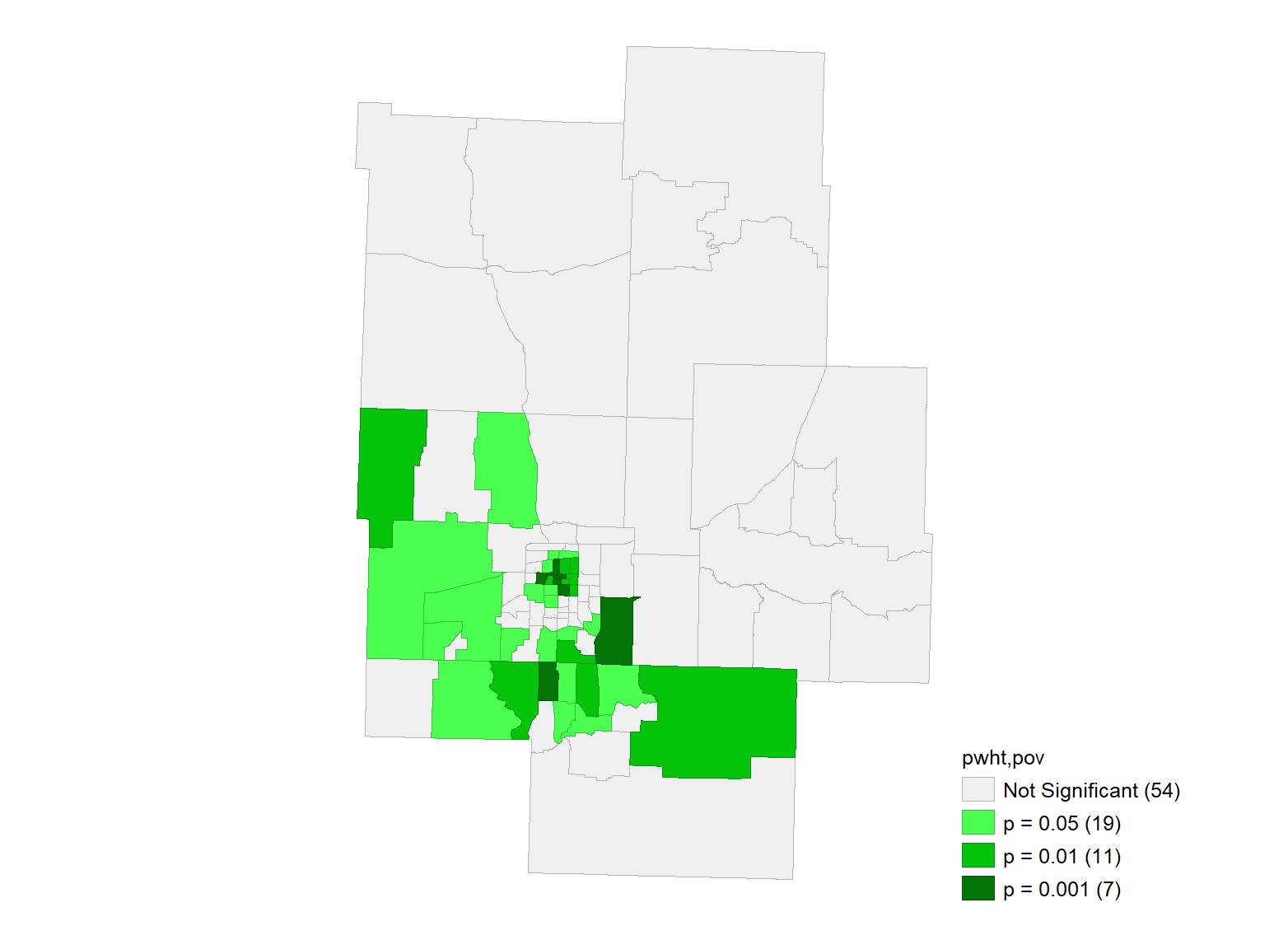
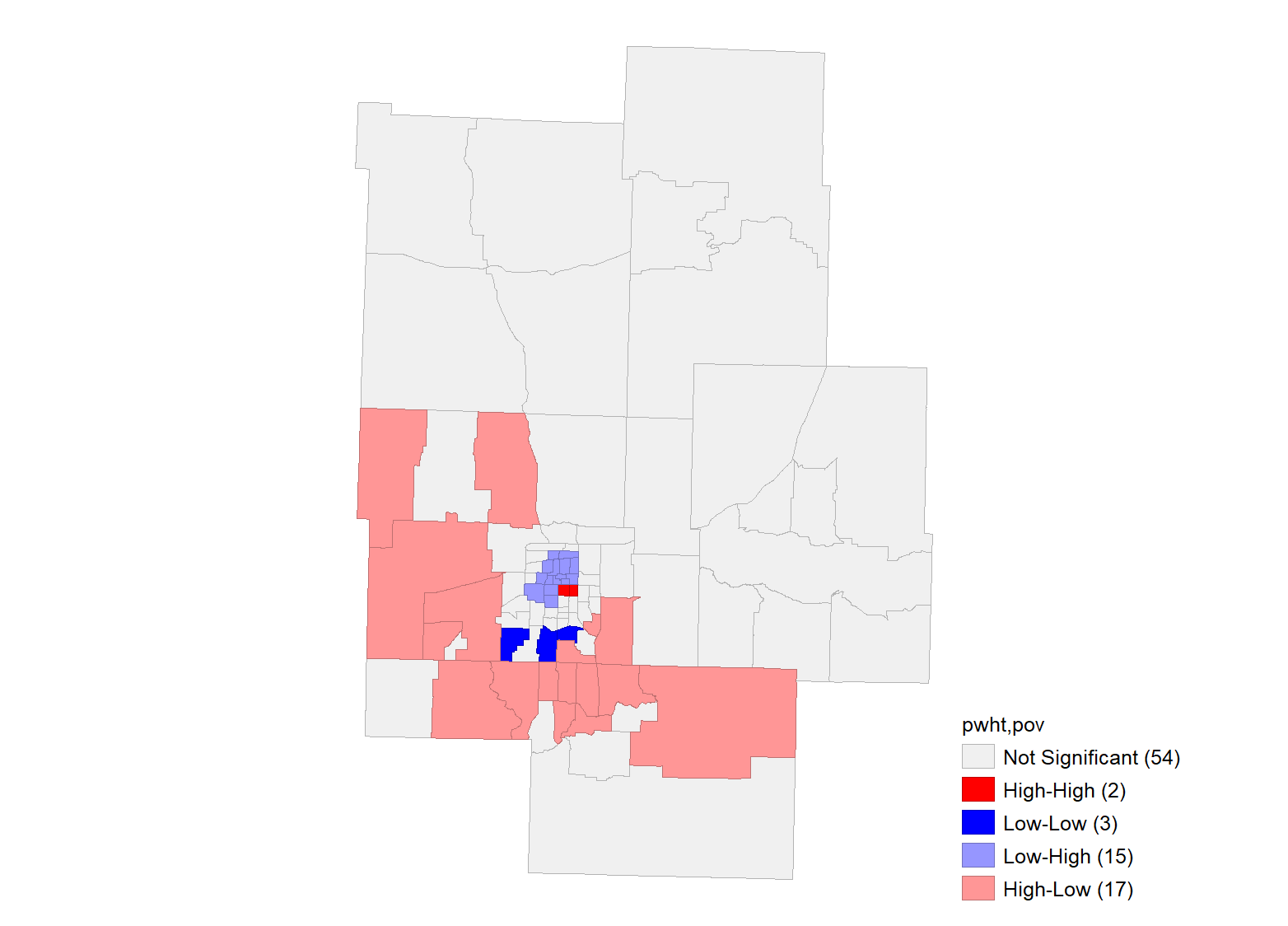
 

(b) (c)

Figure 10. Spatial autocorrelation found between percent Black population and poverty.



(a)



(b) (c)

Figure 11. Spatial autocorrelation found between percent White population and poverty.

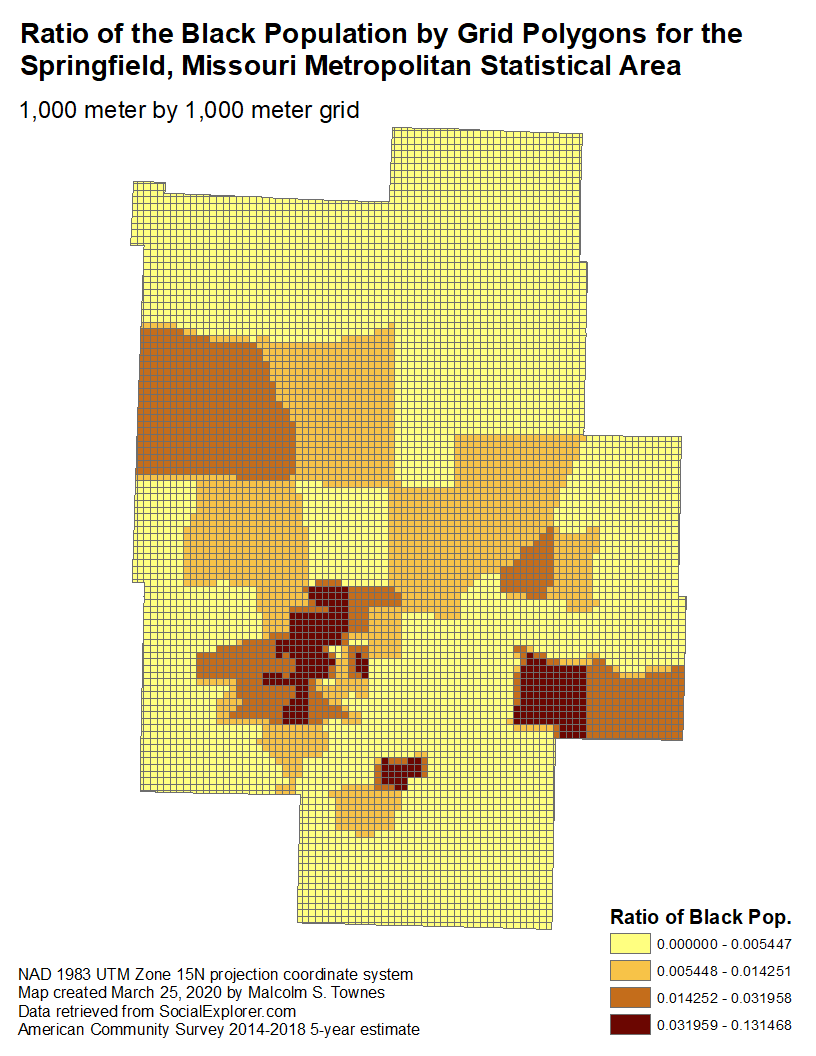


Figure 12. Black population appears concentrated in three pockets based on grid polygons.

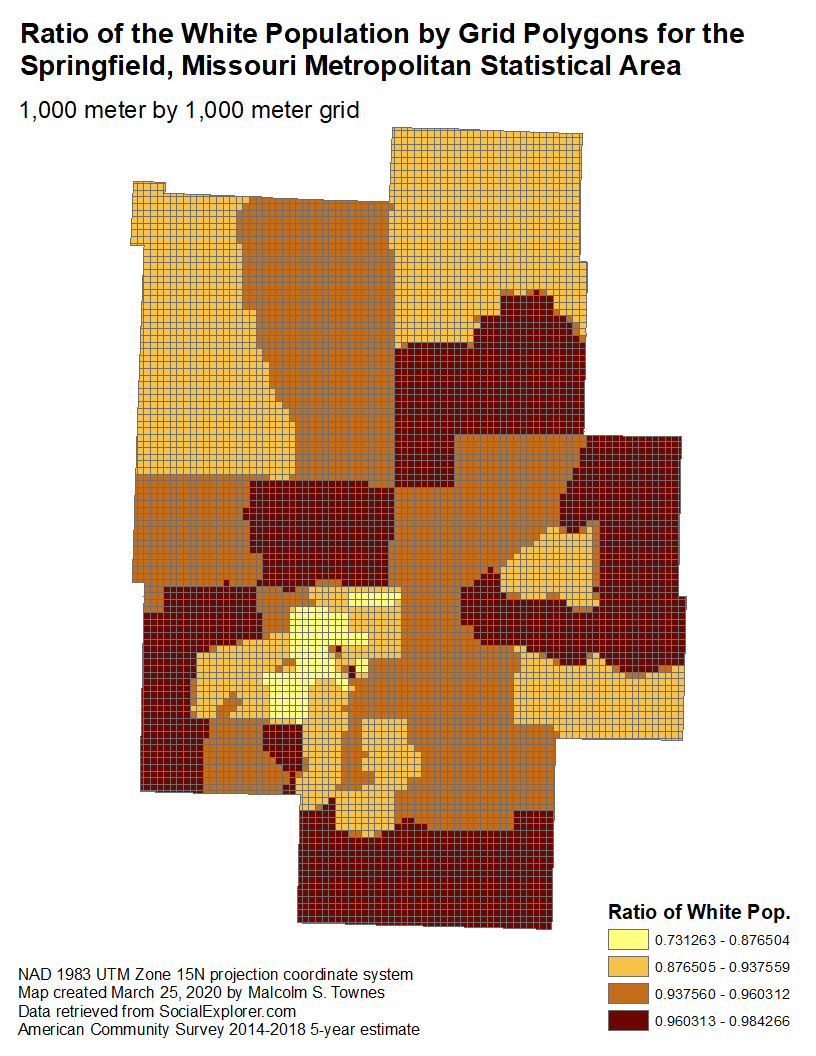
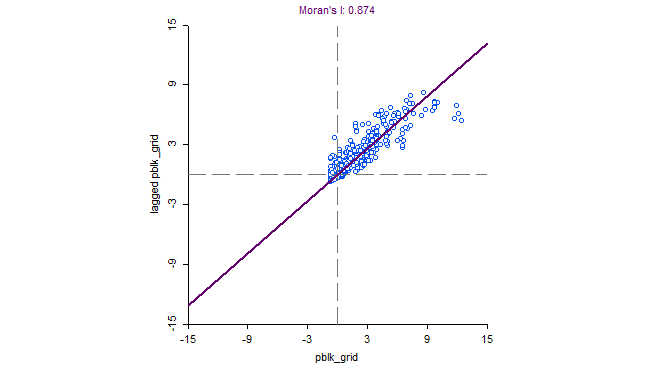
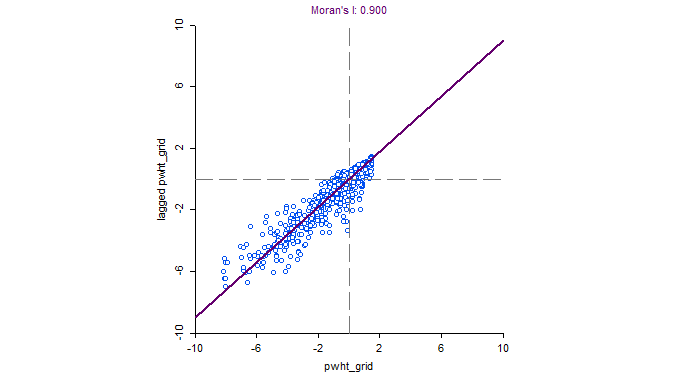


Figure 13. Greater than 87 percent of the population was White for the vast majority of grids.



(a)



(b)

Figure 14. Grid based Moran’s I indicates severe spatial autocorrelation for both populations.