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DEFINING A REGION, THE GREAT RIVER ROAD

A Master's Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Geography & Geology/Geospatial Science

By

Evan Arthur Telle

May 2021

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DEFINING A REGION, THE GREAT RIVER ROAD

Geography & Geology/Geospatial Science

Missouri State University, May 2021

Master of Science

Evan Arthur Telle

ABSTRACT

The Great River Road (GRR) is a set of scenic byways connecting the headwaters of the Mississippi River in Minnesota to its mouth in Louisiana. This route follows both the East and West banks of the river through the heartland of the United States. Since the 1970s, the GRR has been established as a tourism corridor for both domestic and foreign travelers. The GRR's intended purpose is to enhance local economic development through showcasing the Mississippi-regional culture and its natural environment. Chapter One analyzes data based on industry, occupation, education, and demographics to attempts to identify the economic and social boundaries of the GRR region in Missouri. Spatial representation and hot spot analysis using the Getis-Ord GI ArcGIS tool helped to determine a more concise socio-economic GRR region in the state of Missouri. Chapter Two applies finding from chapter one and applies it to the entire extent of the GRR. United States census data was used to assess the entire GRR region where data pertains to social, economic, housing, and demographic characteristics results from Chapter two help determine a socio-economic border for the GRR along the Mississippi River.

KEYWORDS: Great River Road, Missouri, Mississippi River, ArcGIS, hot spot analysis, economic development, economic review, social review, housing review, demographic review

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In the interest of academic freedom and the principle of free speech, approval of this thesis indicates the format is acceptable and meets the academic criteria for the discipline as determined by the faculty that constitute the thesis committee. The content and views expressed in this thesis are those of the student-scholar and are not endorsed by Missouri State University, its Graduate College, or its employees.

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TABLE OF CONTENTS

Chapter 1. Defining A Region, The Great River Road in Missouri 1
- Introduction 1
- Literature Review 3
  - The Great River Road's History 3
  - Economic, Social, and Geographic Reviews Defining Regions 5
  - The Great River Road in Missouri 7
- Methodology 9
  - Study Area 9
  - Data Collection and Analysis 13
- Results and Discussion 22
  - Social Characteristics 22
  - Economic Characteristics 25
  - Housing Characteristics 28
  - Demographic Characteristics 29
- Conclusion 63

Chapter 2. Defining A Region, The Great River Road Along The Mississippi River 68
- Introduction 68
- Literature Review 70
  - History of the Great River Road 70
  - Defining a Region in the United States 73
  - Defining a Region in Europe 76
  - The Great River Road 77
- Methodology 78
  - Study Area 78
  - Data Collection and Analysis 82
- Results and Discussion 92
  - Social Characteristics 92
  - Economic Characteristics 94
  - Housing Characteristics 97
  - Demographic Characteristics 99
  - Airbnb Data 100
- Conclusion 133

References 136

Appendices 139
- Appendix A. Chapter One Map Representations 139
- Appendix B. Chapter Two Map Representations 158

LIST OF TABLES

Table 1. Great River Road counties list in Missouri. 10

Table 2. Variable's list for chapter one 16

Table 3. GRR counties in each state along the Mississippi River 79

Table 4. Variable's list for chapter two 83

LIST OF FIGURES

Figure 1. Great River Road Sign 2

Figure 2. Missouri Counties 11

Figure 3. Great River Road App “Driving Guide” 12

Figure 4. Missouri Regions 14

Figure 5. Missouri Total Population Quantile Classification 19

Figure 6. Missouri Total Population Getis-Ord GI Classification 20

Figure 7. Missouri Urban Rural Distinction 21

Figure 8. Quantile representations of citizenship status 31

Figure 9. Getis-Ord GI representations of citizenship status 31

Figure 10. Quantile representations of household by type 32

Figure 11. Getis-Ord GI representations of household by type 32

Figure 12. Quantile representations of education attainment 33

Figure 13. Getis-Ord GI representations of education attainment 33

Figure 14. Quantile representations of disability by age 34

Figure 15. Getis-Ord GI representations of disability by age 34

Figure 16. Quantile representations of internet use 35

Figure 17. Getis-Ord GI representations of internet use 35

Figure 18. Quantile representations of employment status 36

Figure 19. Getis-Ord GI representations of employment status 36

Figure 20. Quantile representations of class worker 37

Figure 21. Getis-Ord GI representations of class worker 37

Figure 22. Panel of quantile representations of workers by occupation including management 38

Figure 23. Panel one of Getis-Ord GI representations of workers by occupation including management 38

Figure 24. Panel of quantile representations of workers by occupation including construction 39

Figure 25. Panel of Getis-Ord GI representations of workers by occupation including construction 39

Figure 26. Panel of quantile representations of workers by industry including agriculture 40

Figure 27. Panel of Getis-Ord GI representations of workers by industry including agriculture 40

Figure 28. Panel of quantile representations of workers by industry including retail trade 41

Figure 29. Panel of Getis-Ord GI representations of workers by industry including retail trade 41

Figure 30. Panel of quantile representations of workers by industry including scientific management 42

Figure 31. Panel of Getis-Ord GI representations of workers by industry including scientific management 42

Figure 32. Panel of quantile representations of workers by industry including public administration 43

Figure 33. Panel of Getis-Ord GI representations of workers by industry including public administration 43

Figure 34. Quantile representations of insurance coverage 44

Figure 35. Getis-Ord GI representations of insurance coverage 44

Figure 36. Panel of quantile representations of household income including less than $10,000 45

Figure 37. Panel of Getis-Ord GI representations of household income including less than $10,000 45

Figure 38. Panel of quantile representations of household income including $35,000 to $49,999 46

Figure 39. Panel of Getis-Ord GI representations of household income including $35,000 to $49,999 46

Figure 40. Panel of quantile representations of household income including $150,000 to $199,999 47

Figure 41. Panel of Getis-Ord GI representations of household income including $150,000 to $199,999 47

Figure 42. Panel of quantile representations of heating fuel including utility gas 48

Figure 43. Panel of Getis-Ord GI representations of heating fuel including utility gas 48

Figure 44. Panel of quantile representations of heating fuel including coal, coke 49

Figure 45. Panel of Getis-Ord GI representations of heating fuel including coal, coke 49

Figure 46. Panel of quantile representations of heating fuel including no fuel 50

Figure 47. Panel of Getis-Ord GI representations of heating fuel including no fuel 50

Figure 48. Panel of quantile representations of year structure built from 1939 to 1969 51

Figure 49. Panel of Getis-Ord GI representations of year structure built from 1939 to 1969 51

Figure 50. Panel of quantile representations of year structure built from 1970 to 2009 52

Figure 51. Panel of Getis-Ord GI representations of year structure built from 1970 to 2009 52

Figure 52. Panel of quantile representations of year structure built from 2010 to present 53

Figure 53. Panel of Getis-Ord GI representations of year structure built from 2010 to present 53

Figure 54. Panel of quantile representations of home value including less than $50,000 54

Figure 55. Panel of Getis-Ord GI representations of home value including less than $50,000 54

Figure 56. Panel of quantile representations of home value including $200,000 to $299,999 55

Figure 57. Second panel of Getis-Ord GI representations of home value including $200,000 to $299,999 55

Figure 58. Panel of quantile representations of home value including $2,000,000 or more 56

Figure 59. Panel of Getis-Ord GI representations of home value including $2,000,000 or more 56

Figure 60. Panel of quantile representations of age from under 5 to 19 57

Figure 61. Panel of Getis-Ord GI representations of age from under 5 to 19 57

Figure 62. Panel of quantile representations of age from 20 to 54 58

Figure 63. Panel of Getis-Ord GI representations of age from 20 to 54 58

Figure 64. Panel of quantile representations of age from 55 to 84 59

Figure 65. Panel of Getis-Ord GI representations of age from 55 to 84 59

Figure 66. Panel of quantile representations of age including 85 and over 60

Figure 67. Panel of Getis-Ord GI representations of age including 85 and over 60

Figure 68. Panel of quantile representations of race including male 61

Figure 69. Panel of Getis-Ord GI representations of race including male 61

Figure 70. Panel of quantile representations of race including American Indian 62

Figure 71. Panel of Getis-Ord GI representations of race including American Indian 62

Figure 72. Proposed GRR subregions in Missouri 67

Figure 73. Example of the GRR road sign 69

Figure 74. Five tributaries feeding the Mississippi River 81

Figure 75. Counties in states bordering the Mississippi River 84

Figure 76. Total population represented by Jenks natural breaks classification 85

Figure 77. Total population represented by quantile classification 89

Figure 78. Total population represented by Getis-Ord GI hot spot analysis 90

Figure 79. Percentage of urban population and area in each county 91

Figure 80. Quantile representations of citizenship status 102

Figure 81. Getis-Ord GI representations of citizenship status 102

Figure 82. Panel of quantile representations of high school educational attainment 103

Figure 83. Panel of Getis-Ord GI representations of high school educational attainment 103

Figure 84. Panel of quantile representations of higher learning educational attainment 104

Figure 85. Panel of Getis-Ord GI representations of higher learning educational attainment 104

Figure 86. Quantile representations of internet use 105

Figure 87. Getis-Ord GI representations of internet use 105

Figure 88. Quantile representations of employment status 106

Figure 89. Getis-Ord GI representations of employment status 106

Figure 90. Panel of quantile representations of workers by occupation including management 107

Figure 91. Panel of Getis-Ord GI representations of workers by occupation including manaegement 107

Figure 92. Panel of quantile representations of workers by occupation including sales, office 108

Figure 93. Panel of Getis-Ord GI representations of workers by occupation including sales, office 108

Figure 94. Panel of quantile representations of workers by occupation including production transit 109

Figure 95. Panel of Getis-Ord GI representations of workers by occupation including production transit 109

Figure 96. Panel of quantile representations of workers by industry including agriculture 110

Figure 97. Panel of Getis-Ord GI representations of workers by industry including agriculture 110

Figure 98. Panel of quantile representations of workers by industry including manufacturing 111

Figure 99. Panel of Getis-Ord GI representations of workers by industry including manufacturing 111

Figure 100. Panel of quantile representations of workers by industry including retail trade 112

Figure 101. Panel of Getis-Ord GI representations of workers by industry including retail trade 112

Figure 102. Panel of quantile representations of workers by industry including information 113

Figure 103. Panel of Getis-Ord GI representations of workers by industry including information 113

Figure 104. Panel of quantile representations of workers by industry including scientific management 114

Figure 105. Panel of Getis-Ord GI representations of workers by industry including scientific management 114

Figure 106. Panel of quantile representations of workers by industry including arts, rec., food services 115

Figure 107. Panel of Getis-Ord GI representations of workers by industry including arts, rec., food services 115

Figure 108. Panel of quantile representations of workers by industry including public administration 116

Figure 109. Panel of Getis-Ord GI representations of workers by industry including public administration 116

Figure 110. Quantile representations of household income 117

Figure 111. Getis-Ord GI representations of household income 117

Figure 112. Panel of quantile representations of heating fuel including utility gas 118

Figure 113. Panel of Getis-Ord GI representations of heating fuel including utility gas 118

Figure 114. Panel of quantile representations of heating fuel including electricity 119

Figure 115. Panel of Getis-Ord GI representations of heating fuel including electricity 119

Figure 116. Panel of quantile representations of year structure built from 1939 to 1949 120

Figure 117. Panel of Getis-Ord GI representations of year structure built from 1939 to 1949 120

Figure 118. Panel of quantile representations of year structure built from 1950 to 1969 121

Figure 119. Panel of Getis-Ord GI representations of year structure built from 1950 to 1969 121

Figure 120. Panel of quantile representations of year structure built from 1970 to 1989 122

Figure 121. Panel of Getis-Ord GI representations of year structure built from 1970 to 1989 122

Figure 122. Panel of quantile representations of year structure built from 1990 to 2009 123

Figure 123. Panel Getis-Ord GI representations of year structure built from 1990 to 2009 123

Figure 124. Panel of quantile representations of year structure built from 2010 to present 124

Figure 125. Panel of Getis-Ord GI representations of year structure built from 2010 to present 124

Figure 126. Panel of quantile representations of home value including less than $50,000 125

Figure 127. Panel of Getis-Ord GI representations of home value including less than $50,000 125

Figure 128. Panel of quantile representations of home value including $100,000 to $149,999 126

Figure 129. Panel of Getis-Ord GI representations of home value including $100,000 to $149,999 126

Figure 130. Panel of quantile representations of home value including $200,000 to $299,999 127

Figure 131. Panel of Getis-Ord GI representations of home value including $200,000 to $299,999 127

Figure 132. Panel of quantile representations of home value including $500,000 to $999,999 128

Figure 133. Panel of Getis-Ord GI representations of home value including $500,000 to $999,999 128

Figure 134. Panel of quantile representations of home value including median home value 129

Figure 135. Panel of Getis-Ord GI representations of home value including median home value 129

Figure 136. Panel of quantile representations of race including White 130

Figure 137. Panel of Getis-Ord GI representations of race including White 130

Figure 138. Panel of quantile representations of race including Hispanic or Latina 131

Figure 139. Panel of Getis-Ord GI representations of race including Hispanic or Latina 131

Figure 140. Airbnb locations in each county 132

CHAPTER ONE: DEFINING A REGION, THE GREAT RIVER ROAD IN MISSOURI

Introduction

The state of Missouri is part of the Midwest region of the United States. Situated on the western banks of the Mississippi River, Missouri is located between latitudes 36°N and 40° 35' N and longitude 89° 6' W and 95° 42' N in the center of the Mississippi River basin. The Mississippi River starts at Lake Itasca in Minnesota and flows 2,350 miles (3781.958 kilometers) to the Gulf of Mexico in Louisiana, based on National Park Service findings. In the 1950s, the federal government allocated funding for a set of scenic byways to be constructed, repaired, and maintained along the entire extent of the Mississippi River. This set of roads would be known as the Great River Road (GRR) and the Mississippi River Parkway Commission (MRPC) was created to oversee this new designated network of roads. The GRR follows the Mississippi River on both banks of the river from Minnesota to Louisiana. The state of Missouri maintains over three hundred and ninety-five miles of the GRR as it travels alongside the western bank of Mississippi River.

A region is a defined area based on similar physical, social, cultural, and or economic characteristics. The MRPC in Missouri classifies the GRR "region" as counties adjacent to the Mississippi River, stated in article 226. 455 section three of the duties and responsibilities of the MRPC in Missouri ("Missouri state statutes", 1979). This includes seventeen eastern counties, with fifteen having the GRR running within the boundaries of those counties. One question posed in this study considers if this rigid boundary for the GRR "region" is accurate, or if the "region" should be expanded westward further into the interior of the state.

Along the entirety of the route, signs are present indicating if drivers are on the GRR. The

design of the logo resembles a river boat wheel with the title “Great River Road” written at the top of the wheel and the name of the state that section of the road is in at the bottom. Figure 1 is an example of the GRR road sign seen along the route, with the general title “Canada To Gulf” in place of a specific state name.

Figure 1: The road sign design seen along the GRR (MnDOT).

The GRR was created to encourage the movement of commercial and private vehicles in the ten states along the Mississippi River. This conceptualization of a Route 66-styled automobile corridor never fully developed. However, the GRR’s presence within Missouri and the other nine states along the Mississippi is interesting and generally understudied. What socio-economic impacts does the GRR have on the counties it runs through? In this study, the socio-economic characteristics present in Missouri will be analyzed to see if the GRR has impact on the eastern-most counties in the state. County-level data from five-year estimates (2014 – 2018) conducted by the United States Census Bureau is used to give greater insight of any impacts the GRR has in Missouri. Considering social, economic, housing, and demographic information will help identify a region centered around the GRR in Missouri.

Spatial and statistical analysis will be used to determine patterns in the state and along the GRR. ESRI ArcMap is used to help represent county-level census data in Missouri. Hot spot analysis will further assist in spatial examination of patterns present throughout Missouri. This spatial data will provide further information about the true border of the GRR.

Literature Review

The Great River Road's History. The Mississippi River begins in central Minnesota and crosses the central United States, moving south before emptying into the Gulf of Mexico. Historically, this waterway has been used for the transportation of goods and people up and down the Midwestern United States. The unique culture of this region would inspire Mark Twain to write his novel *The Adventures of Huckleberry Finn*. The Mississippi River's economic and cultural identity would also inspire the creation of the Great River Road as a means to preserve and promote this historic waterway. The Great River Road's history began in 1936 when the Missouri Planning Board proposed a river road along the full extent of the Mississippi River (Smith, 1998). This plan would connect ten states and two Canadian provinces when completed, spanning almost three-thousand miles. In 1938, the Mississippi River Parkway Planning Commission was created and took many of the same ideas put forth by the Missouri Planning Board. In 1939, the river road concept gained popularity, and talk of authorizing studies over the logistics of creating such a road began (Smith, 1998). Discussion or funding for the project ceased until the conclusion of World War II in the late 1940s. It would not be until 1951 when an official report was completed by the Bureau of Public Roads on the plausibility of a river road (Smith, 1998).

With a clear goal for a scenic route along the Mississippi River, federal funds were set

aside for the river road in the Federal Highway Act of 1954 (Smith, 1998). The next two decades were spent finding suitable routes for the scenic drive (Smith, 1998). Even though federal funds were allocated to the Great River Road, states put up navigation signs and individually allocated funds for the project; no federal aid was provided. This changed in 1976 when the Federal Highway Administration distributed federal funding to states that followed their guidelines for the scenic road (Smith, 1998). Individual states could set further restrictions and protections on scenic routes as well. Both federal and state roads focused on incorporating the most scenic, historic, and recreational routes along the Mississippi River. The Great River Road is a patch work of federal and state roads; however, no distinction or advertisements prioritized state or federal roads over the other (Smith, 1998).

Since the 1970s, the Great River Road has experienced a dwindling of federal government interest and development regulation. Travel articles give detail to small sections of the Great River Road, displaying the capability for added tourism in these local areas. (Berlin, & Chu, 2006) photographed locks and dams, barges, homes, watersports, boating, and more along the upper Mississippi River. Care was given to show the recreational, economic, and residential character for this portion of the Great River Road. (Bures, 2008) insists the start of a "Midwestern Renaissance" is beginning in and around Minneapolis and sweeping south down the Mississippi River. Bures lists several music studios and art museums from Minneapolis, Minnesota to Davenport, Iowa. (Measells, & Grado, 2008) studied the economic impacts of two birding festivals in the state of Mississippi. They surveyed visitor spending habits at one of these festivals taking place along the Great River Birding Trail, which coincides with the Great River Road's location within the state. (Mueller, 1998) emphasizes the unique opportunity the Great River Road provides- the ability to see a major world river from head waters to mouth. The

Amazon and Nile Rivers are unable to boast such experiences due to lack of infrastructure. The Mississippi River dominates North America, and any individual with a vehicle can experience it in its geographic entirety.

The Great River Road is identifiable through web searches, with an official website showcasing places and activities along the road. However, the Great River Road has sparked little interest in pop culture or academia over the past two decades. Regardless of popularity, this historic scenic route connects tourists to major cities and small towns all along the Mississippi River and warrants further study. The GRR in 2021 was given the title All American Road in eight of the ten states the scenic route travels through.

Economic, Social, and Geographic Reviews Defining Regions. The GRR has been consistently referred to as a "region"; in order to accurately do so, however, we must address this question: How are regions defined, and what does it mean to be a part of a region? A region can be classified in several different ways. It can be a strictly geographic distinction, an economic one. Congress often sets political boundaries of regions for the purposes of economic stimulus programs and studies. Often, each of these aspects are utilized in setting a region in the United States and around the world. A good example of a geographic, political, and economic region as the Appalachian region in the Eastern United States.

The Appalachian Regional Commission (ARC) was established by Congress to help identify and address slow economic growth in the geographic highlands and mountains of the Eastern United States. One study of the Appalachian Mountains region set by the ARC. Evaluating the effectiveness of the ARC, Isserman and Rephann used twin counties outside the Appalachian region to determine if the ARC increased the rate of growth for economies inside Appalachia (Isserman, & Rephann, 1995). Joshi and Geremedhin (2012) conducted a study using

the regional boundaries set by the ARC, which includes more than four-hundred counties in thirteen states (Joshi, & Geremedhin, 2012). Looking at this political and geographic region, Joshi and Geremedhin compared variables such as education rates, minority populations, urban rural distinctions, and workers in industries to help explain poverty rates and wealth disparages in the Appalachian region. Gerbremarian, Gebremedhin, and Schaeffer (2011) also designed an economic review of the ARC defined Appalachian region examining employment, migration patterns, and median household income. Their work demonstrated correlations between employment and poverty in the Appalachian region. Deaton, and Niman (2012) analyzed the Appalachian region without defining its geographic borders, discussing the high rates of poverty found in Appalachia and the impacts extraction industries have on what is assumed to be a well-known and defined region.

Feser, Renski, and Goldstein (2008) broke away slightly from the boundaries of the ARC's Appalachian region. Feser, Renski, and Goldstein (2008) studied the impacts of industry clusters on the economic development of the region. They noted that over four-hundred ARC counties were included within the study, adding other counties adjacent to the region and of similar economic makeup and population density for a more complete analysis. Regional economic clusters can have a positive impact on economic growth when administered correctly. Douglas and Walker (2012) questioned the ARCs regional boundary completely, looking at income growth, topography continuity, and historic slave populations in counties in 1860. Although their study was inconclusive, they discuss the necessity of including a correct sample of counties with minimal noise, or where "non-conforming" counties are removed from analysis.

Other studies in the United States use similar criteria of political and economic

boundaries to set their study areas. Latanich (2001) covers the Mississippi River Delta, outlined by Congress' approval of the establishment of the Lower Mississippi Delta Development Commission (LMDDC) in 1988. Like the ARC, the LMDDC was created to identify and address a lack of economic growth in the Mississippi Delta. Latanich's article details findings of the MDDC, attributing education rates, lack of infrastructure, poor incentives for outside investment, and a lack of new industries as some of the reasons for low economic growth. Duncan looked at rural counties in three different economic zones, analyzing Mississippi, Texas, and Appalachian counties to try and determine the cause of persistent poverty. Problems such as a lack of job diversity and poor family reputation can be attributed to persistent poverty in rural counties (Duncan, 1996). Another study by Shutters and Waters (2020) examines three-hundred and ninety-five metropolitan areas across the United States, including adjacent counties with a population or fifty-thousand or more. Shutters and Waters (2020) worked to determine if cities are more interconnected and serve as a benefit for labor forces. The study concluded that metropolitan areas were more connected, but also more prone to disruptions in labor systems

The Great River Road in Missouri. These reviews focus regions whose boundaries have be established based upon political, economic, or geographic indicators, or alternatively, a combination of the three. Often, these aspects of each region overlap and help solidify regional borders. Existing counties frequently define lines for political boundaries and the boundaries of academic studies, as data is documented and easily obtainable from the county level. This makes economic and social review more practical, as researchers and writers do not have to collect and compile the data for counties in set regions like the Mississippi Delta and Appalachia. Even when looking at rural or urban areas, county level boundaries are the main political boundaries used in these studies (Baltalunga, & Dumitrescu, 2008; Czako, Fekete, Poreisz 2014; Deaton, &

Niman, 2012; Duncan, 1996; Feser, Renski, & Goldstein, 2008; Gerbremarian, Gebremedhin, & Schaeffer 2011; Isserman, & Rephann, 1995; Joshi, & Geremedhin, 2012; Latanich, 2001; Nedea, Milea, & Pascu 2012; Shutters, & Waters, 2020; Tabellini, 2010). Furthermore, the presence of regional borders seems to encourage the study of an area, as seen with the abundant academic literature available over the Appalachian region in the United States and the Danube River region in Europe. This is also seen in the Mississippi Delta region in the southern United States and pertains to the lower portion of the Mississippi River. Such predetermined regions are better equipped to handle environmental, economic, and social issues facing those areas (Coanen, Hanson, & Rekers 2015). Regional corporation can prove to be invaluable in future problems such as climate change, ageing populations, economic struggles, and other regional problems.

Defining a region seems to invite criticism and critiques over all aspects of how and why the boundaries were set. This dialogue only strengthens the regional definition of an area, with further analysis and insight being given on the nature and makeup of that region. Generally speaking, the Great River Road has been left out of this regional debate as the MRPC sets a regional border at counties adjacent to the Mississippi River. This small region of seventeen counties within the state of Missouri, will be analyzed to determine a larger and more accurate GRR-regional border in the state. In this study, socio-economic variables will be analyzed to assess (and possibly propose) a new boundary line for the Great River Road as it runs through state Missouri.

The GRR is geographically established as a network of roads following both banks of the Mississippi River. The Mississippi River Parkway Commission (MRPC) determines the boundaries of the GRR to counties contiguous to the Mississippi River. While the GRR has been

established as a “region” based on proximity, reviewing its sociodemographic appeal indicates that defining a “GRR region” should require a more thorough analysis. In this research, we ask if this socio-political boundary should define the GRR as a region, or if the true borders of the GRR within Missouri should be expanded.

Methodology

Study Area. The political boundaries for the state of Missouri establish the geographical limits of this study. Figure 2 shows the boundaries of the state and the location of the Mississippi River and the Missouri River. Missouri is in the Midwestern United States, with the Mississippi River acting as a physical border to the East. The northern border is shared with Iowa and is largely a political boundary with no major defining physical feature. In the same way, the southern border is a political boundary shared with Arkansas. The northwestern boundary of the state of Missouri is bound by the Missouri River, as seen in Figure 2. This section of Missouri borders Nebraska and parts of Kansas. The final portion of the Southwestern boundary of Missouri is again defined by no major physical feature, and is shared with Kansas and Oklahoma.

Missouri contains one hundred and fourteen counties and one independent city, St. Louis City. For this study, St. Louis City is treated as another county within Missouri. As a result, a total of one hundred and fifteen counties were examined, with emphasis placed on the seventeen eastern counties encompassing the Great River Road (GRR). These counties are listed from north to south along the Mississippi River in three economic regions in eastern Missouri displayed in Table 1.

Figure 2 also highlights the seventeen GRR counties on the eastern side of Missouri.

These counties are highlighted to show Missouri's Great River Road region as defined by the MRPC. The distinction between GRR counties and non-GRR counties based on founding MRPC article 226. 455. Section 3 of the article states "To advise the governor and the general assembly when, in the judgment of the commission, action should be taken which will better promote the development of commerce and trade in counties contiguous to the Mississippi River in Missouri;" ("Missouri state statutes", 1979).

This analysis will determine if the boundary set by the MRPC is most appropriate when discussing the GRR region in Missouri. The GRR shapefile was created using the GRR app "Driving Guide". Figure 3 shows the GRR app with a map view of the GRR route highlighted for public use. The dot on the map shown in the figure represents the location of the user and helps users with geolocation while on the app. The app logo is the same as seen in Figure 1. Roads were selected based on the routes recommended in this app, maintained by the MRPC.

Table 1: Counties in Missouri along the Mississippi River.

Great River Road Counties (North to South)		
Northeast Region	St. Louis Region	Southeast Region
Clark County	St. Charles County	Ste Genevieve County
Lewis County	St. Louis County	Perry County
Marian County	St. Louis City	Cape Girardeau County
Ralls County	Jefferson County	Scott County
Pike County		Mississippi County
Lincoln County		New Madrid County
		Pemiscot County

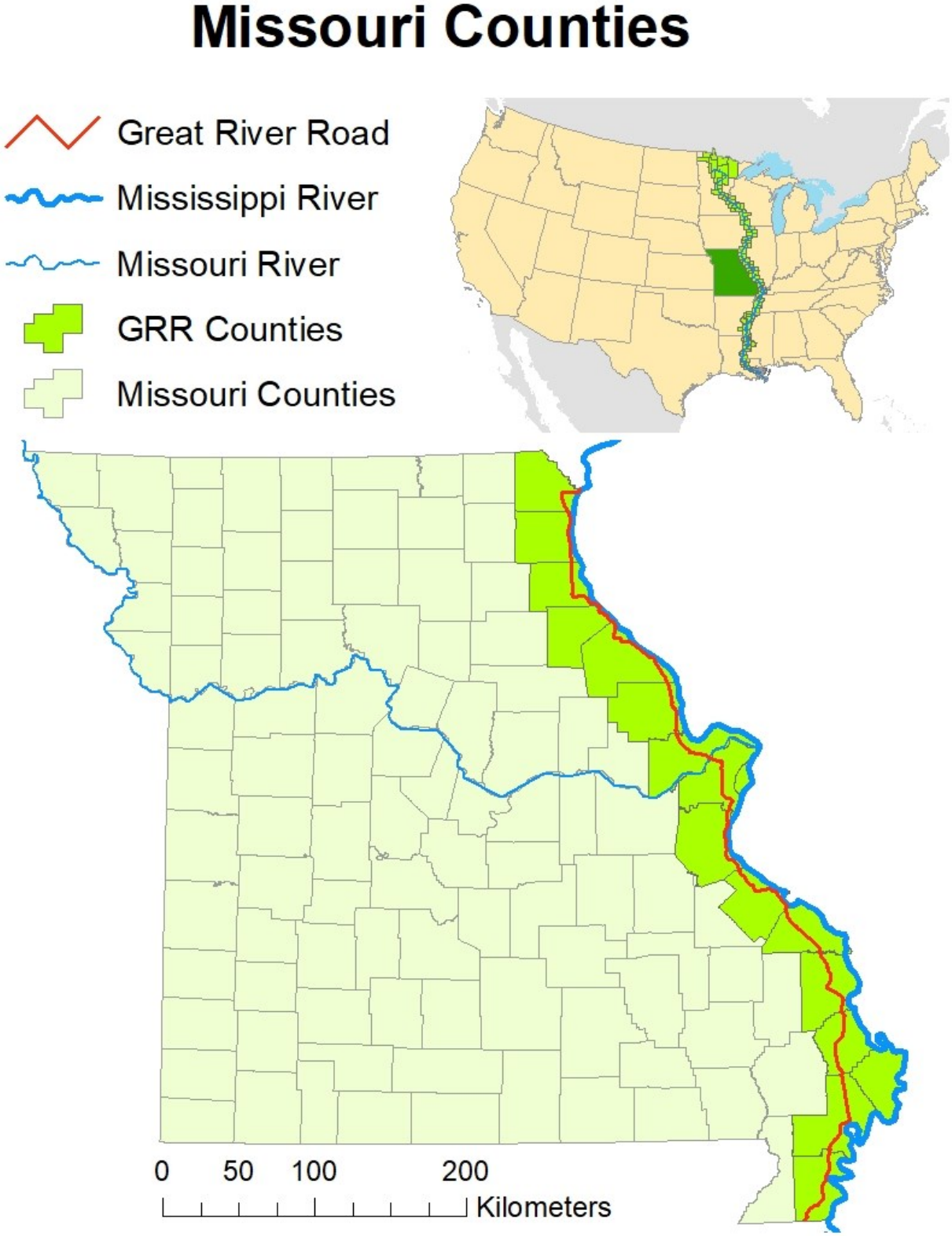

Figure 2: Map of Missouri Counties, and the Great River Road (GRR).

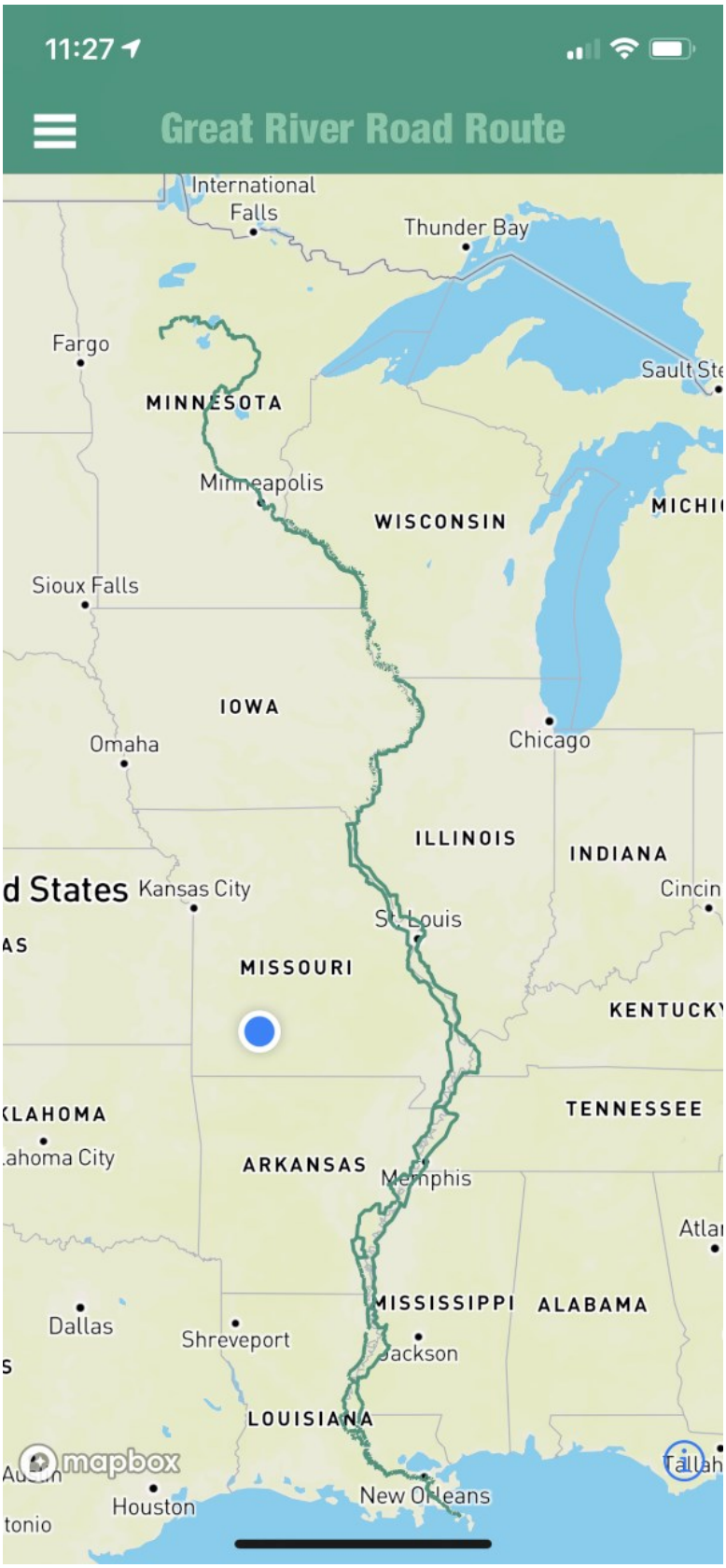

Figure 3: A screenshot of what the GRR app "Driving Guide" looks like for users.

Missouri counties have been categorized into ten regions based off the categorization of the Missouri Economic Research and Information Center (MERIC). MERIC distinguishes ten different regions in Missouri, with the number of counties varying depending on the region. Each region's definition was based on labor needs and local economies in Missouri counties. The GRR crosses three MERIC regions in eastern Missouri: Northeast, St. Louis, and Southeast regions. None of these regions are exclusively within the GRR designation. The three eastern-most regions of Missouri may help to set a new boundary for the GRR, but it is challenging to presume that all counties in these regions are congruent with GRR counties. Figure 4 highlights these ten regions and their titles.

Data Collection and Analysis. County level census data for the state Missouri is gathered from the Office of Social and Economic Data Analysis (OSEDA), housed under the University of Missouri in Columbia, Missouri. OSEDA reformatted data released by the American Community Survey (overseen by the United States Census Bureau), specifically the five-year estimates from 2014 – 2018. The reformatting of data by OSEDA includes the creation of an interactive county level maps to show data for each county and the creation of publicly available, user-friendly Excel worksheets for each county. The 2014 – 2018 data collected by the American Community Survey was the most current five year estimate available at the start of this study. With access to forty-one variables in the dataset, only twenty-four variables were identified for further analysis. These twenty-four variables cover social, economic, housing, and demographic data to determine which variable characteristics are most appropriate when defining a GRR region. Evaluating variables with varying characteristics provides a more complete analysis over the study area. Variables were omitted from this study due to redundancy of collected data such as variables based on nationality or origin of birth showing the same type

of data. Some variables were omitted due to a lack of data for each county in Missouri. Two variables, including “Hispanic and Latino” populations and “Race” populations, were combined for more concise analysis.

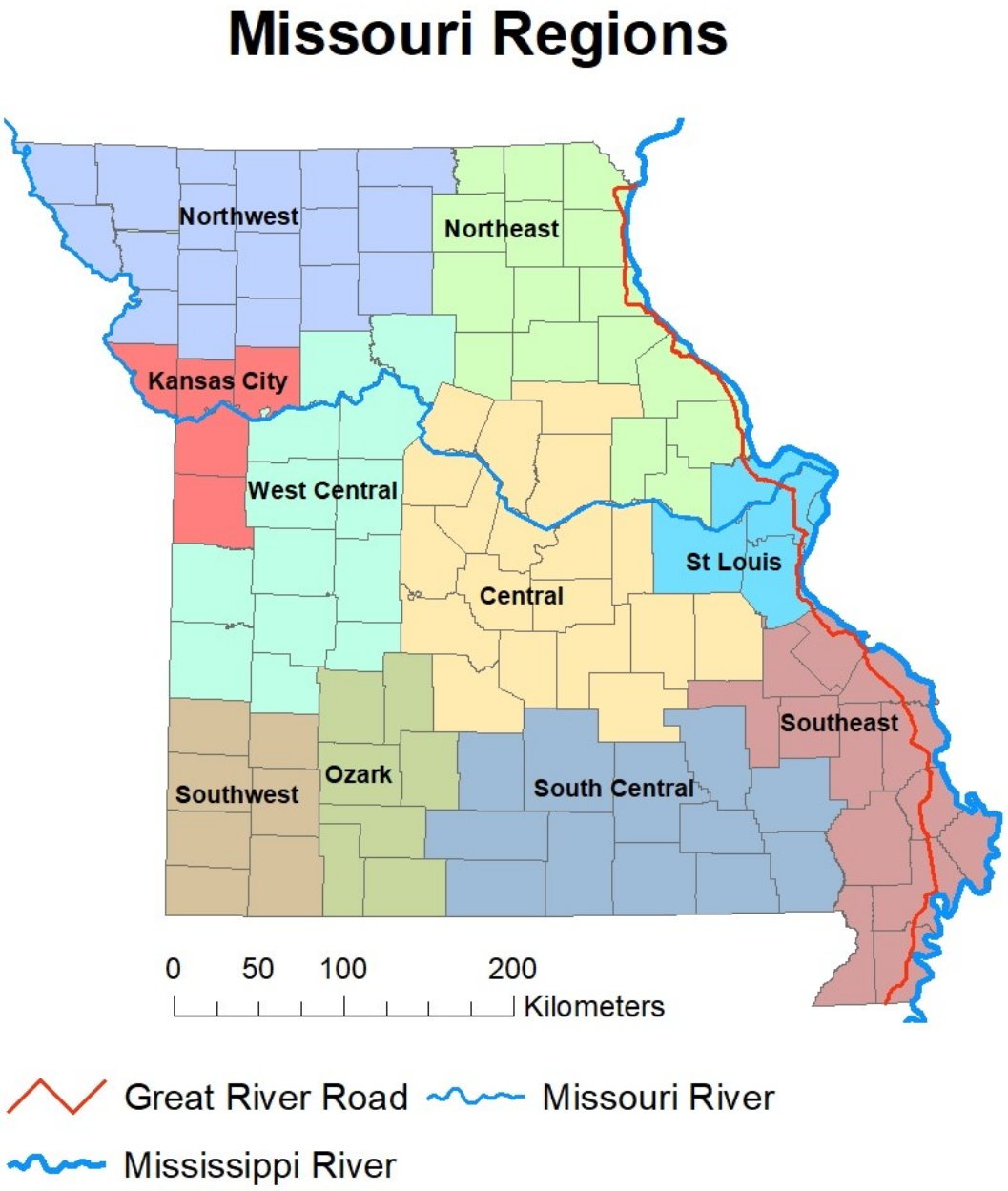

Figure 4: Map representing the ten regions of Missouri defined by MERIC.

Using census data for economic reviews of specified regions has been established in previous research (Brasington, Hite, & Jauregui, 2015; Daly, Jackson, & Valletta, 2007; Stoilkovic, 2017; Vinje, 1977,). Stoilkovic (2017) analyzed the age, unemployment, and labor statistics along the Serbian border to explain income disparities. Another study analyzed the increase in education attainment and age compared to unemployment and the income gap in the United States (Daly, Jackson, & Valletta, 2007). A study of "Indian Reservations" by (Vinje, 1977) used independent variables, including labor in manufacturing, agriculture or government industries, unemployment, labor participation, and geographic characteristics, to be correlated with the dependent variable per capita income. A study compared housing prices, based on race and education attainment of homeowners to correlate which individuals and neighborhoods have higher valued homes (Brasington, Hite, & Jauregui, 2015). Table 2 lists variables assessed in this study in alphabetical order. Spatial analysis through ArcGIS was the primary method used to analyze this data.

Quantile classification is used for data representation to account for the broad variety of variables used in this study. Quantile classification is based on the sample size and determines categories, with the same number of sample data points (counties) in each group. For this study, as one hundred and fifteen counties are divided into five groups, exactly twenty-three counties are present in each individual group. Outliers in the dataset can skew the spatial representations. These outliers impact the map produced and can create a false sense of correlation or lack of correlation based on the color scheme and classification when comparing variable maps (Slocum, McMaster, Kessler, & Howard, 2009). The visual impact of outliers in each variable are addressed by quantile classification through the grouping process, with each category containing twenty-three other counties with the "highest" or "lowest" value in a variable. By

classifying the data using quantile classification, outliers are not represented in a separate category, but grouped in with the other "highest" or "lowest" valued counties depending on the skew of the data.

Table 2: Alphabetical list of variables in this study.

Twenty-four Variables Analyzed		
Age	Home Value	Origin of Birth
Citizenship Status	Household by Type	Other Income
Class Worker	Household Income	Race
Disability by Age	Housing Characteristics	Residence 1 Year Ago
Education	Housing Occupancy	School Enrollment
Employment Status	Insurance Coverage	Workers by Industry
Family Income	Internet Use	Workers by Occupation
Heating Fuel	Marital Status	Year Structure Built

Quantile classification also allows map comparison of variables that are not necessarily Expressed on the same scales. For example, "median household income" is based on US dollar amounts while "workers by industry" is based on a population. These two variables are not directly comparable, as many variables are measured on different scales (US dollar, population, total number of households, etc.). Quantile classification allows for an accurate comparison between maps by standardizing the number of samples (counties) in each class (twenty-three), which standardizes the comparison of maps representing different variables (Slocum, McMaster, Kessler, & Howard, 2009). These five classification groups are displayed using a cold to hot

color scheme. Figure 5 shows the total population of Missouri represented with quantile classification.

When determining patterns in labor force or education rates, variables are presented relative to the county populations, creating per-capita analyses. Data is treated in this way when raw totals for many social and economic variables (i.e., labor forces, education levels) are used, spatial relationships may not be appropriately displayed. Counties with larger populations tend to show as hot spots, while counties with lower populations tend to classify as cold spots. To address this, a normalization function was performed in ArcMap. As a result, the data is represented as a percentage of the population based on the variable's value. However, these normalization techniques can change slightly, depending on the variable observed. For example, workers by industry are normalized with the variable "total population over the age of sixteen". In similar fashion, the number of people with high school diplomas and associates or bachelor's degrees are normalized by "total population over twenty-five".

Additional spatial analysis was performed using the autocorrelation method Getis-Ord GI. Getis-Ord GI is a hot spot analysis GIS tool used to determine "hot" and "cold" spots in a study area. "Hot spots" represent sections of the study area that have higher values in the dataset. For example, the total population data hot spot represents a spatially significant area with higher population numbers compared to the rest of the study area. "Cold spots" represent sections of the study area with lower values based on the dataset. A cold spot concerning total population represents a spatially significant area with low population numbers compared to other part of the study area. Calculating the numerical value of the variable in question in a county and the surrounding counties, Getis-Ord GI detects patterns (set at 90%, 95%, 99% confidence) for both "hot" and "cold" spots in the state of Missouri. This is calculated through identifying the value of

the county statistic in question while simultaneously assessing adjacent counties to determine "hot" and "cold" spots. Figure 6 shows total population using of Getis-Ord GI hot spot analysis: the result has effectively identified St. Louis and Kansas City, the largest cities in the state of Missouri, as hot spots concerning total population.

As a result of these considerations, in this research we ask: Is the GRR region different from other parts of Missouri? Does the GRR area have distinctive socio-economic characteristics that allow it to be defined as a coherent region in Missouri? Do any geographic or demographic conditions exist that act as obstacles for defining the GRR as a coherent region within Missouri? To help answer these questions, maps of each variable are represented for analysis and patterns in the dataset are identified. Attentiveness was given to the Great River Road (GRR) region when reviewing the data for Missouri as a whole. While analyzing this data, three baseline designations were established to help identify the geographic nature of the GRR region:

1) Are the characteristics and patterns found in the data subject to whether a county is urban or rural? This distinction is made by looking at the percentage of a county's population living in urban areas and the percentage of a county's area identified as urban. Figure 7 shows the percentage of urban population and percent urban area in each county, using equal interval classification based on increments of twenty percent.

2) Is the variable in question a regional Missouri or state of Missouri distinction? The Missouri Economic Research and Information Center divides the state into ten regions. Figure 4 lists these regional distinctions. The ten regions of Missouri are set to help research and analyze economic prosperity and labor statistics. If certain characteristics are only affecting specific regions of Missouri, efforts on addressing issues will be different than if all of Missouri is

impacted in the same way. Regional dips in economic prosperity would be assessed and managed differently than statewide disparities.

3) Is the variable in question a GRR regional characteristic, or a regional Missouri distinction? Should the three eastern regions of Missouri (Northeast, St. Louis, and Southeast) be considered the new border for the GRR, or are these regions too expansive for a contiguous GRR region? Are characteristics between each of the three regions significant enough to differentiate themselves as unique GRR regions, such as a North GRR, a South GRR, and or an Urban (St. Louis) GRR?

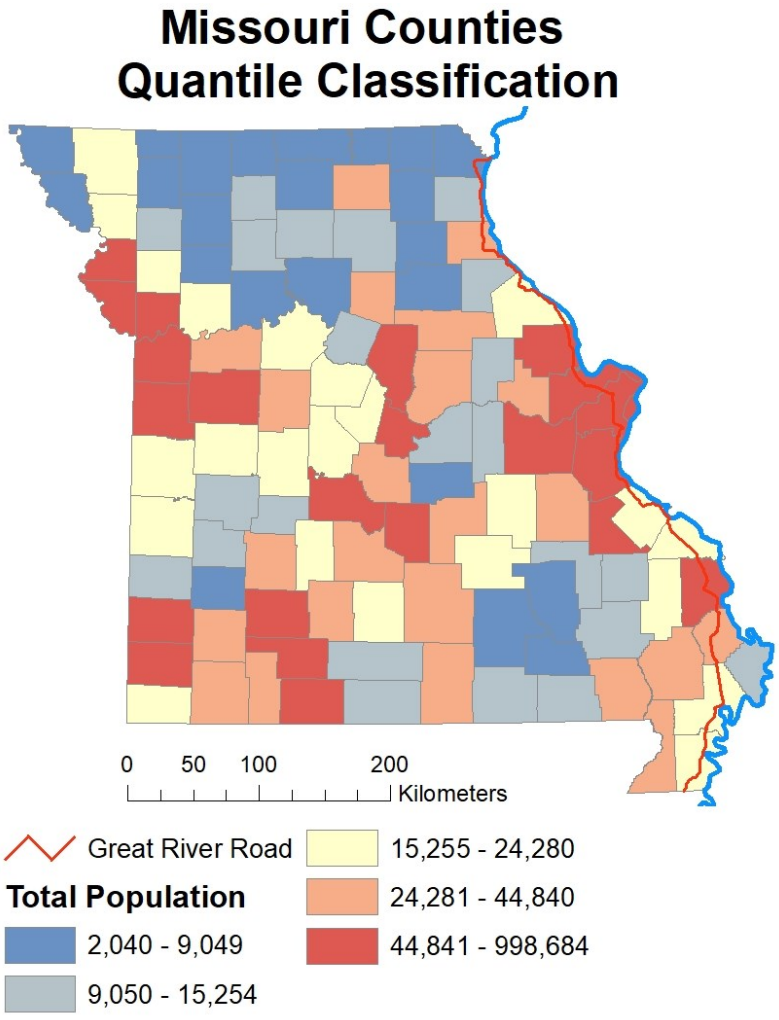

Figure 5: Total population in Missouri represented using quantile classification.

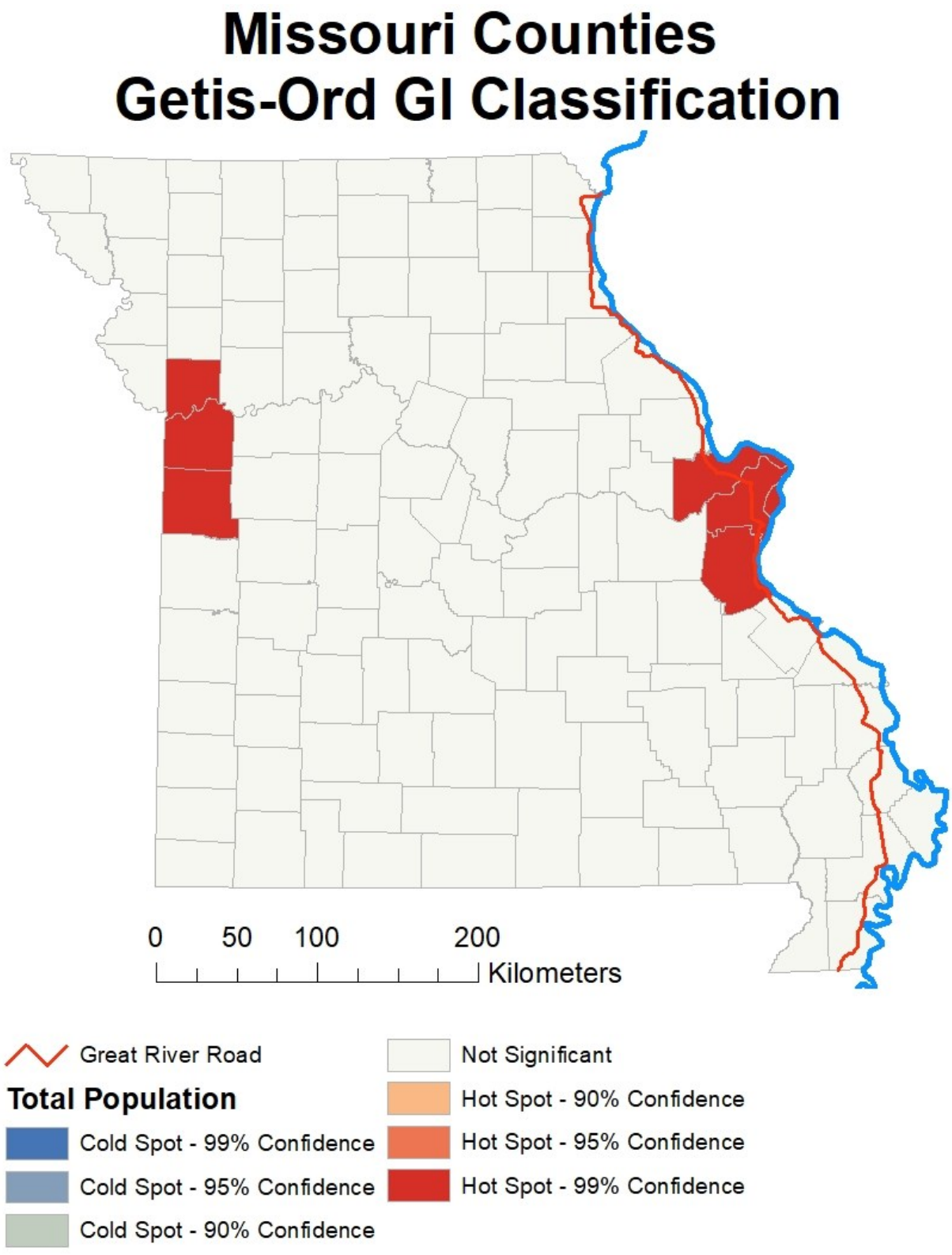

Figure 6: Example of the hot spot analysis Getis-Ord GI* and the different confidence levels.

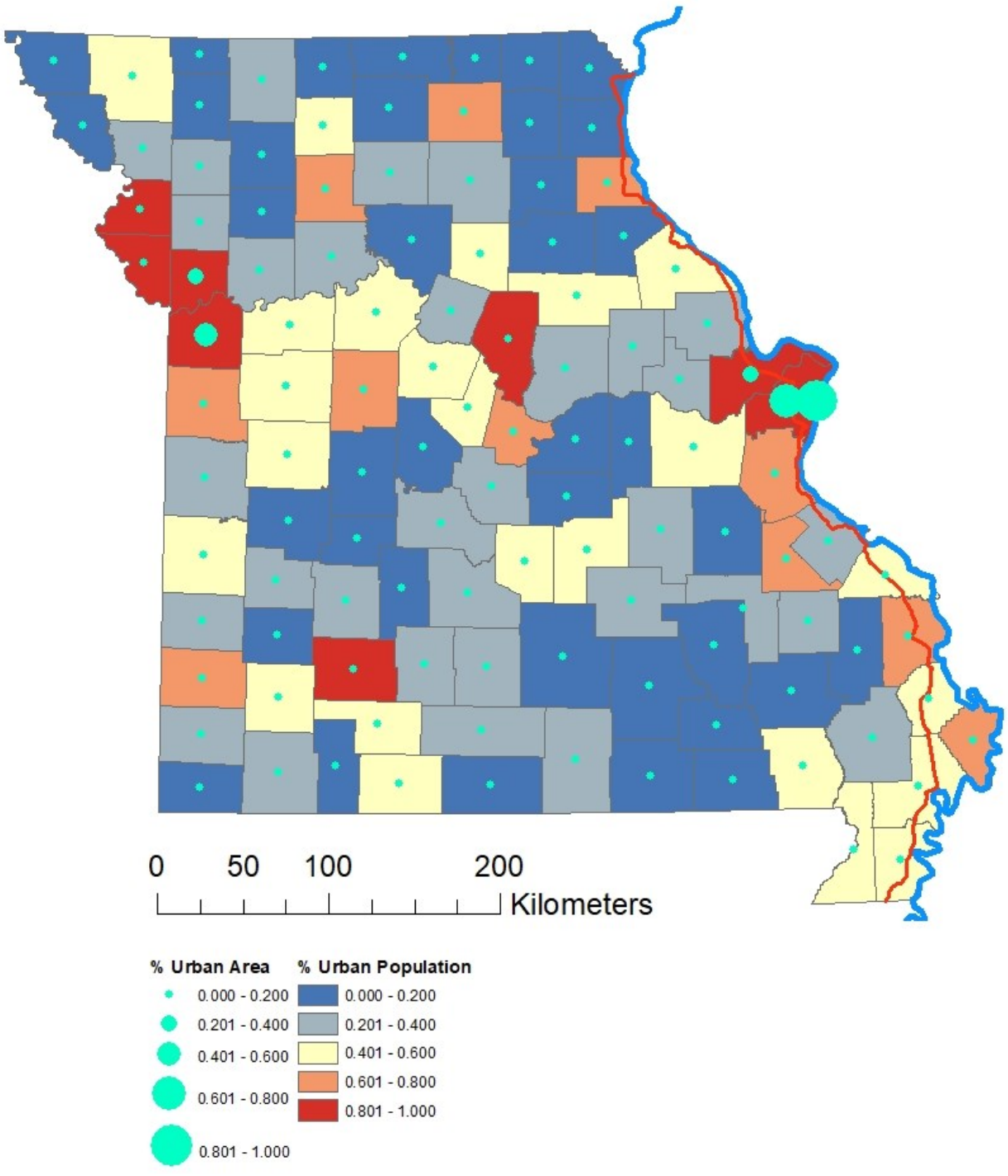

Figure 7: Percent urban by county.

Results and Discussion

Below are quantile maps and Getis-Ord GI hot spot analysis maps for each variable listed in the methods section. The data is segmented into four categories: social, economic, housing, and demographic. This grouping system is used by the United States Census Bureau. Each variable has a short description for the accompanying maps listed. Each variable was assessed based on urban and rural counties, Missouri regional location, and, if the variable fit into a GRR region within eastern Missouri. A variable's quantile representation and hot spot representation were viewed simultaneously to limit error or bias when identifying spatial patterns. Each variable representation for Missouri is scaled at "1:550,000", with the visual representation for each variable being equivalent. Scalebars are only present in the first set of map representations.

Every variable mentioned in this study was assessed; however, only variables deemed statistically significant when evaluating spatial patterns are presented within this section. The variable maps omitted from this section are located in Appendix A.

Social Characteristics. Citizenship status details the population in each county normalized by the total population of that county. Figures 8 and 9 show the quantile representation and Getis-Ord GI hot spot analysis representation. People born in the United States comprise a higher percentage of the population in rural areas and in the Northeast and Southeast regions of Missouri. Urban areas, such as St. Louis and Kansas City, are hot spots for non-citizen individuals. The Southwest region of Missouri is also a hot spot for non-citizens. The most interesting variable, however, is "born in state of current residence", which shows a large population percentage increase in rural eastern Missouri counties. This pattern excludes the urban counties of St. Louis, but covers most of the Northeast, Southeast, and Central regions of

Missouri. The Getis-Ord GI analysis shows a spatially significant hot spot in these counties, but many of the GRR counties are left out. This pattern may be caused by the Mississippi River acting as a physical barrier for the movement of labor forces, encouraging individuals to stay where they are. “Born in current state of residence” is the variable most closely associated to a GRR region.

Household by type contains many variables regarding the structure of households in each county. The data for these variables was normalized by the total number of households in each county. Figures 10 and 11 show the quantile representation and Getis-Ord GI hot spot analysis representation. Many of these variables showed minimal patterns and have been placed in Appendix A. One set of variables did yield interesting patterns when looking for a GRR region. “Females no husband with persons under 18”, also classified as single mother households, increase in the “Bootheel” (the most southeastern portion of Missouri). This is in contrast to the rest of the Southeast region of Missouri. These higher numbers of single mother households coincide with the GRR counties south of St. Louis, excluding Cape Girardeau. The Northeast and Northwest regions of the state also have higher percentages of single mother households, which seems to align with the border between Missouri and Iowa. Urban and rural counties show no pattern in higher or lower numbers of single mother households, making these regional patterns more distinct.

Educational attainment variables were normalized by the population over twenty-five years of age in each county. Figures 12 and 13 show the quantile representation and Getis-Ord GI hot spot analysis representation. Firstly, the high number of individuals in the South-central and Southeast regions of Missouri without a high school diploma or equivalent are spatially significant, as represented with the hot spot analysis. This will coincide with lower household

income discussed later in this section. Urban areas in each variable are centers for higher educated individuals throughout Missouri. People with an associates degree are most prevalent around St. Louis and parts of the Central region, while persons with a bachelors degree are more prevalent in St. Louis, Kansas City, Jefferson City areas, as well as the Ozark region. Hot spots for bachelors degrees are generally located in counties where colleges and universities are present. Northern Missouri counties tend to have more individuals with higher education attainment than southern Missouri. Also, urban counties throughout the state are hot spots of individuals with higher educational attainment.

Disability by age examines individuals with disabilities in the age groups under eighteen, nineteen to sixty-four, and over sixty-five years old. Each variable was normalized by the population in the respective age brackets of each county. Figures 14 and 15 show the quantile representation and Getis-Ord GI hot spot analysis representation. Each age group shows high percentages of disabled individuals in the South-Central, and Southeast regions of Missouri. The northern portion of the state shows cold spots representing a lower percentage of disabled individuals in these counties. GRR counties in the age group of nineteen and older have lower percentages than adjacent counties, particularly in the South. This does change, however, as the southern-most GRR counties are part of a larger hot spot in the South-Central and Southeast regions. Overall, urban counties have less individuals with disabilities over the age of nineteen. These same areas have a more significant number of disabled individuals under the age of eighteen, but do not appear as spatially significant in the hot spot analysis.

Internet use variables were normalized by the total number of households in each county. Figures 16 and 17 show the quantile representation and Getis-Ord GI hot spot analysis representation. Most urban areas (St. Louis, Kansas City, Springfield, and Jefferson City) contain

higher percentages of households with at least one computer. The South-Central and Southeast regions have lower percentages of households with computers. This coincides with a higher number of people, especially in the South-Central region with no internet. In general, the GRR has low numbers of households without internet, but varies when looking at the number of homes with a computer. Again "households with a computer" appears to be an urban or rural county distinction, while broadband internet services appear to be impacted regionally.

Economic Characteristics. Employment status variables were normalized by the population over the age of sixteen in each county. Figures 18 and 19 show the quantile representation and Getis-Ord GI hot spot analysis representation. Civilian workers show two large hot spots in the East, clustered around St. Louis, and the West, centered on Kansas City. For the most part, the GRR counties show high percentages of civilians in the labor force. However, counties in the South-Central and Southeast regions are hot spots for high unemployment, including several southern GRR counties. Generally, northern Missouri, particularly the Northwest region, have low unemployment rates. Females in the labor force cluster in urban counties, while more rural counties reflect a noticeable drop in participation of females in the labor force. The Northwest region, however, does show significant numbers of female workers in rural counties. Similar to "civilians in labor force", female workers have a higher percentage along the Mississippi River, particularly in the Southeast region, with several counties south of St. Louis showing very high percentages.

Class worker variables evaluate private or government workers in Missouri and are normalized by the population over the age of sixteen in each county. Figures 20 and 21 show the quantile representation and Getis-Ord GI hot spot analysis representation. Private sector workers are most prevalent in Kansas City, St. Louis, Southwest, and Ozark regions in Missouri. These

higher percentages continue south of St. Louis into the Southeast region, showing larger values than other areas. The Central region is a hot spot for government jobs, which coincides with the location of Jefferson City, the state capital of Missouri, and Pulaski County, where the army base Fort Leonard Wood is located. Self-employed workers are not as prevalent along the GRR, in St. Louis, or in the South. The majority of counties with substantial numbers of both self-employed or unpaid family workers are rural counties.

Workers by occupation variables examine the number of workers in varying occupations and are normalized by the population over sixteen in each country. Figures 22 to 25 show the quantile representation and Getis-Ord GI hot spot analysis representation. The "Construction, extraction" occupation is more prevalent outside St. Louis and in the Southeast region. "Service" jobs are centered in the South-Central and Southeast regions, with the boot heel being a hot spot. The service occupation may show an increase in jobs considered part of a broader tourism sector. "Management, business, sciences, art" and "sales, office" occupations are clustered in urban areas across Missouri. "Sales, office" jobs are more prevalent along the GRR north of St. Louis and in two counties in the South. "Farming, fishing, forestry" and "production transit, material moving" are both clustered in rural counties throughout the north and south of the state. Despite its ties to the Mississippi River today, it does not appear that a single occupation sector dominates the GRR counties.

Workers by industry variables reflect the number of workers in each industry and is normalized by the population over the age of sixteen in each county. Figures 26 to 33 show the quantile representation and Getis-Ord GI hot spot analysis representation. The most compelling industries regarding the GRR are "wholesale trade", "scientific management", and "educational healthcare". Wholesale trade is prevalent throughout the GRR counties in Eastern Missouri.

Wholesale trade is designated as sales to government or other business entities. Scientific management is centered around urban counties, but extends north of St. Louis along the GRR. Finally, education and healthcare jobs are prevalent in the Southern GRR and are part of a larger hot spot in the South-Central region of Missouri. Other industries show patterns pertaining to urban or rural counties and other regions in Missouri, but do not adhere to a GRR region.

Insurance coverage details the types of insurance individuals have in each county. This data was normalized by the total population in each county. Figures 34 and 35 show the quantile representation and Getis-Ord GI hot spot analysis representation. The West-Central region of Missouri and counties along the northern and southern borders have significant numbers of individuals without insurance. “With public insurance” is most prevalent in the South-Central and Southeast regions, omitting three GRR counties south of St. Louis. Those “With private insurance” are located in higher percentages along the Mississippi River in GRR counties. This differs in southern GRR counties, however, where the regional pattern shows more individuals with public insurance coverage. For much of Missouri, urban counties have much higher percentages of the population covered by private insurance.

Household income consists of many different variables covering income in Missouri. The variables listed show patterns between the GRR and other regions in Missouri. These variables are normalized by total number of households in each county. However, several variables have been omitted from this section and placed in the appendix due to a lack of significant patterns and redundancy of the data. Figures 36 to 41 show the quantile representation and Getis-Ord GI hot spot analysis representation. Overall, urban counties tend to have higher household income than rural counties in Missouri. The GRR counties appear to earn more than other counties in the Northeast, and Southeast regions. “Household income $15,000 to $24,999” provides the best

insight of the GRR's impact on income, where many of the counties showing few families earning within this income bracket. This does not apply to the southernmost counties on the GRR. As the income brackets increase, the South-Central and Southeast regions of Missouri reflect a drop in household income. This coincides with a noticeable drop of high school graduates in these regions. "Median household income" and "mean household income" show urban households tend to have higher incomes; this trend is extended north and south of St. Louis along the GRR. The counties south of Cape Girardeau do not fit this pattern, however, and have lower median and mean income observed in the South-Central and Southeast regions.

Housing Characteristics. Heating fuel variables in this section identify the fuel or sources used to heat homes in Missouri. Each variable is normalized by the total number of occupied homes in each county. Figures 42 to 47 show the quantile representation and Getis-Ord GI hot spot analysis representation. Noticeable patterns include the lack of "utility gas" used in homes located in the Central, South-Central, and parts of the Southeast Regions. The southern counties along the Mississippi are in stark contrast to this trend, with many homes using "utility gas" to warm the home. "Electricity" is used in many homes in the Southeast and Central Regions. St. Louis and other urban areas favor "utility gas". A small portion of homes use wood for heat, but this is clustered in the South-Central and Southeast regions.

Year structure built variables listed in this section cover the decades homes in each county were constructed. These variables were normalized by total housing units in each county. Figures 48 to 53 show the quantile representation and Getis-Ord GI hot spot analysis representation. These variables yield interesting regional patterns, but failed to show any patterns of a wider GRR region. However, the 1950s and 60s show many homes being built in the Southeast and St. Louis regions. Although construction was seen in other regions at the time, this

representation shows an increase in homes that are still in existence today. There are no patterns between the year a home was built and urban or rural counties. These variables seem to coincide with regional distinction, but again, lack a GRR region.

Home value is broken up into separate categories representing the number of homes in that value bracket. The variables in this section were normalized by occupied housing units in each county. Figures 54 to 59 show the quantile representation and Getis-Ord GI hot spot analysis representation. Homes valued at $100,000 to $149,999 are clustered along the GRR both to the north and south of St. Louis. However, higher valued homes are associated more with urban areas like St. Louis and Kansas City. Homes priced at $200,000 to $499,999 are clustered in St. Louis and in several counties south of St. Louis along the GRR. The median and average home values in these GRR counties are higher than other counties in the Southeast region. The Kansas City, Central, and Ozark regions also show clusters of higher valued homes when compared to other regions in Missouri.

Demographic Characteristics. Age variables normalized by the total population of each county. Figures 60 to 67 show the quantile representation and Getis-Ord GI hot spot analysis representation. These age ranges do not show any meaningful pattern throughout Missouri when considering an urban-rural distinction, a Missouri regional or GRR regional distinction, or a northern or southern Missouri distinction. The age ranges from twenty to fifty-four are centered in urban areas like St. Louis, Jefferson City, and Kansas City. The age range of thirty-five to fifty-four also show regional hot spots in the Southeast and may be associated to the GRR region south of St. Louis. Citizens eighty-five and older cluster in the North and Northeastern regions of Missouri. No patterns between urban and rural populations or patterns pertaining to a GRR region are present. Median age shows older ages in the West-Central and Ozark regions of

Missouri. Again, spatial patterns between urban or rural counties, or northern or southern Missouri distinction, do not show up when looking at county population's median age. Overall, age does not appear to be spatially correlated to urban or rural counties, a specific region of Missouri (including a GRR region), and no northern or southern distinctions can be made.

Race is the final variable to discuss within the collected demographic data, and each variable was normalized by total population in each county. Figures 68 to 71 show the quantile representation and Getis-Ord GI hot spot analysis representation. Ratio of male and female populations do not seem to be altered by urban areas; however, more females are present in both St. Louis and Kansas City. Female populations based on census data are centered around the Southeast region of Missouri. There is a pattern of "African Americans" living in urban counties in Missouri and in southern regions, including the Southeast. "White" individuals are more prevalent in northern counties, particularly along the Iowa border. There are higher concentration of white populations in the South in the South-Central and Southeastern regions. "American Indian" or Native Americans, are more prevalent in the Southwestern portion of the state, particularly in the Southwest, Ozark, and South-Central regions. No spatial variation based on urban or rural areas in the state can be identified. Like Native American populations, "Hispanic and Latina" populations cluster in the Southwest of Missouri. However, these populations also have noticeable correlation with urban counties in Missouri, holding higher percentages in places like St. Louis, Kansas City, Jefferson City, and Springfield. Different races show different settling patterns in Missouri based on urban or rural counties, regional, and north or south Missouri distinctions. In general, more minority groups live in the south and urban counties in Missouri. The GRR region does not seem to be impacted by the spatial settlement patterns of White, African American, Native American, or Hispanic groups in Missouri.

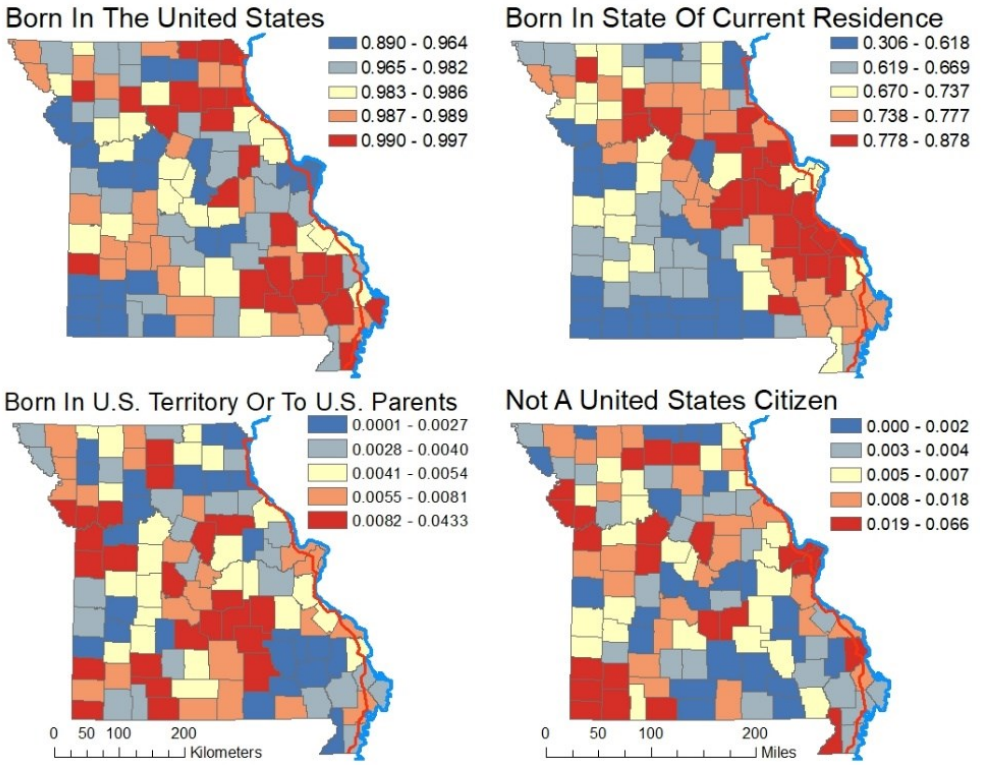

Figure 8: Quantile representations of citizenship status.

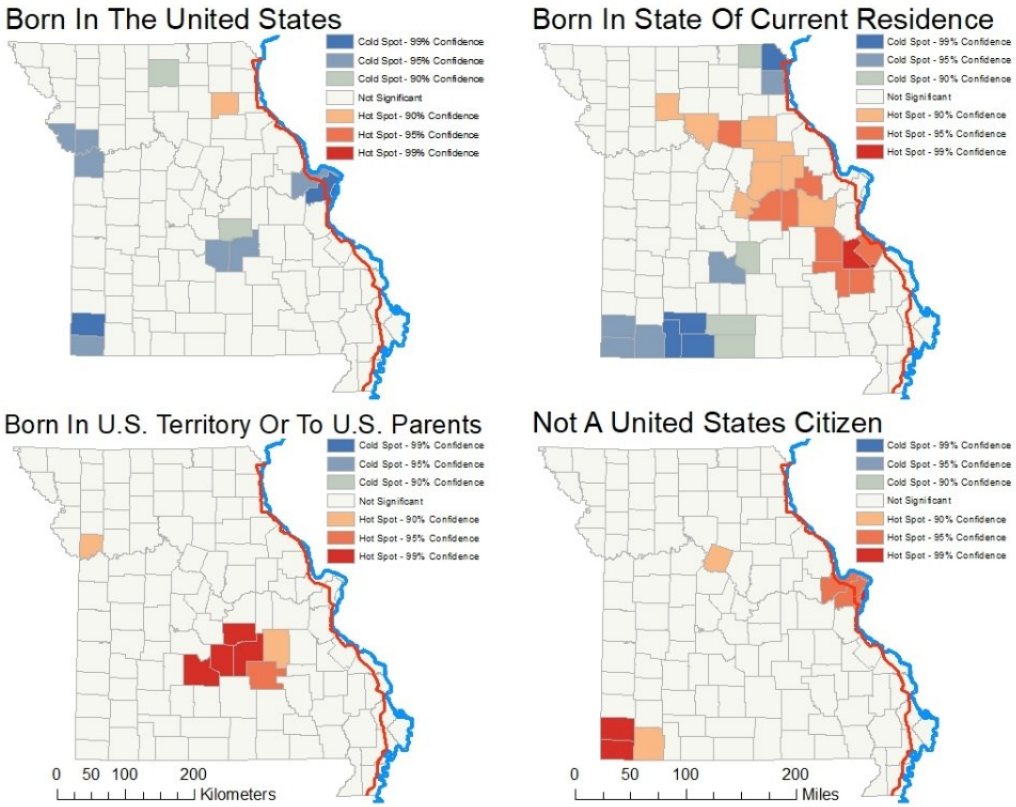

Figure 9: Getis-Ord GI representations of citizenship status.

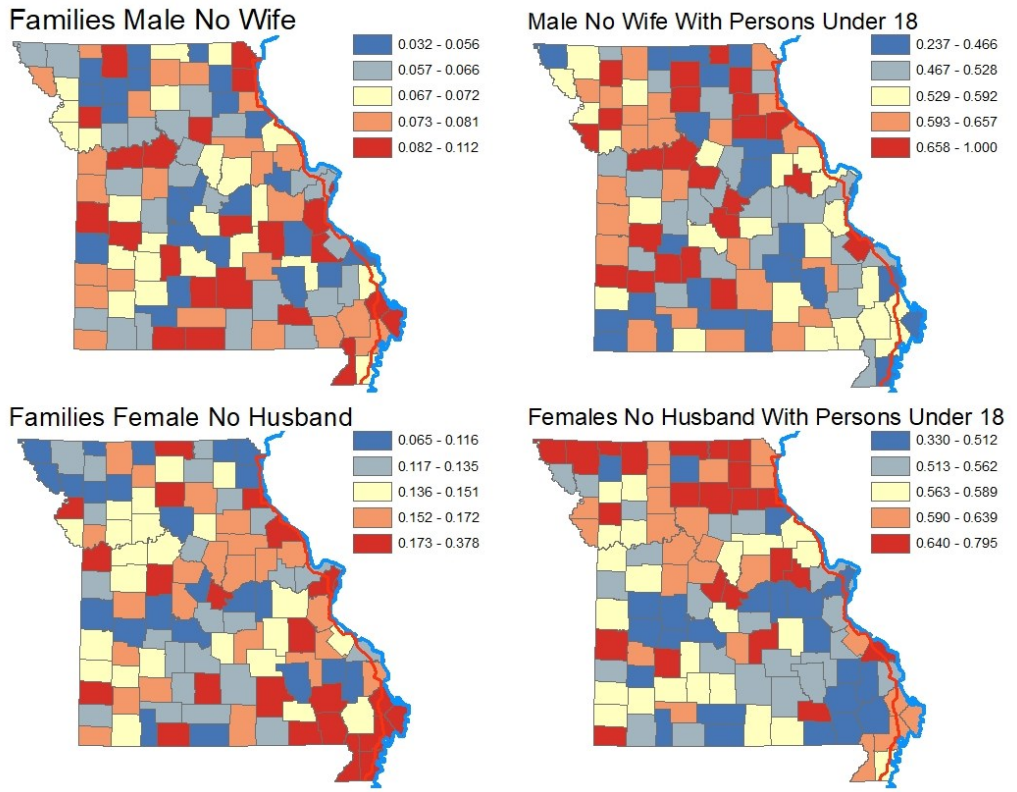

Figure 10: Quantile representations of household by type.

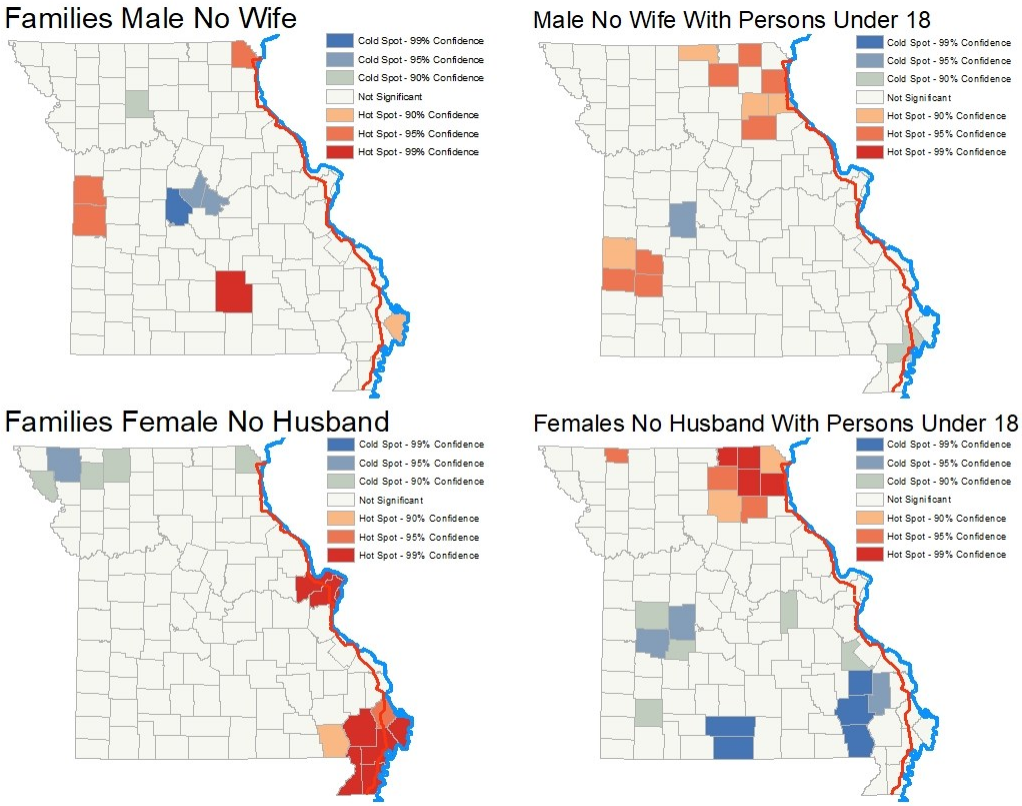

Figure 11: Getis-Ord GI representations of household by type.

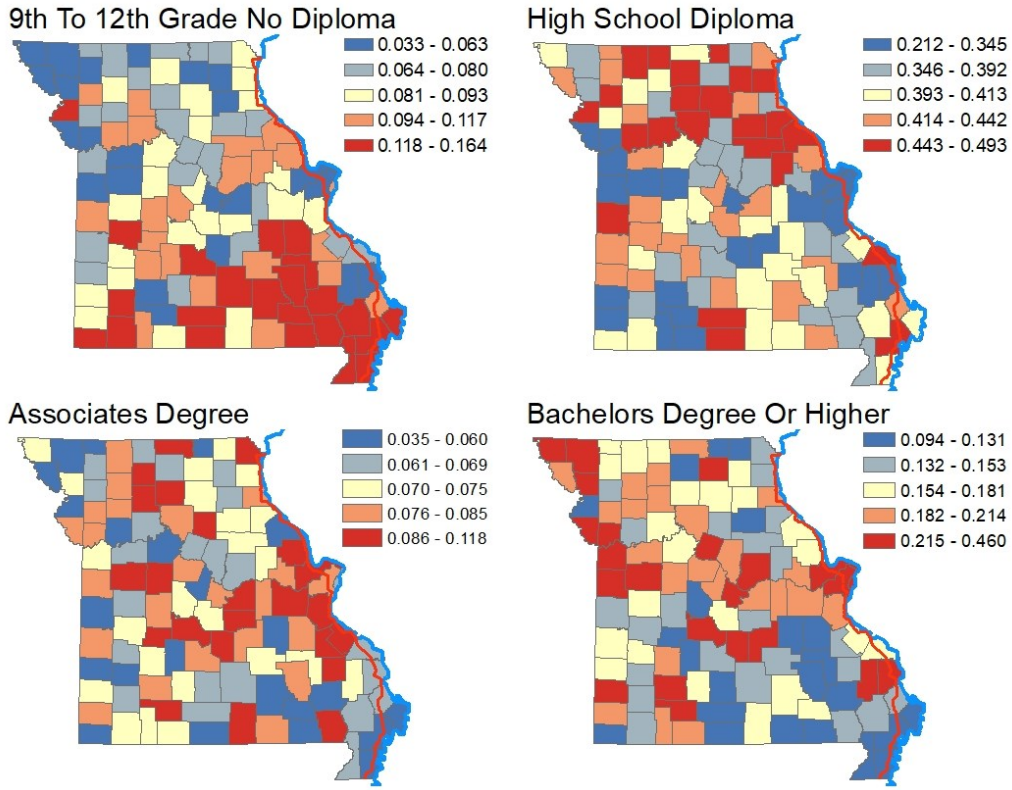

Figure 12: Quantile representations of education attainment.

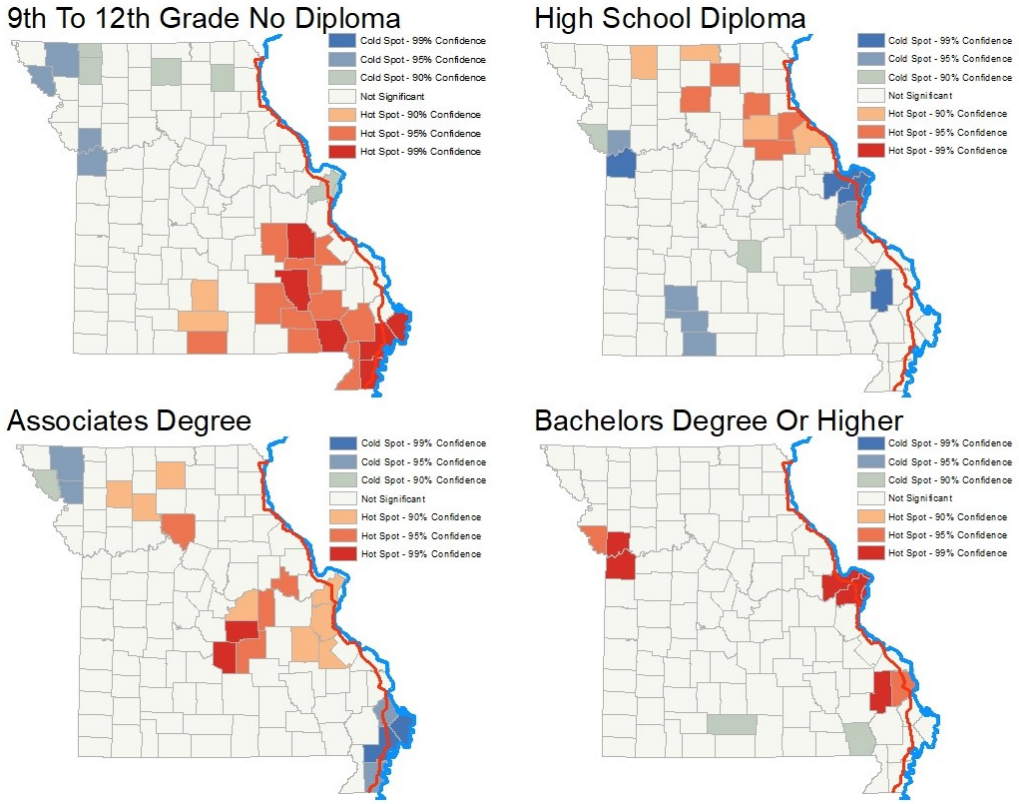

Figure 13: Getis-Ord GI representations of education attainment.

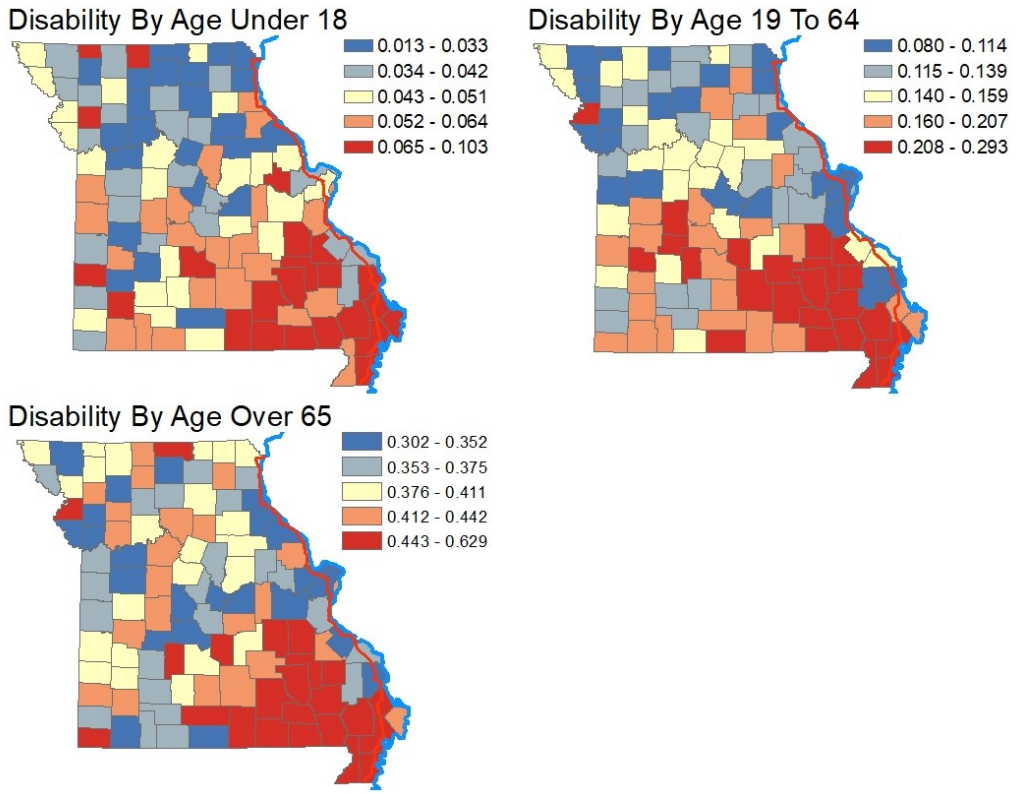

Figure 14: Quantile representations of disability by age.

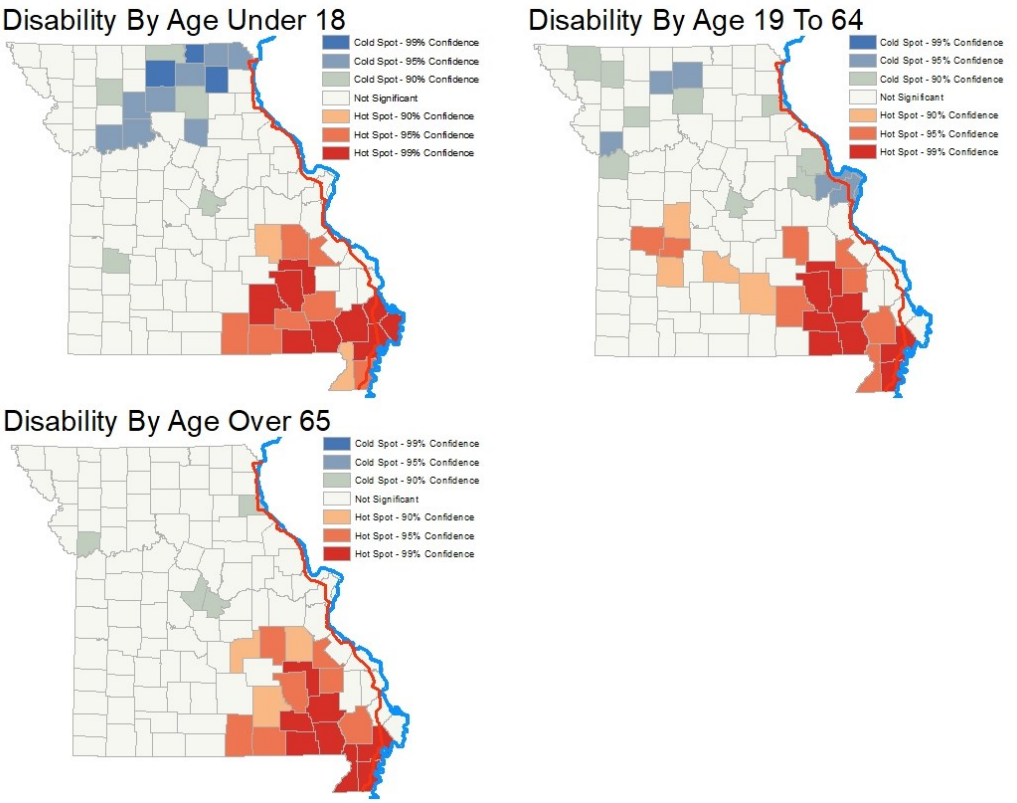

Figure 15: Getis-Ord GI representations of disability by age.

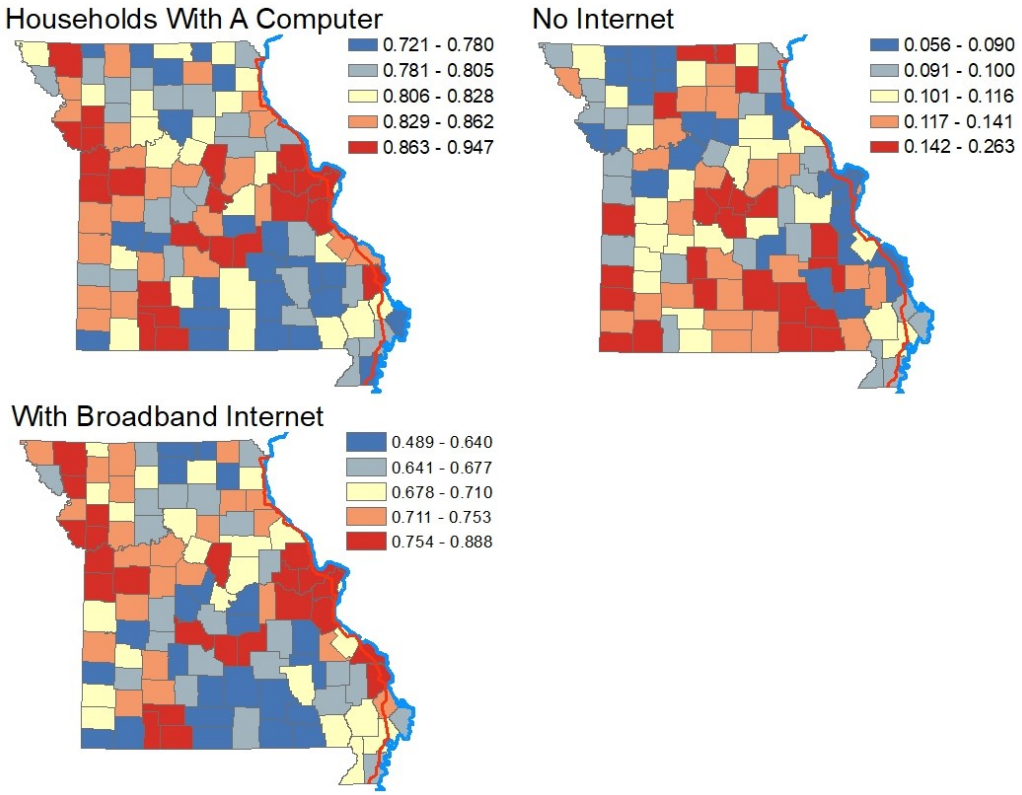

Figure 16: Quantile representations of internet use.

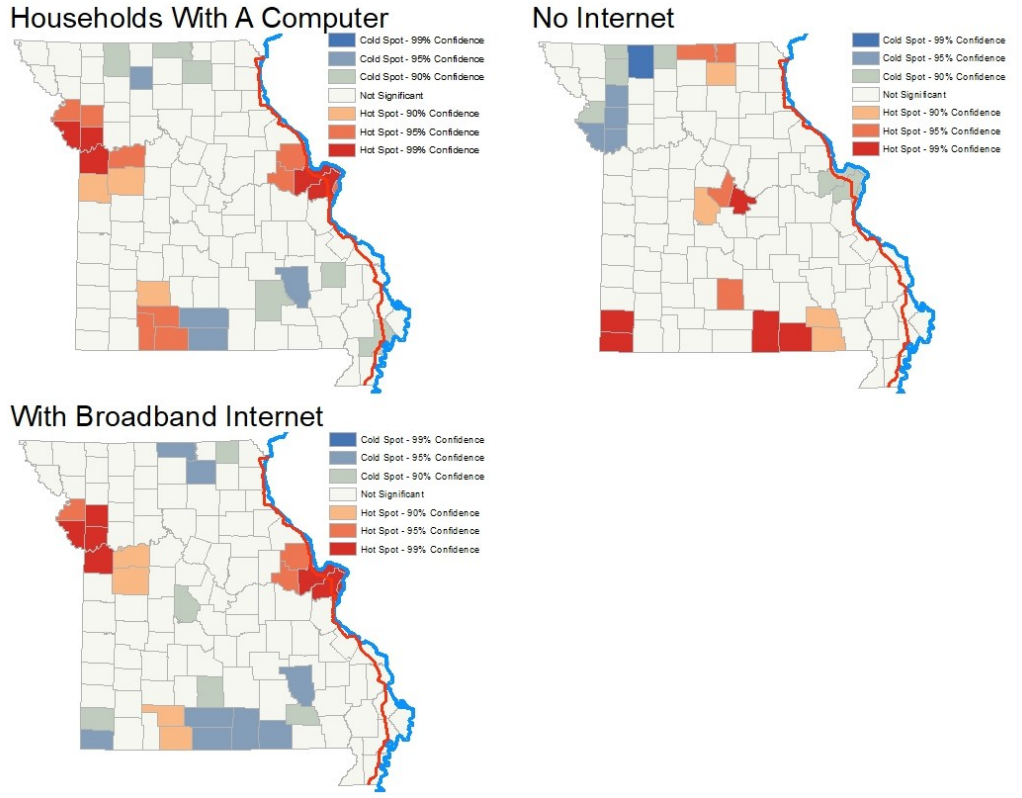

Figure 17: Getis-Ord GI representations of internet use.

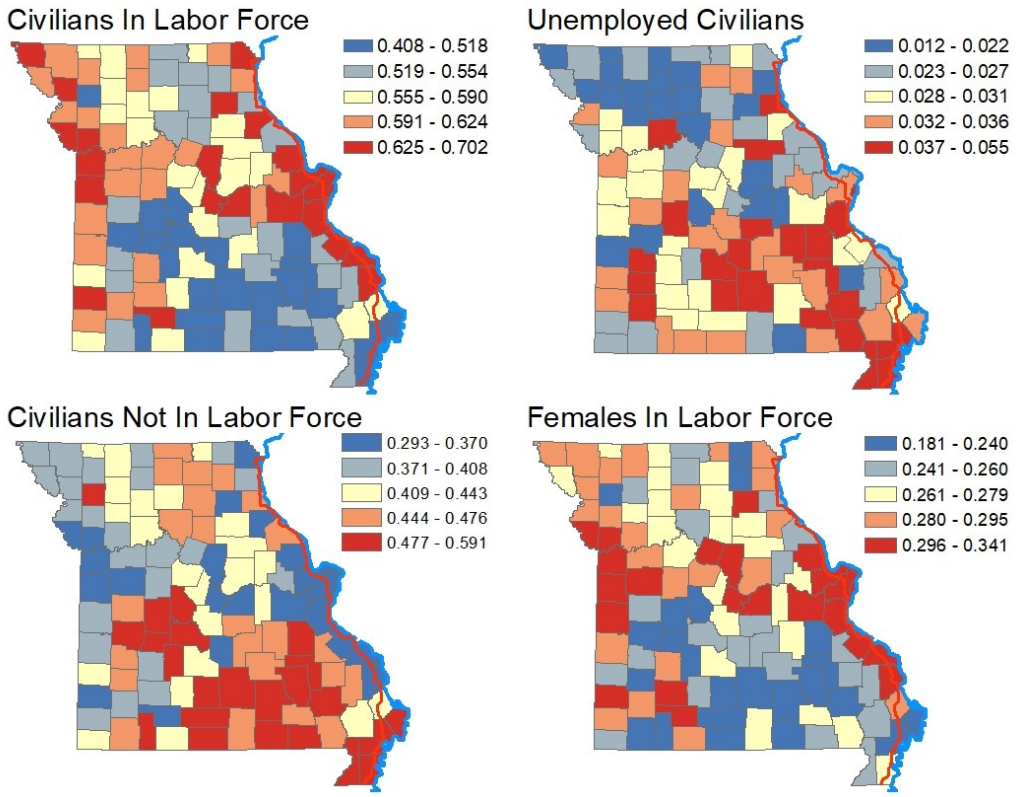

Figure 18: Quantile representations of employment status.

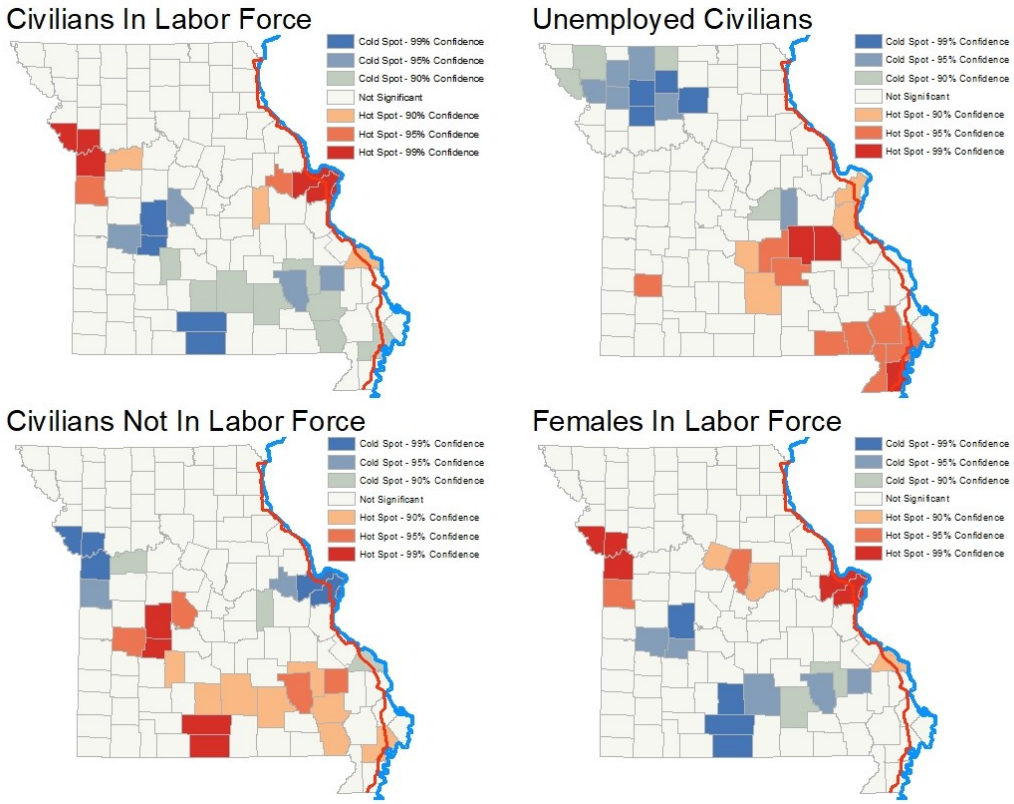

Figure 19: Getis-Ord GI representations of employment status.

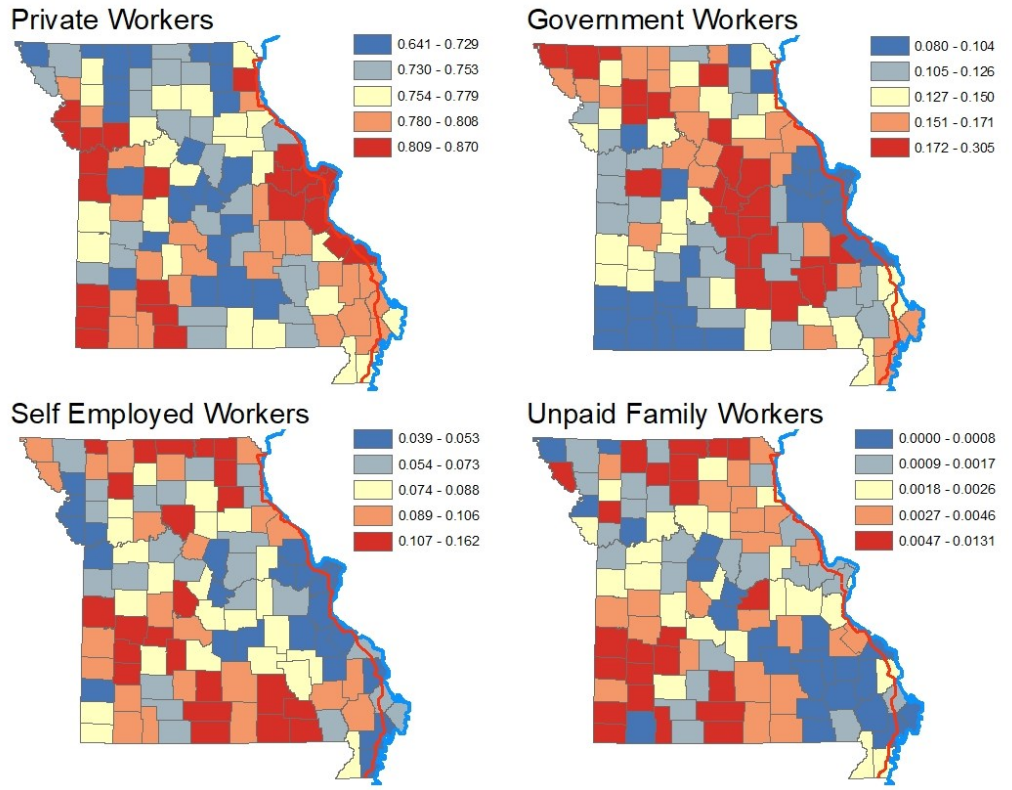

Figure 20: Quantile representations of class worker.

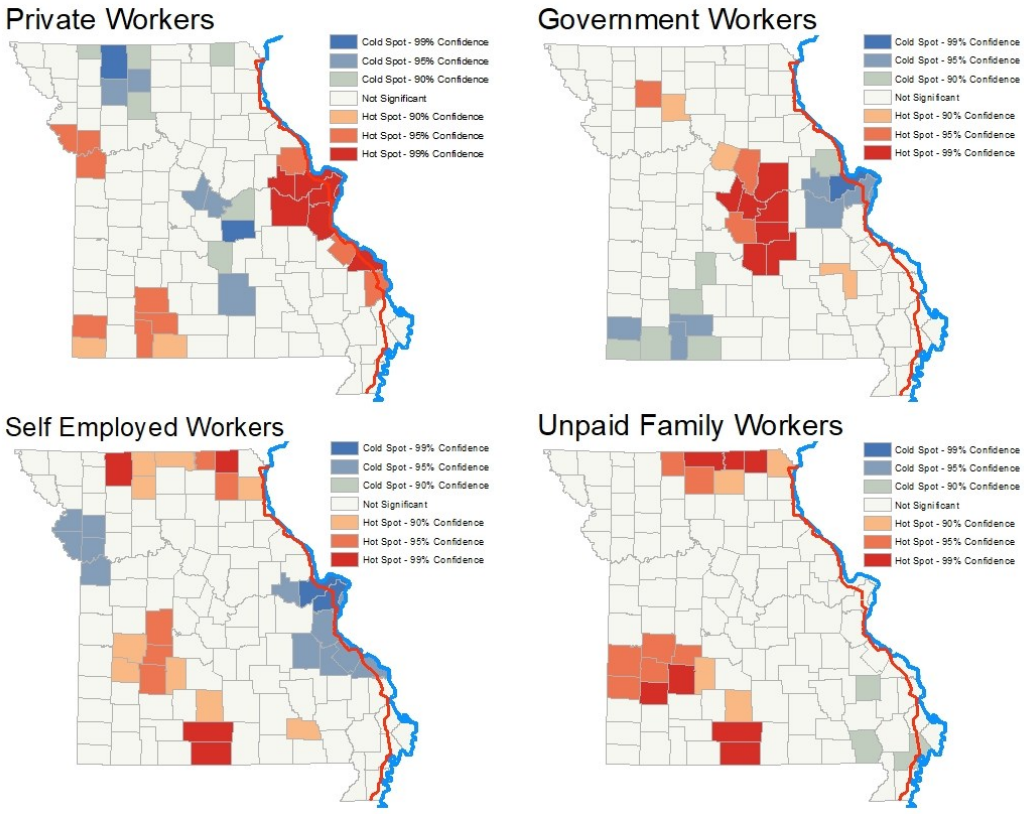

Figure 21: Getis-Ord GI representations of class worker.

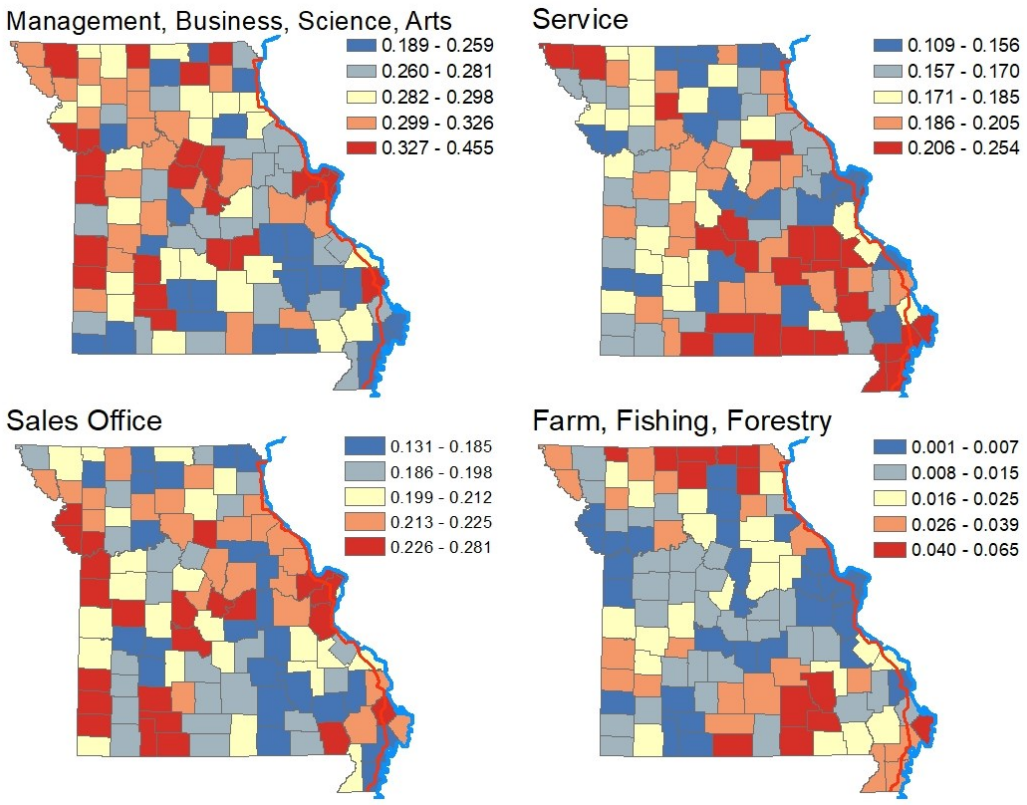

Figure 22: Quantile representations of workers by occupation including management.

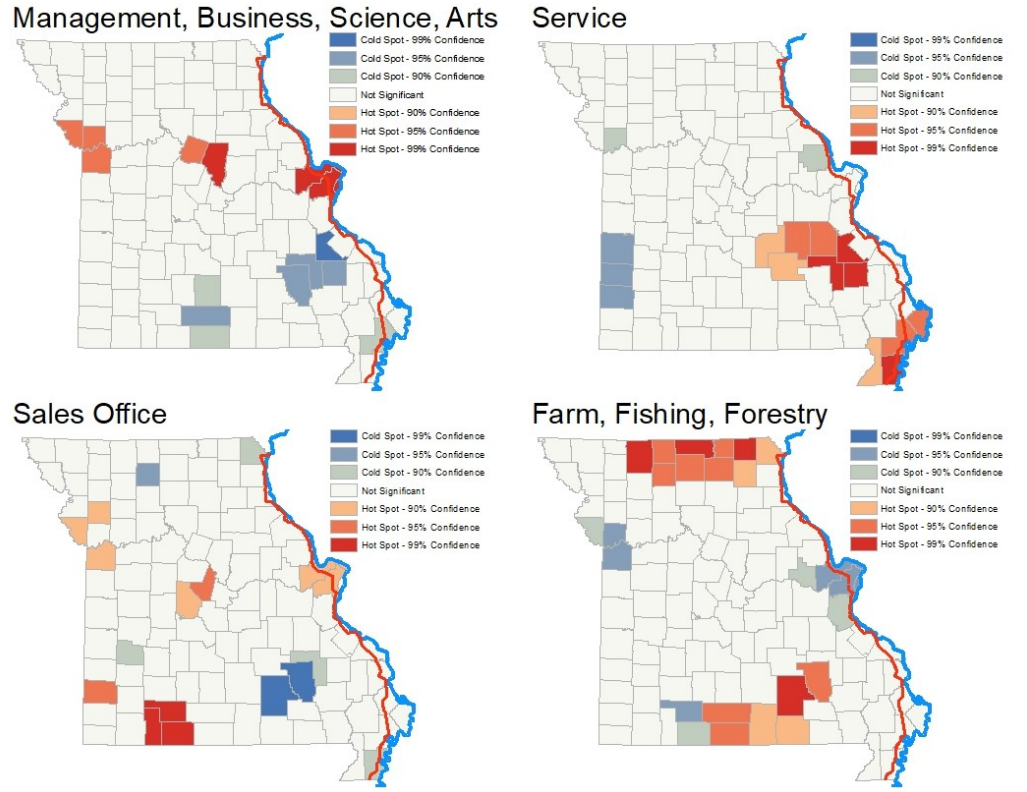

Figure 23: Getis-Ord GI representations of workers by occupation including management.

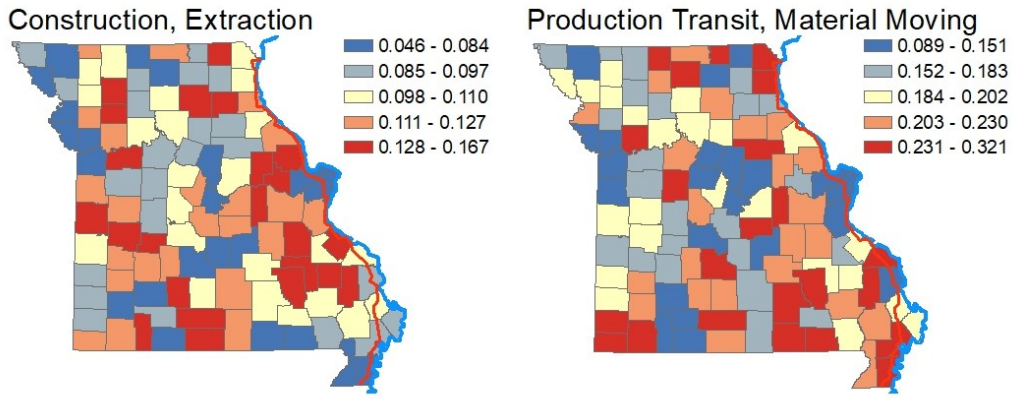

Figure 24: Quantile representations of workers by occupation including construction.

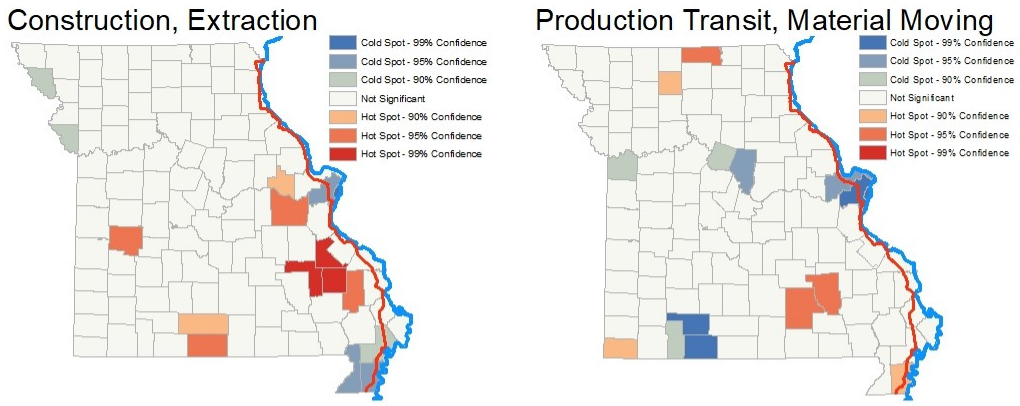

Figure 25: Getis-Ord GI representations of workers by occupation including construction.

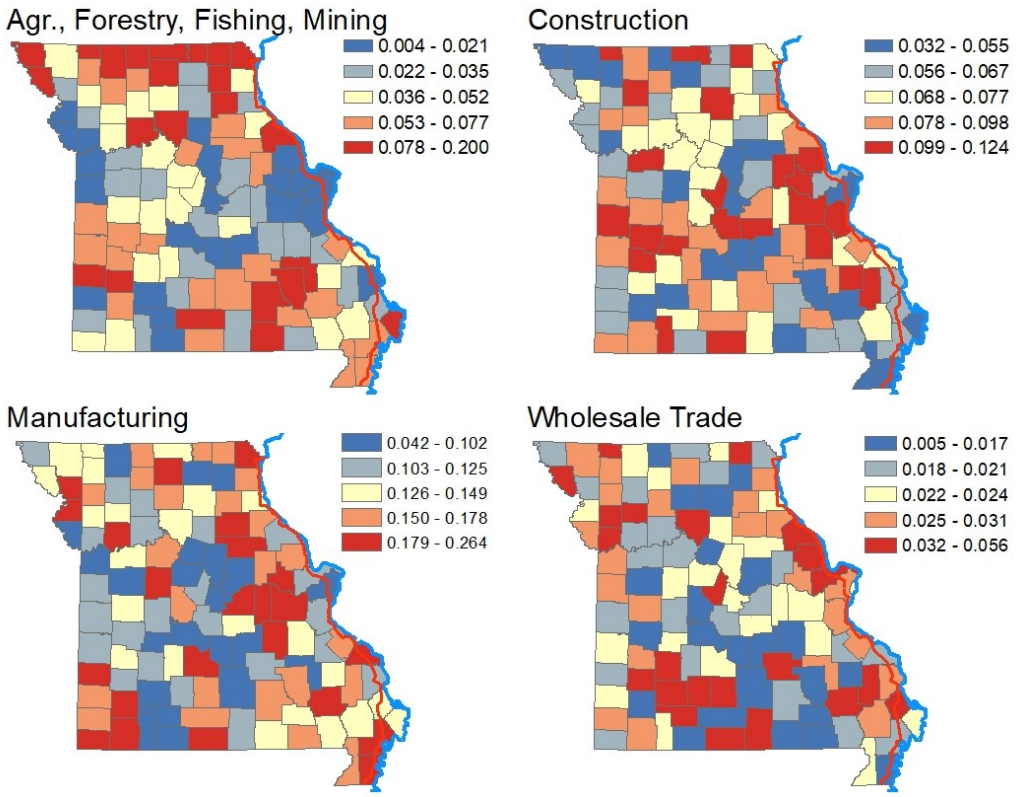

Figure 26: Quantile representations of workers by industry including agriculture.

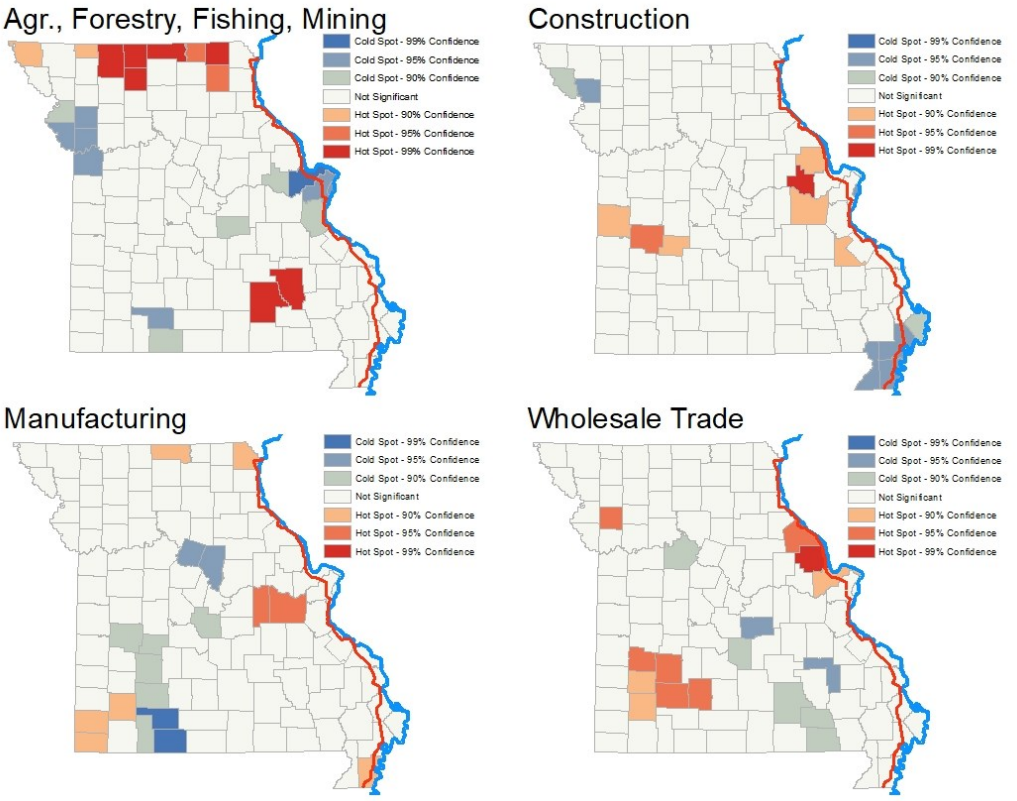

Figure 27: Getis-Ord GI representations of workers by industry including agriculture.

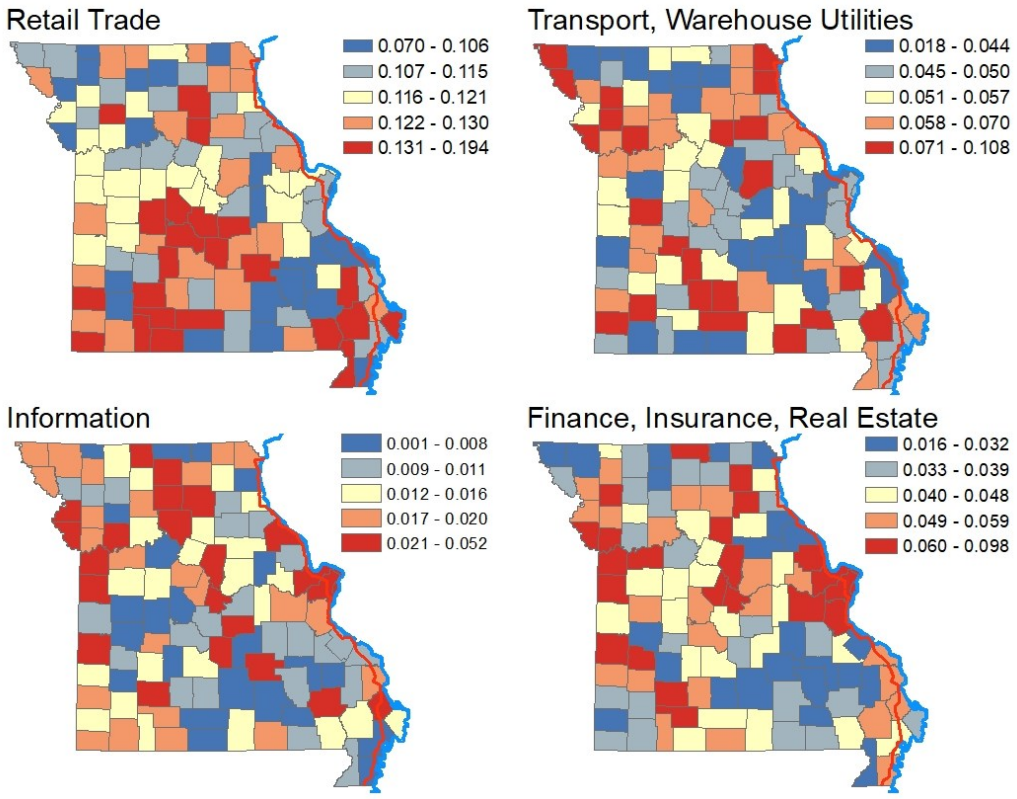

Figure 28: Quantile representations of workers by industry including retail trade.

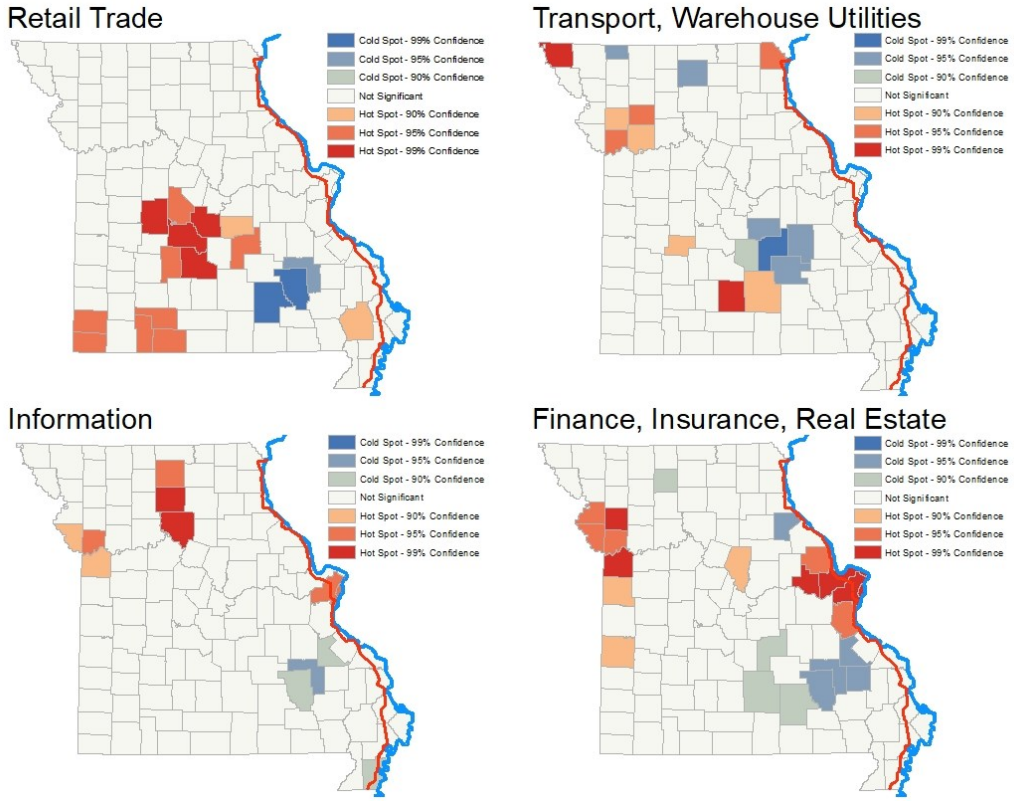

Figure 29: Getis-Ord GI representations of workers by industry including retail trade.

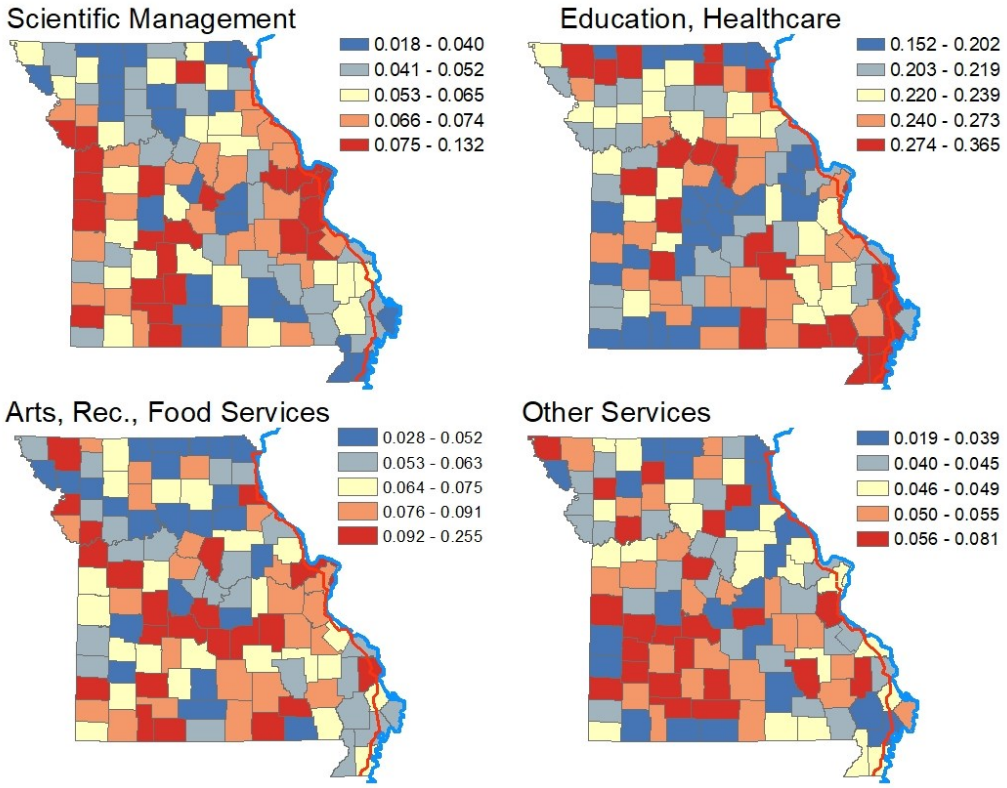

Figure 30: Quantile representations of workers by industry including scientific management.

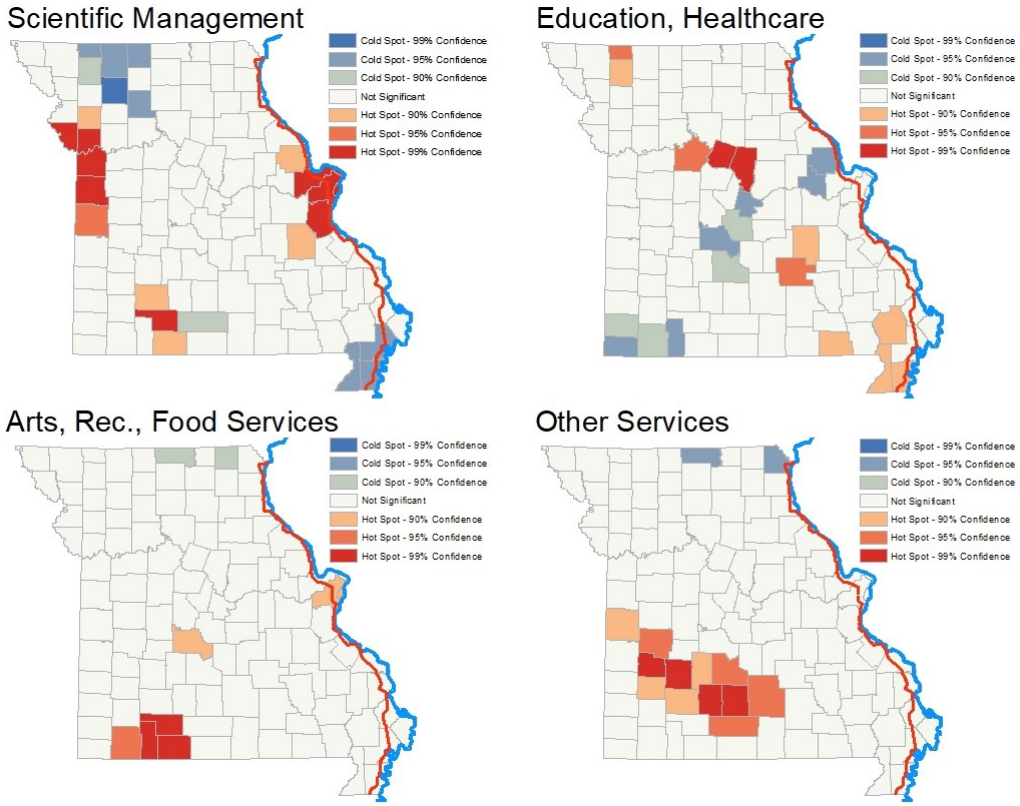

Figure 31: Getis-Ord GI representations of workers by industry including scientific management.

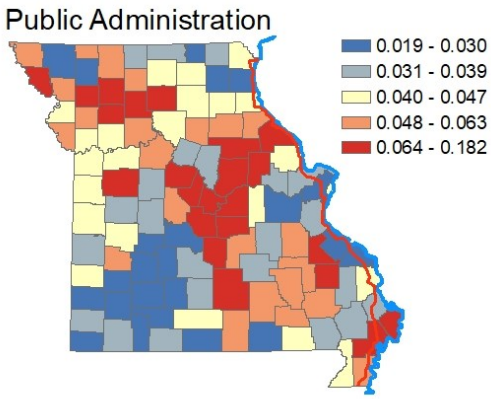

Figure 32: Quantile representations of workers by industry including public administration.

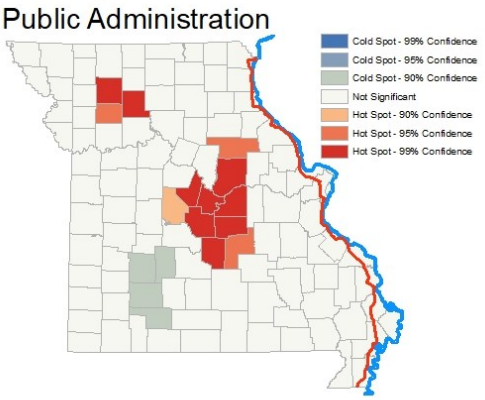

Figure 33: Getis-Ord GI representations of workers by industry including public administration.

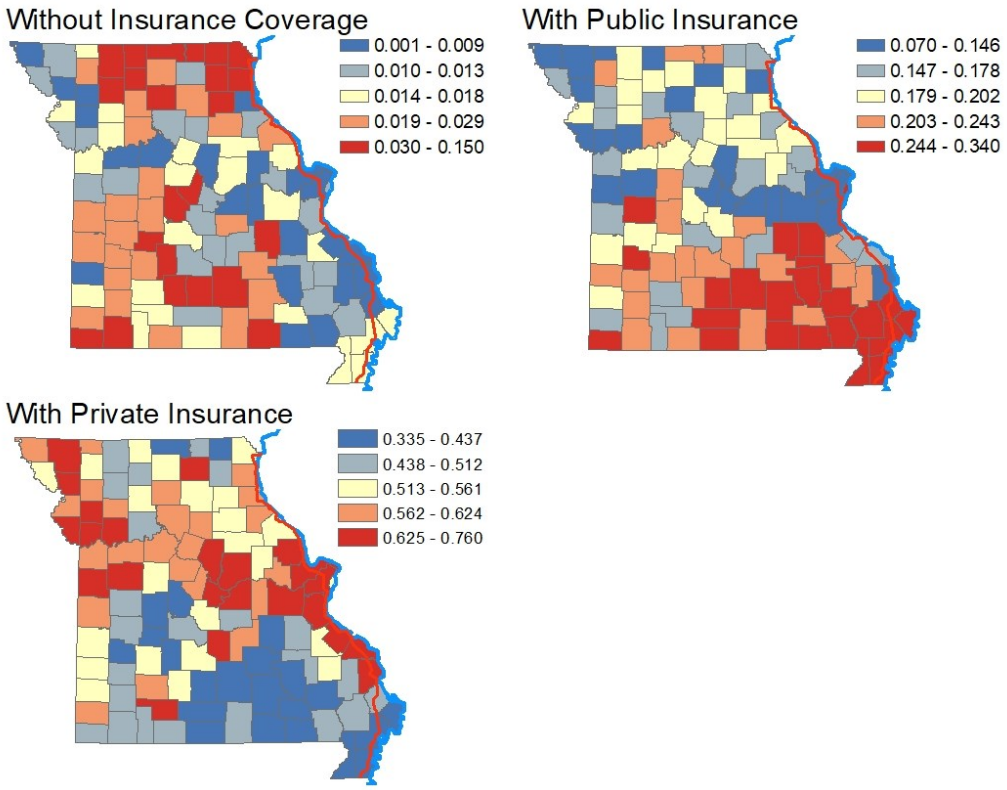

Figure 34: Quantile representations of insurance coverage.

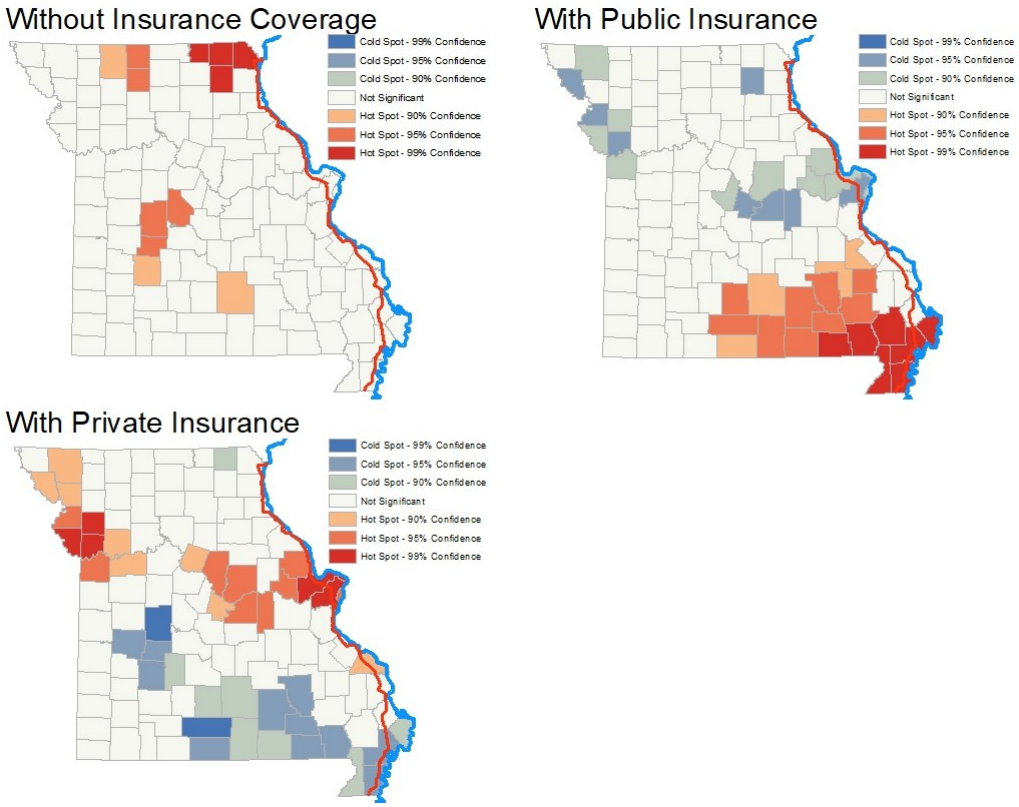

Figure 35: Getis-Ord GI representations of insurance coverage.

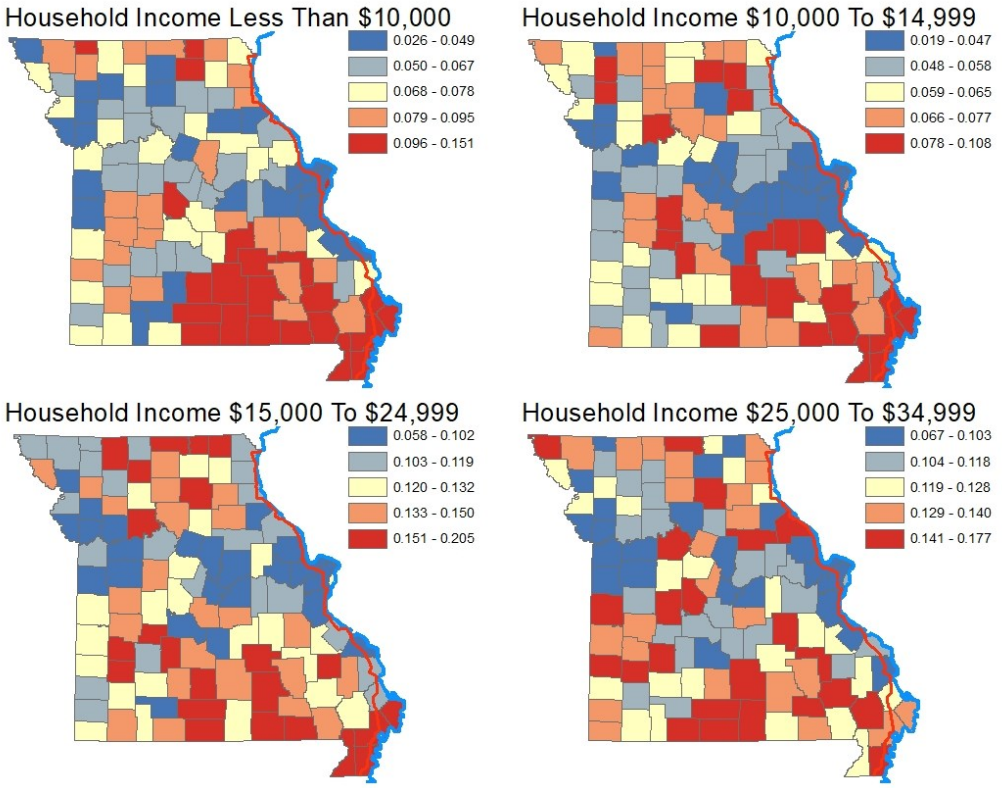

Figure 36: Quantile representations of household income including less than $10,000.

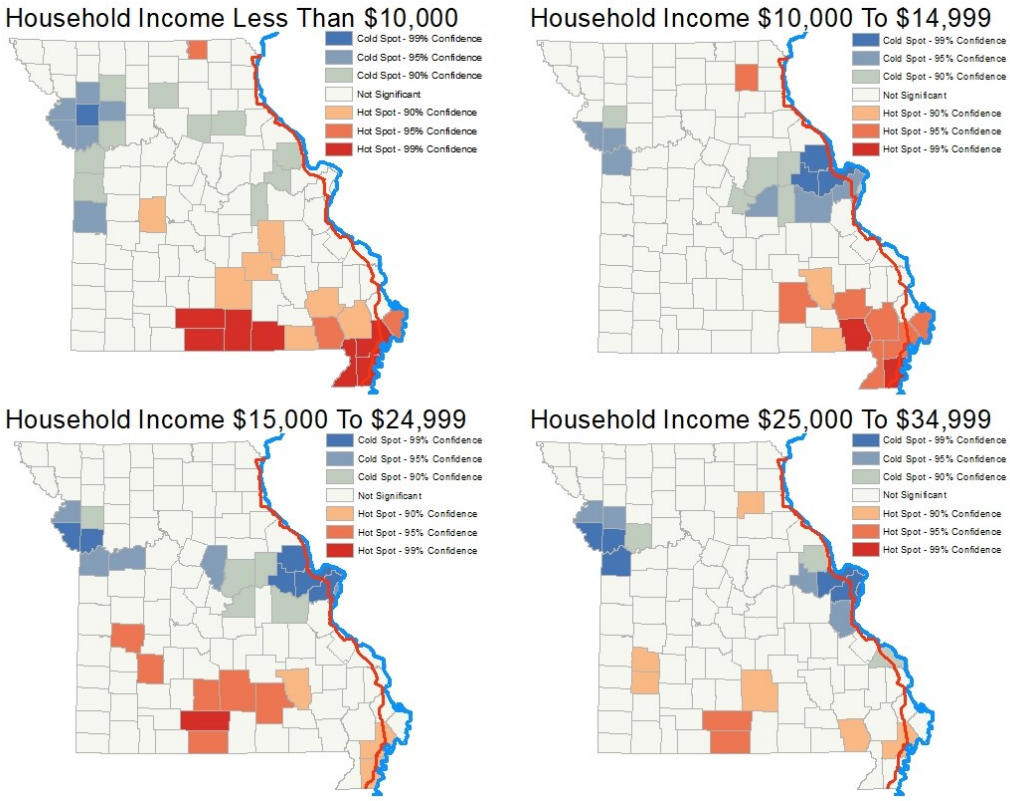

Figure 37: Getis-Ord GI representations of household income including less than $10,000.

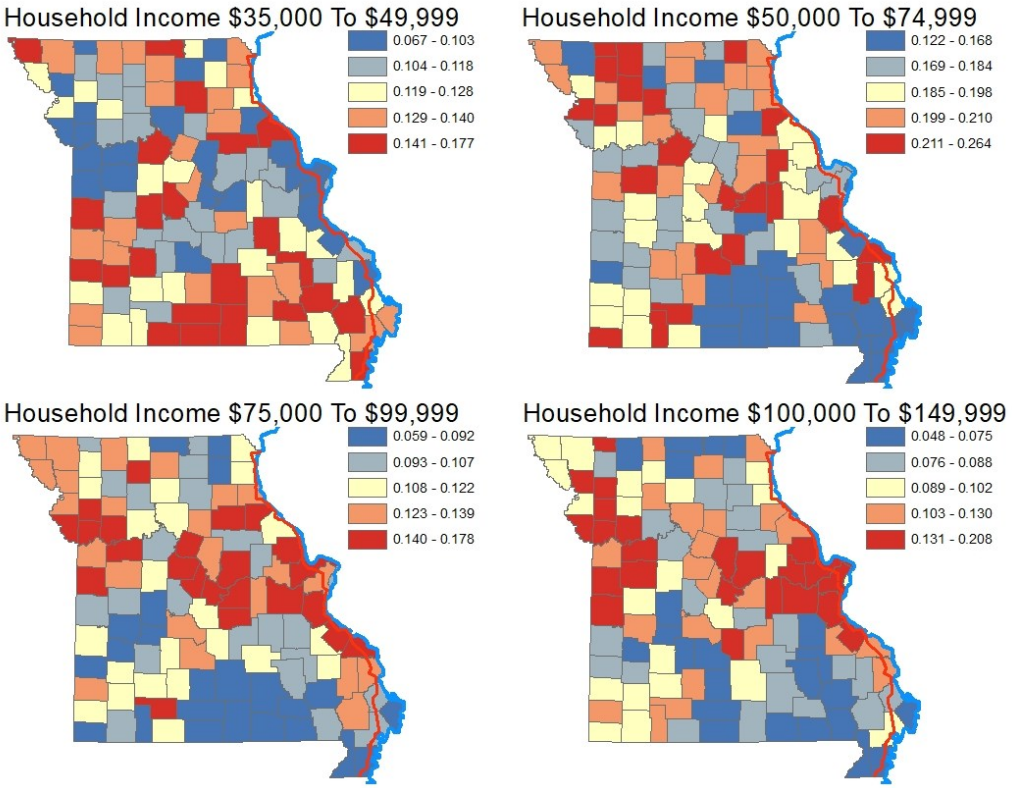

Figure 38: Quantile representations of household income including $35,000 to $49,999.

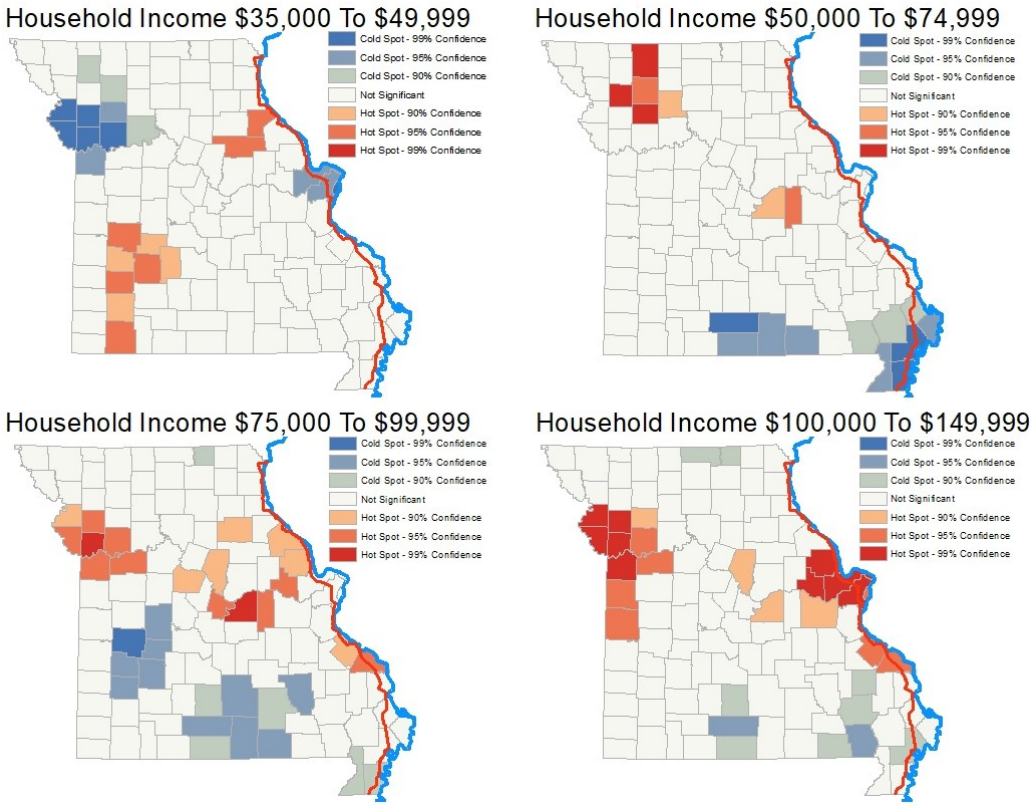

Figure 39: Getis-Ord GI representations of household income including $35,000 to $49,999.

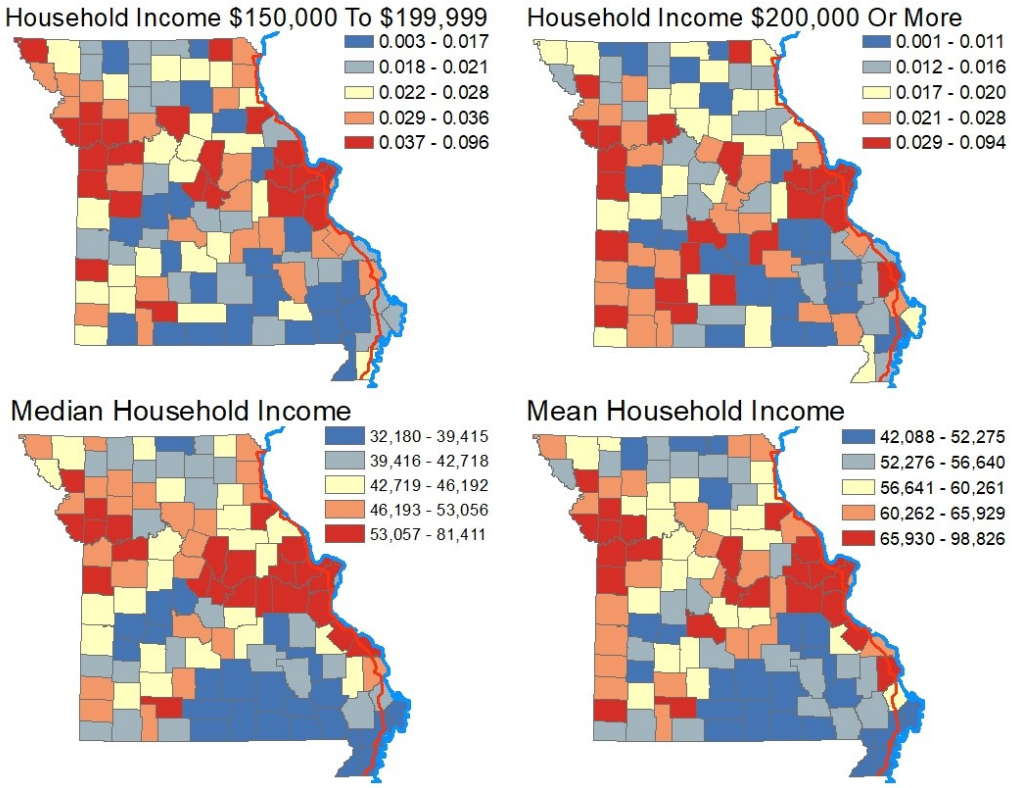

Figure 40: Quantile representations of household income including $150,000 to $199,999.

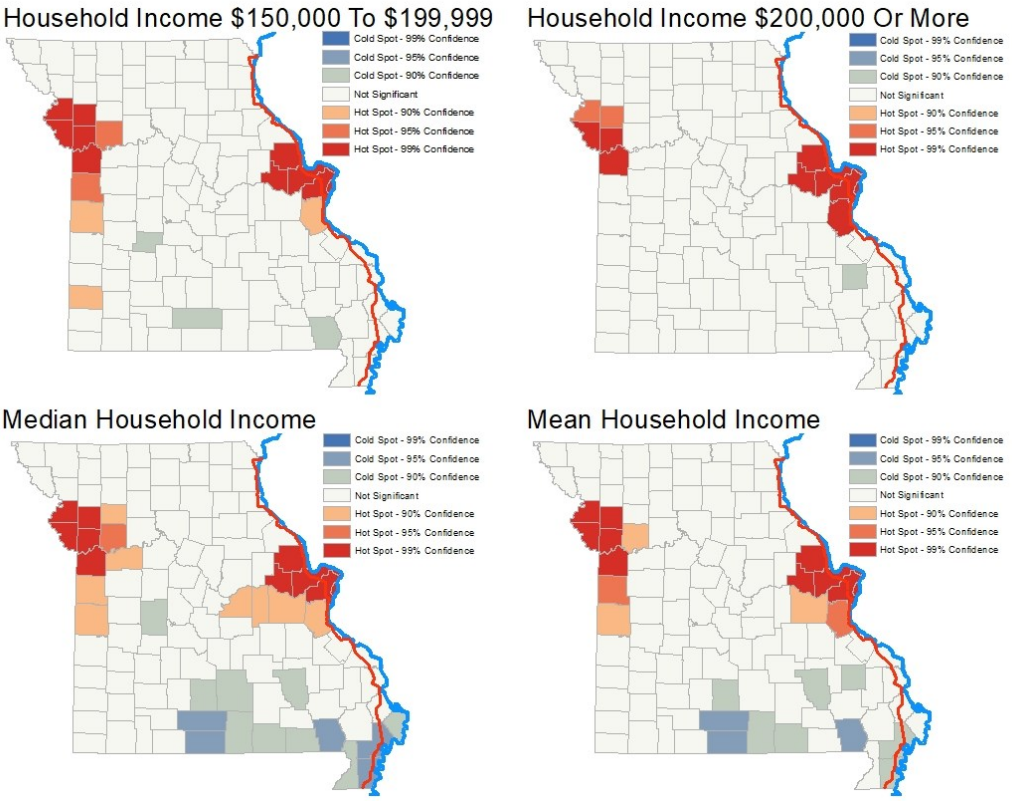

Figure 41: Getis-Ord GI representations of household income including $150,000 to $199,999.

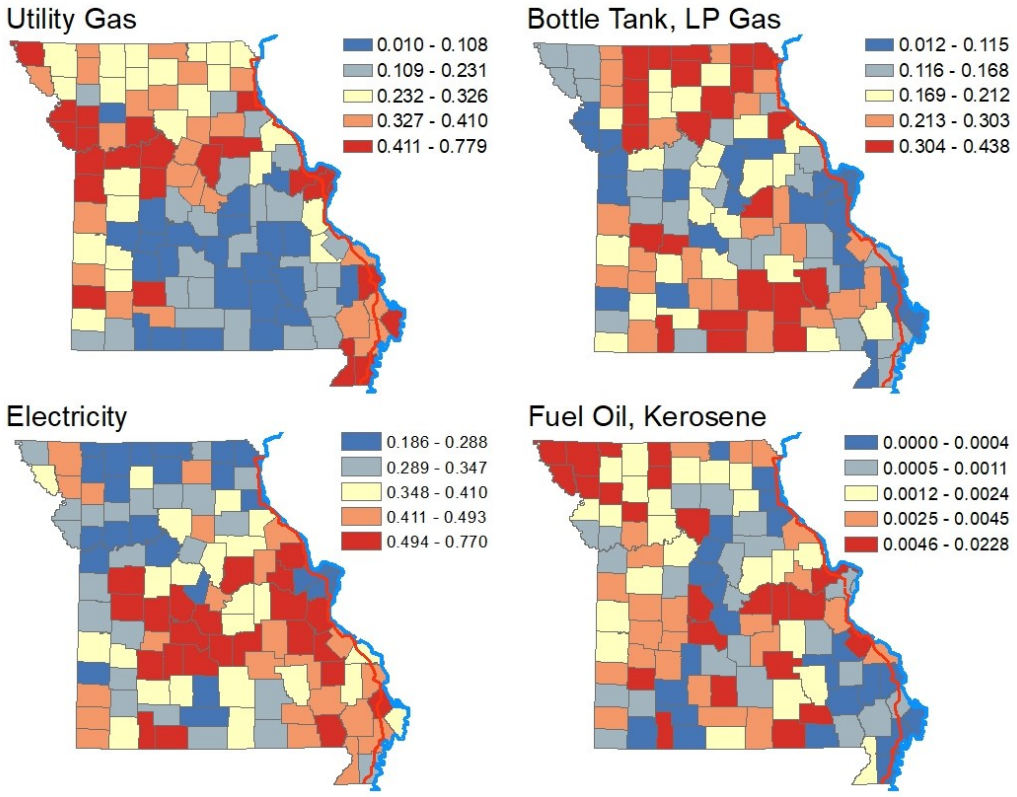

Figure 42: Quantile representations of heating fuel including utility gas.

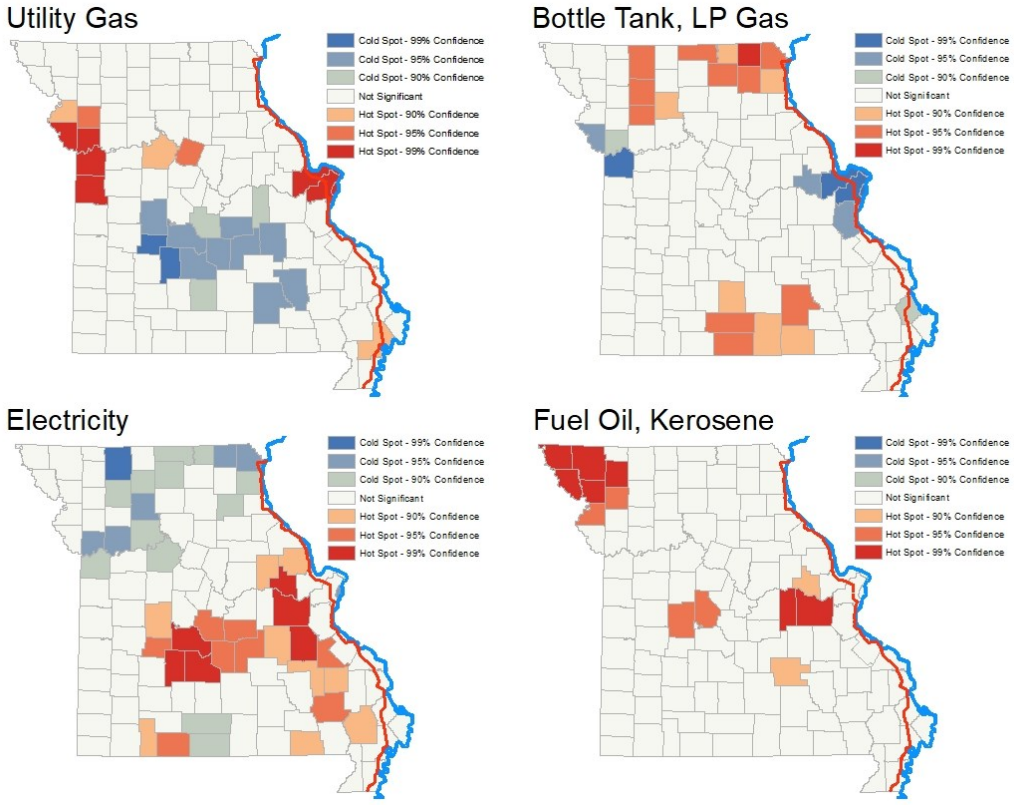

Figure 43: Getis-Ord GI representations of heating fuel including utility gas.

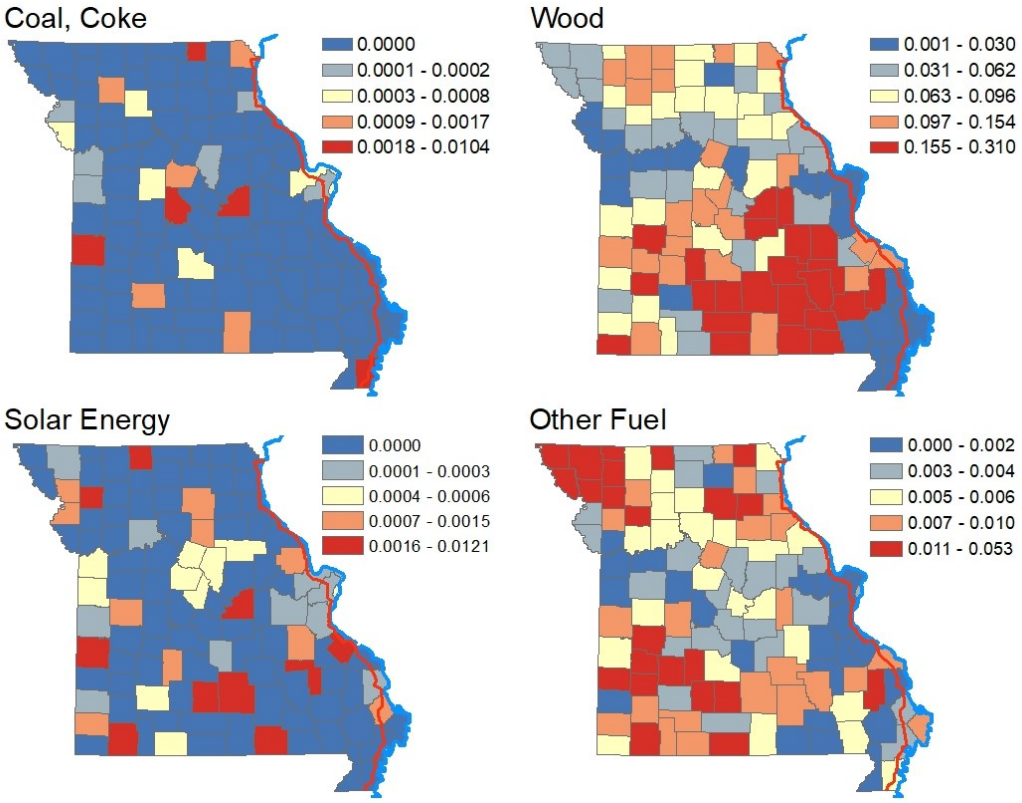

Figure 44: Quantile representations of heating fuel including coal, coke.

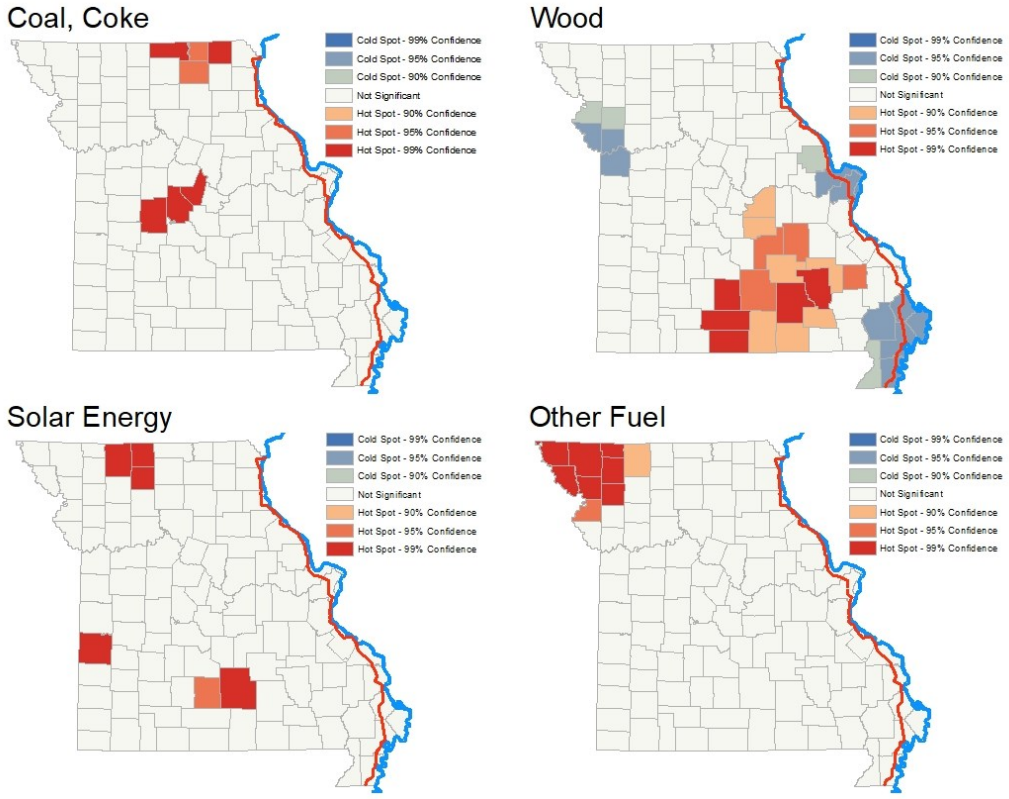

Figure 45: Getis-Ord GI representations of heating fuel including coal, coke.

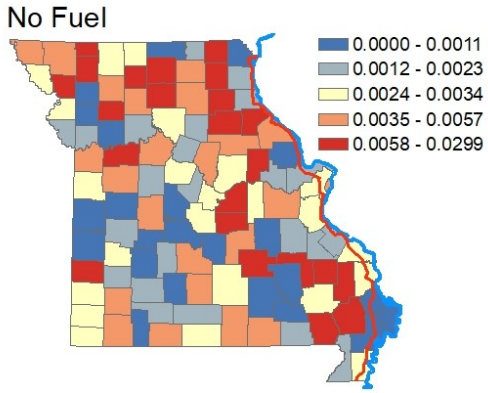

Figure 46: Quantile representations of heating fuel including no fuel.

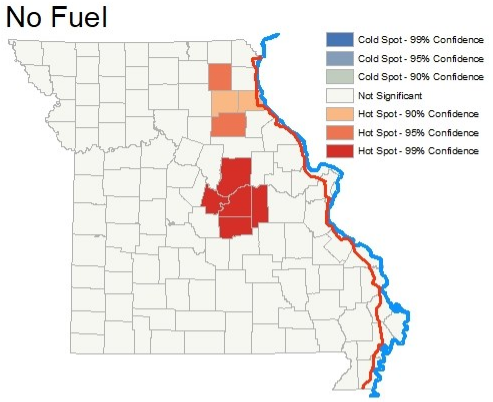

Figure 47: Getis-Ord GI representations of heating fuel including no fuel.

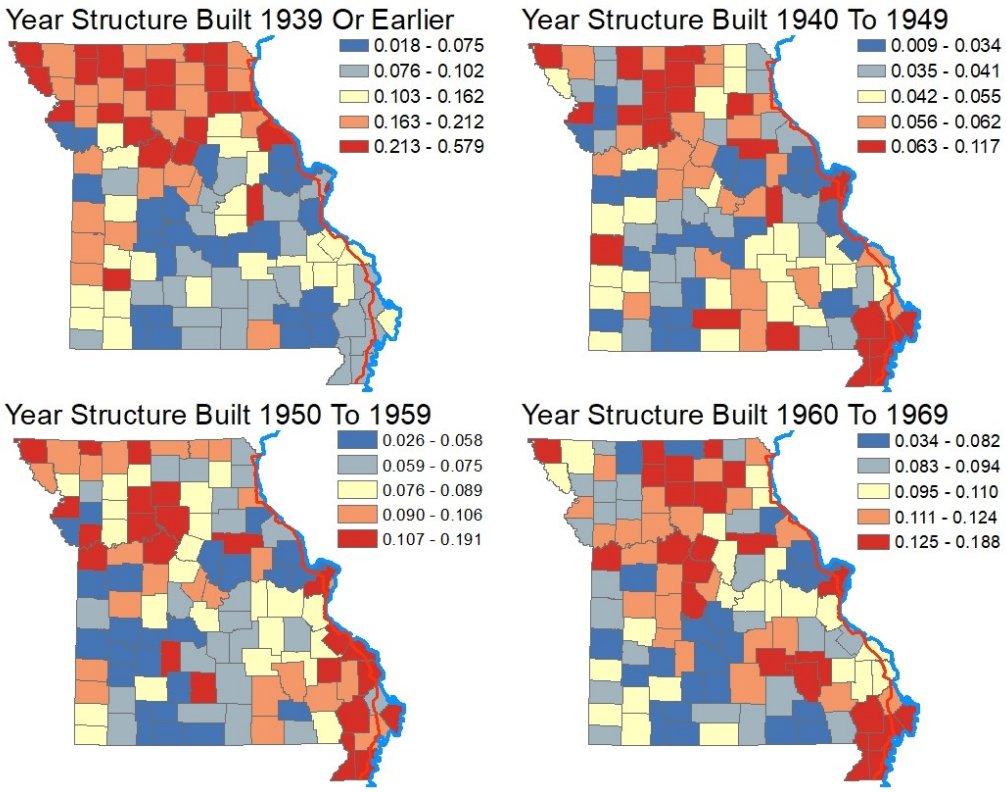

Figure 48: Quantile representations of year structure built from 1939 to1969.

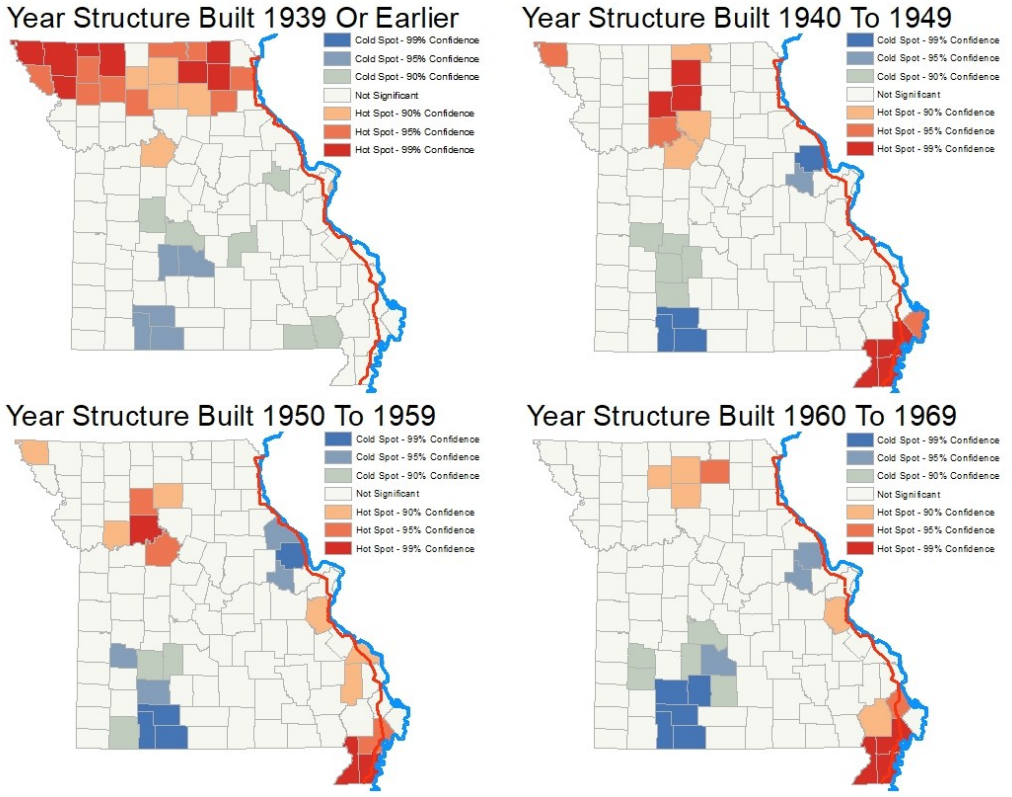

Figure 49: Getis-Ord GI representations of year structure built from 1939 to1969.

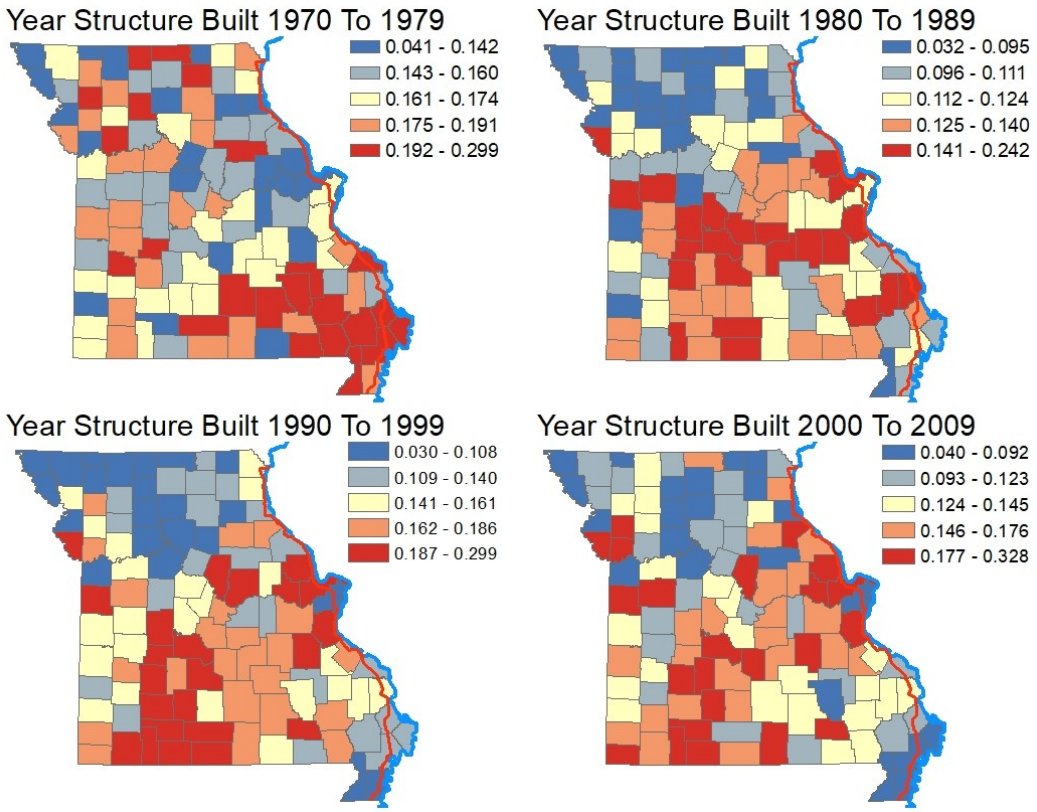

Figure 50: Quantile representations of year structure built from 1970 to2009.

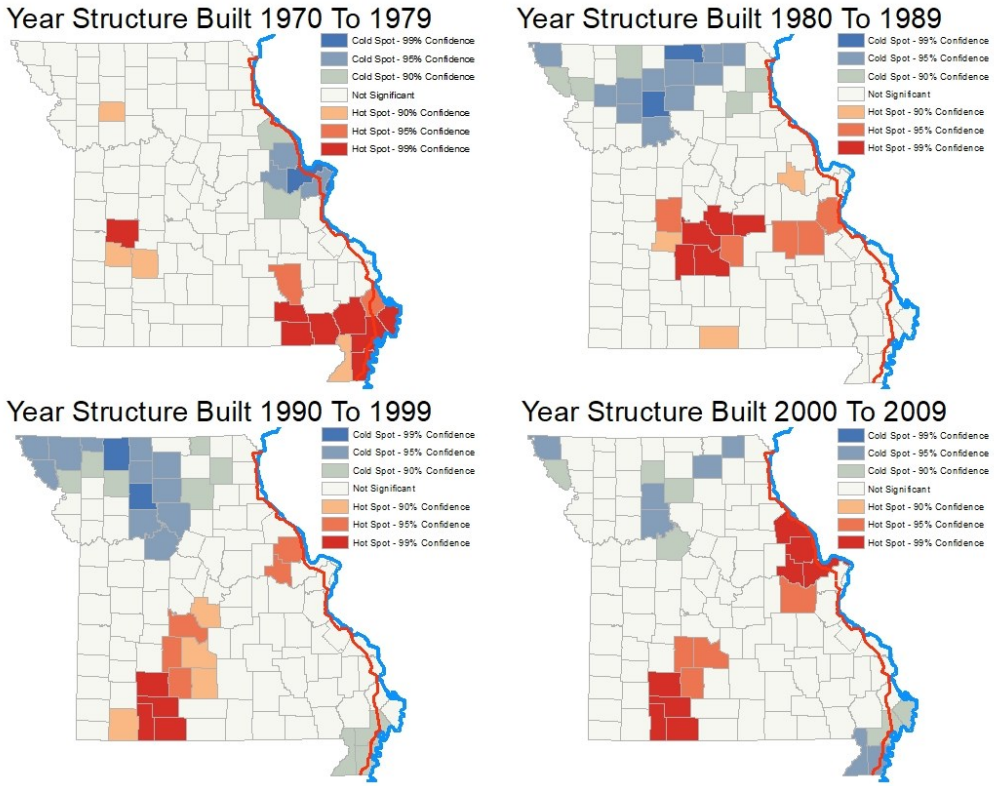

Figure 51: Getis-Ord GI representations of year structure built from 1970 to2009.

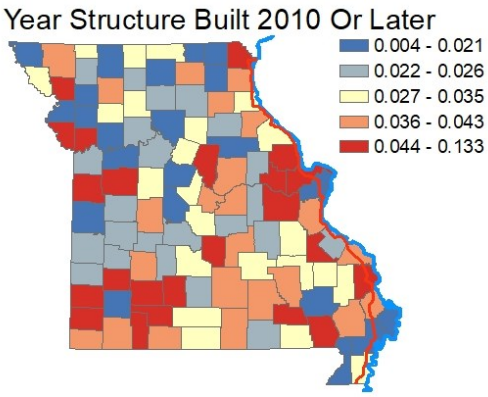

Figure 52: Quantile representations of year structure built from 2010 to present.

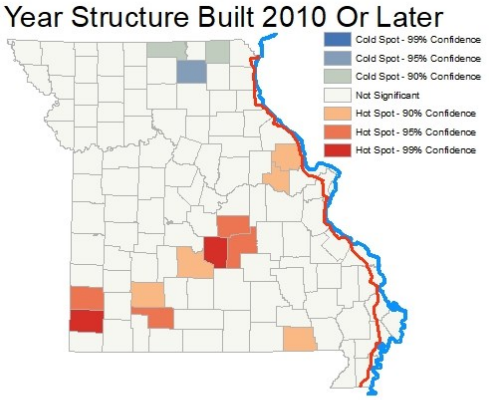

Figure 53: Getis-Ord GI representations of year structure built from 2010 to present.

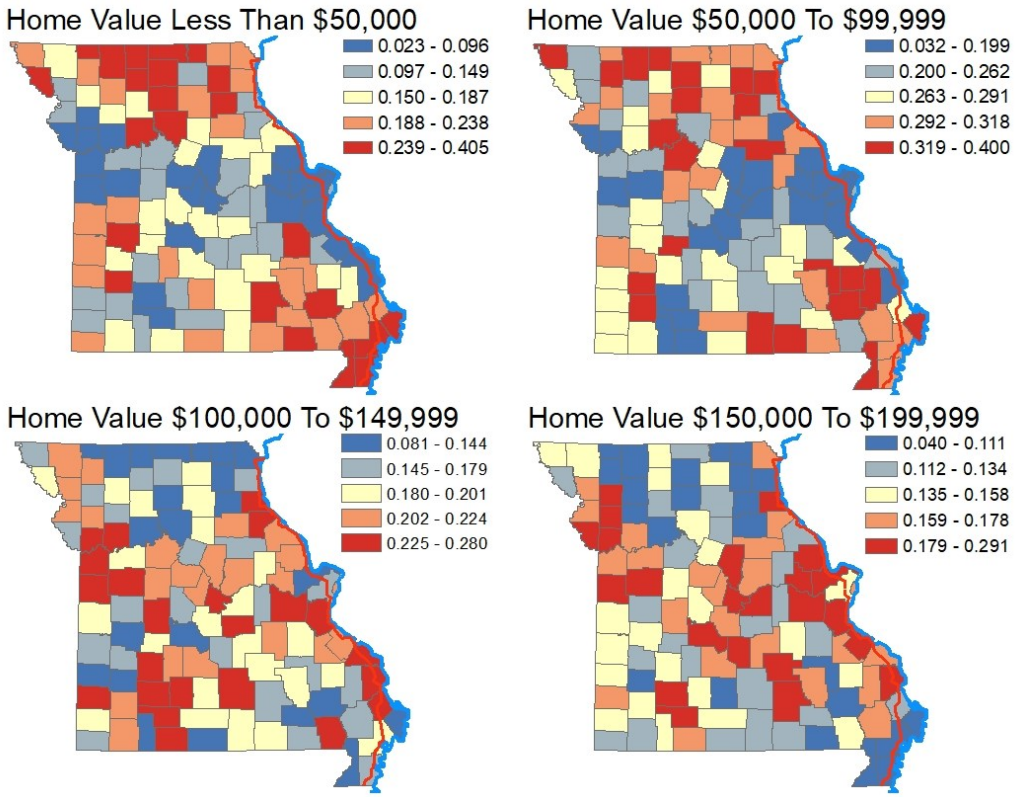

Figure 54: Quantile representations of home value including less than $50,000.

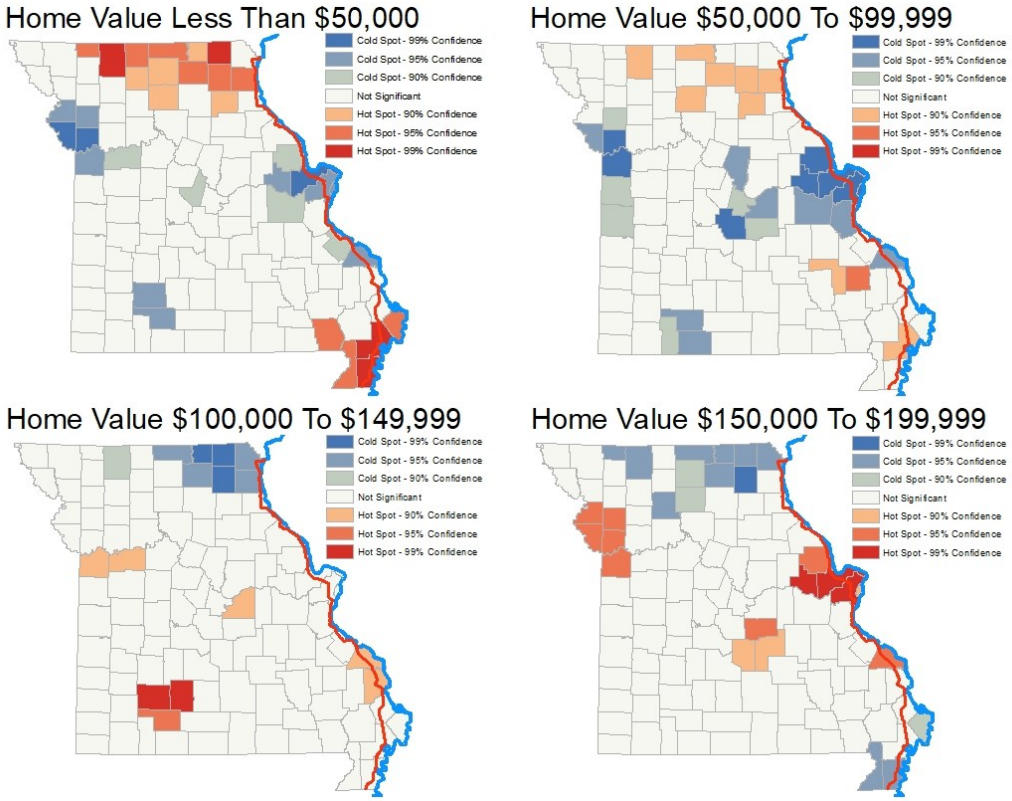

Figure 55: Getis-Ord GI representations of home value including less than $50,000.

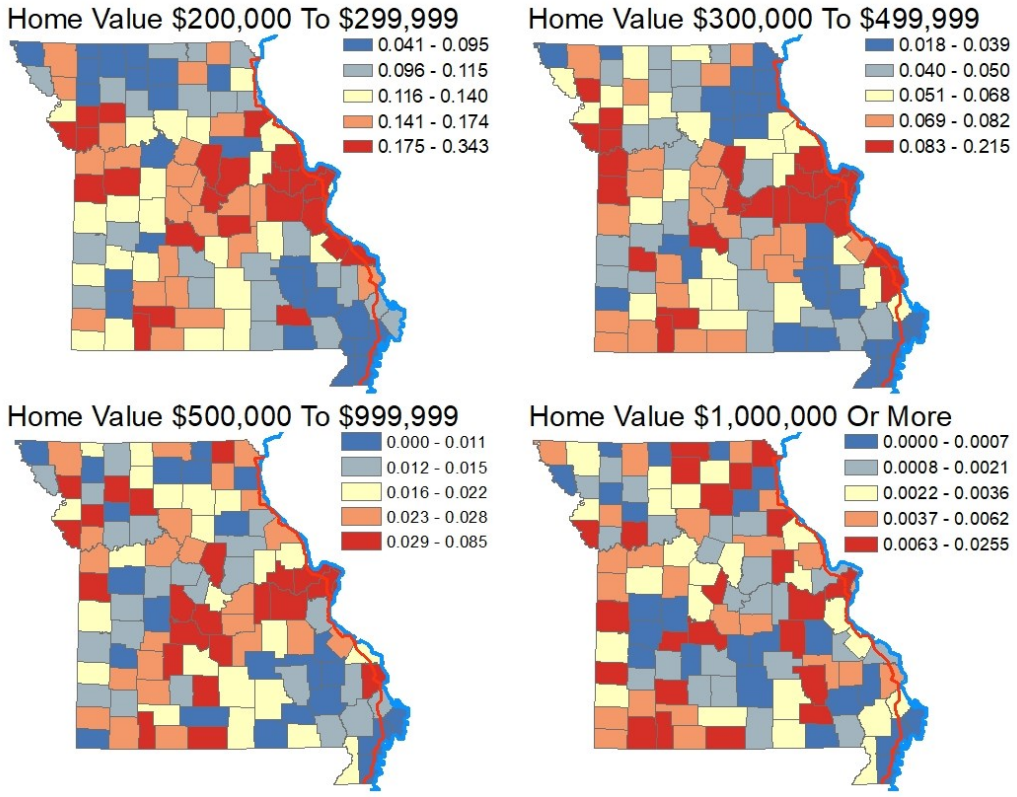

Figure 56: Quantile representations of home value including $200,000 to $299,999.

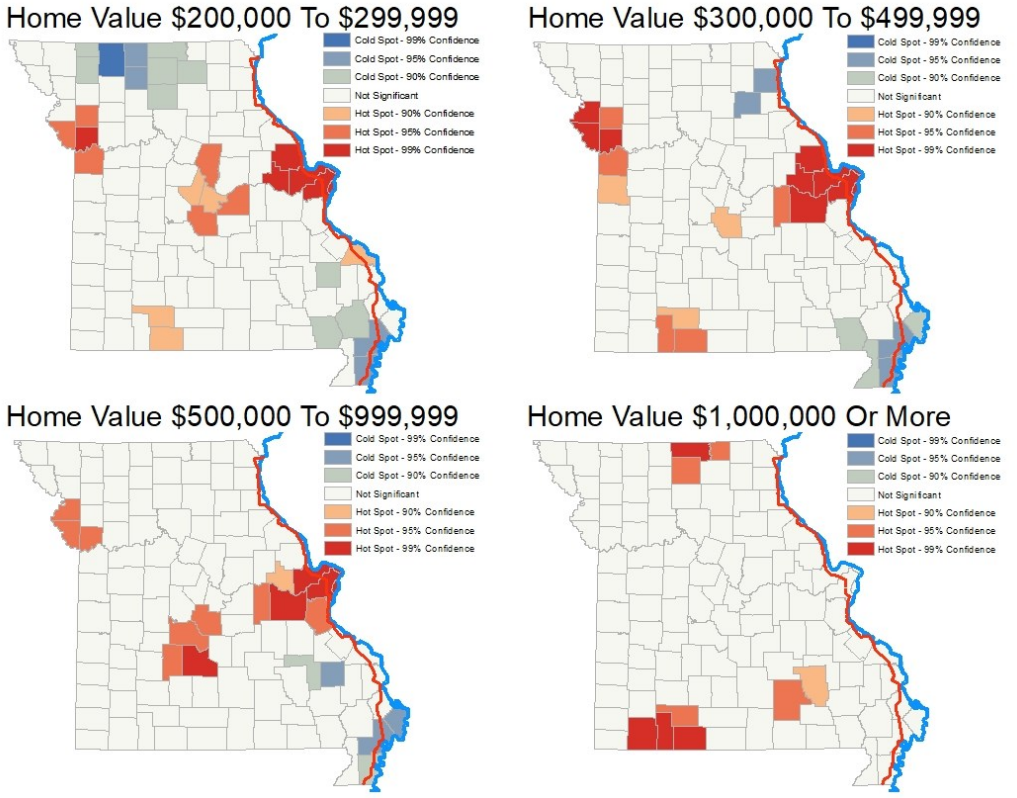

Figure 57: Getis-Ord GI representations of home value including $200,000 to $299,999.

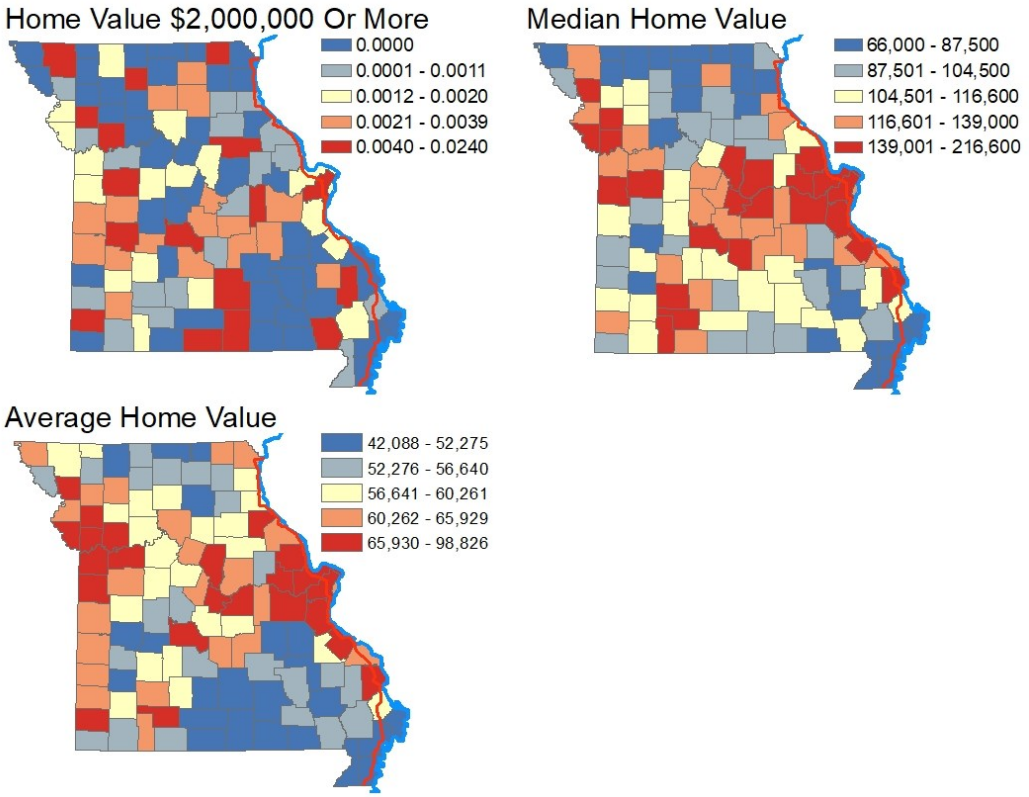

Figure 58: Quantile representations of home value including $2,000,000 or more.

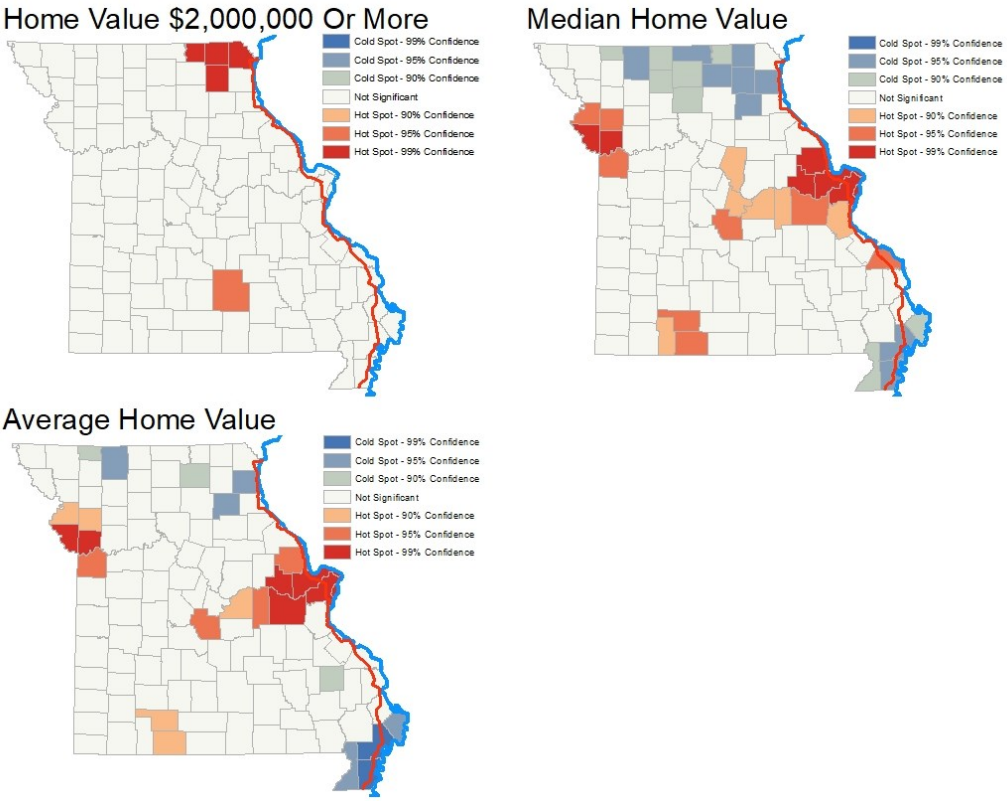

Figure 59: Getis-Ord GI representations of home value including $2,000,000 or more.

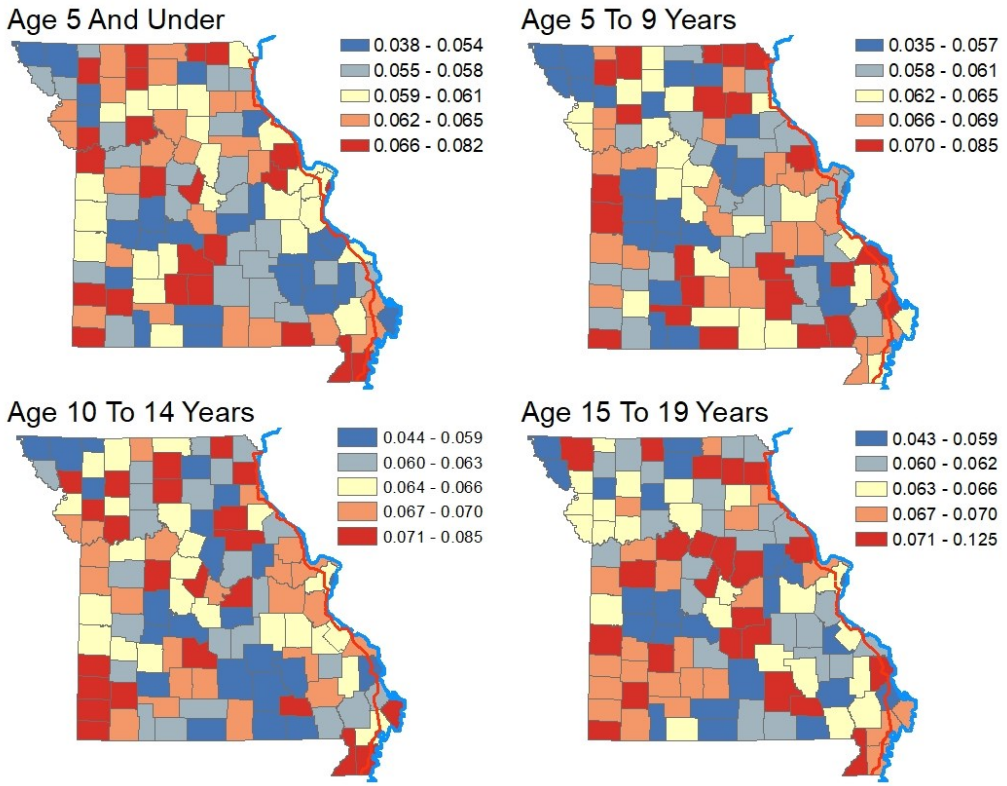

Figure 60: Quantile representations of age from under 5 to 19.

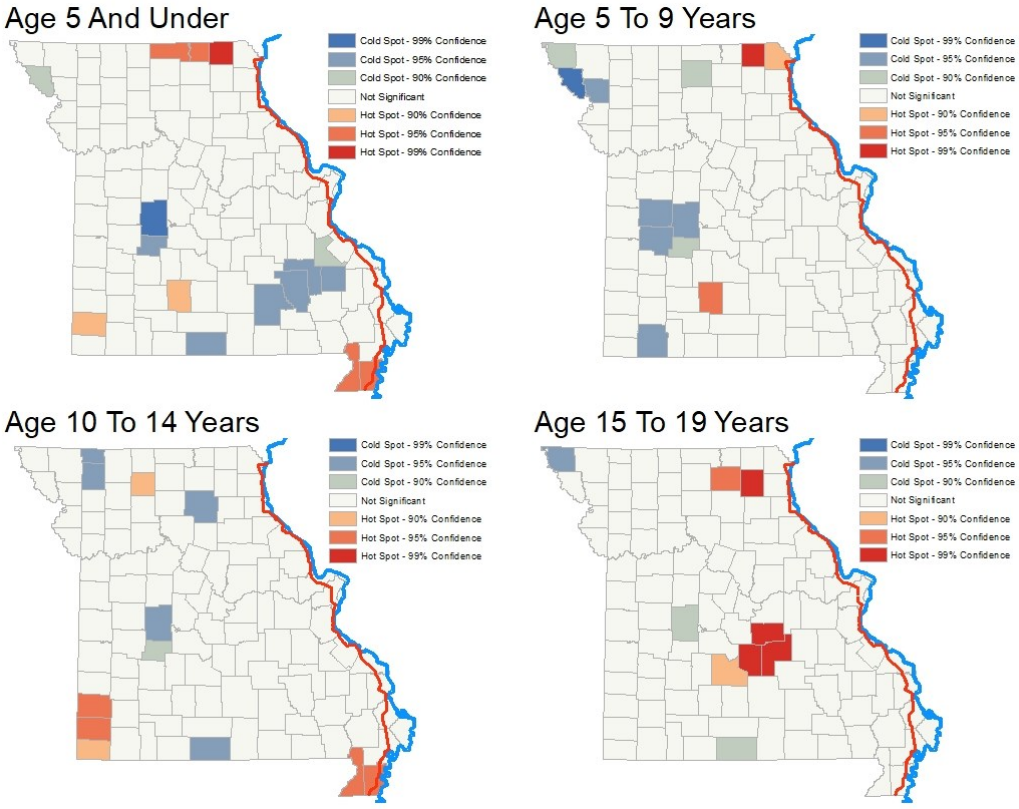

Figure 61: Getis-Ord GI representations of age from under 5 to 19.

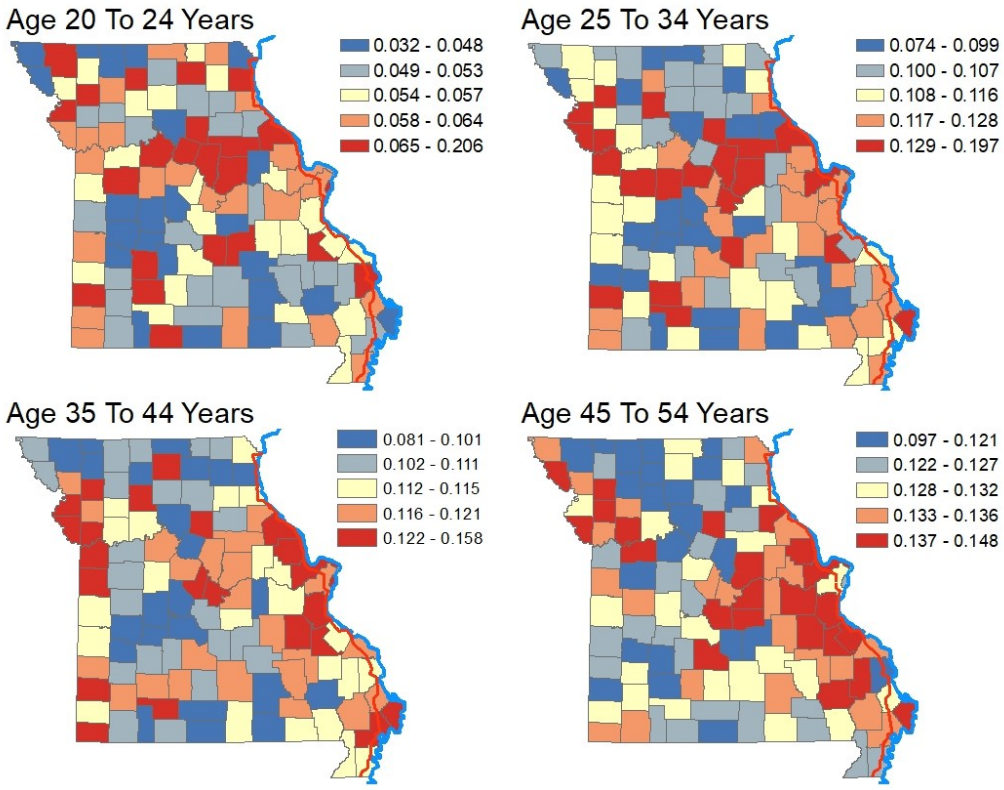

Figure 62: Quantile representations of age from 20 to 54.

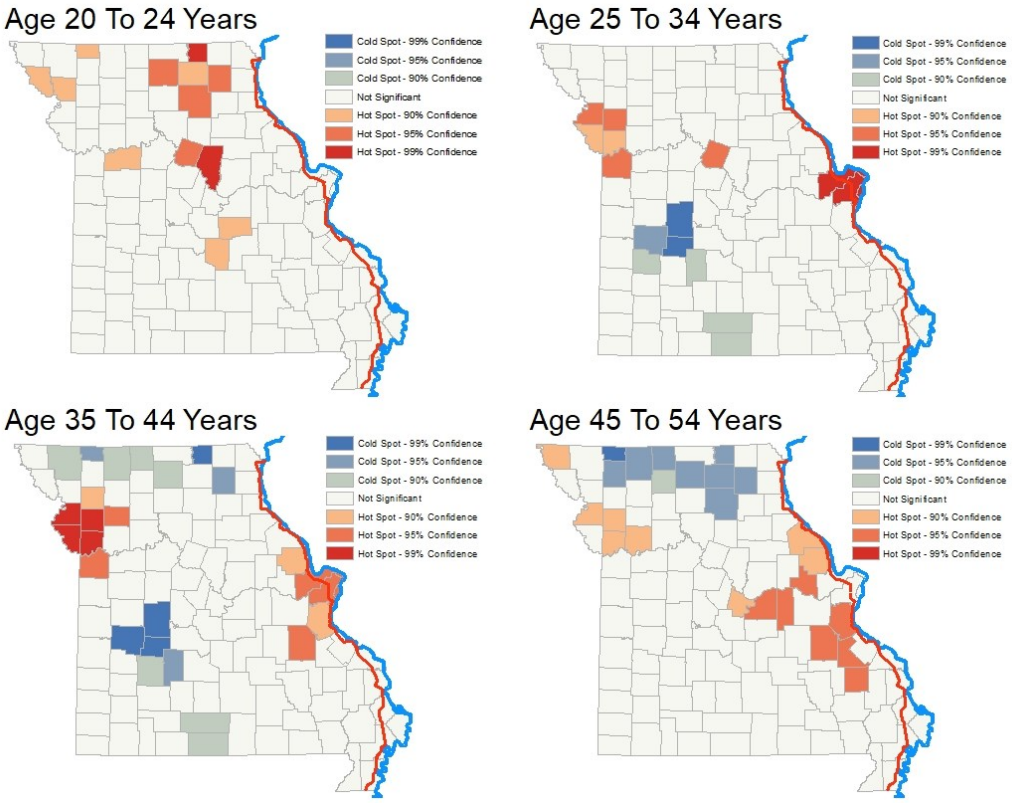

Figure 63: Getis-Ord GI representations of age from 20 to 54.

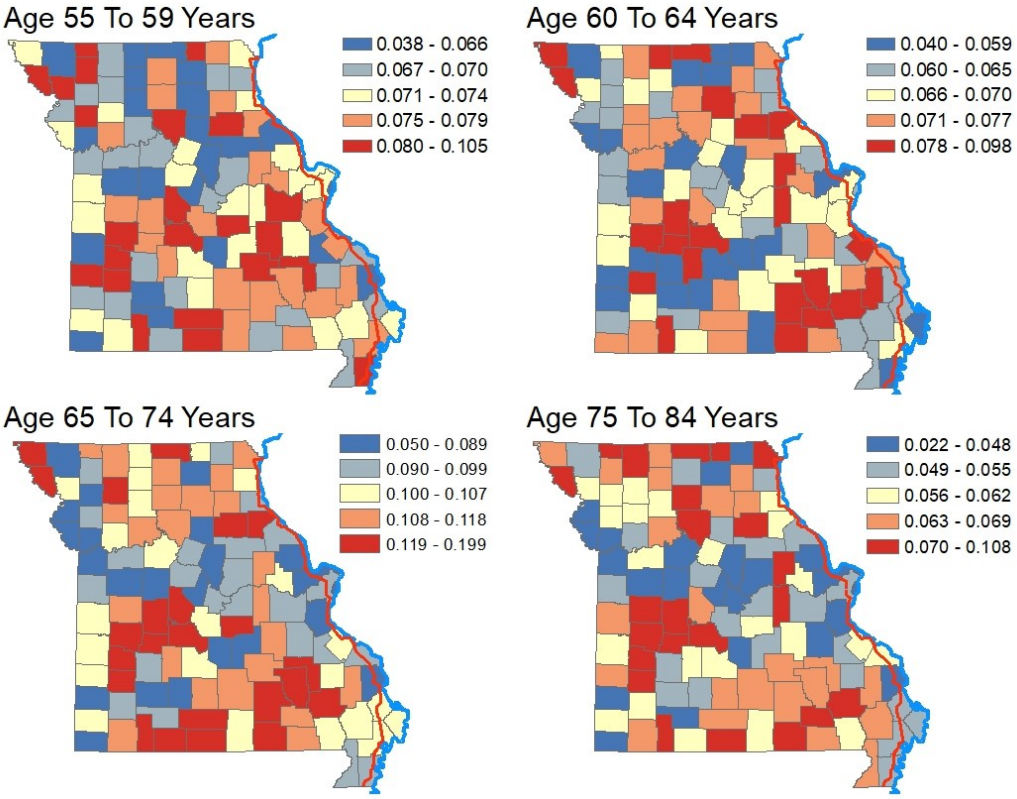

Figure 64: Quantile representations of age from 55 to 84.

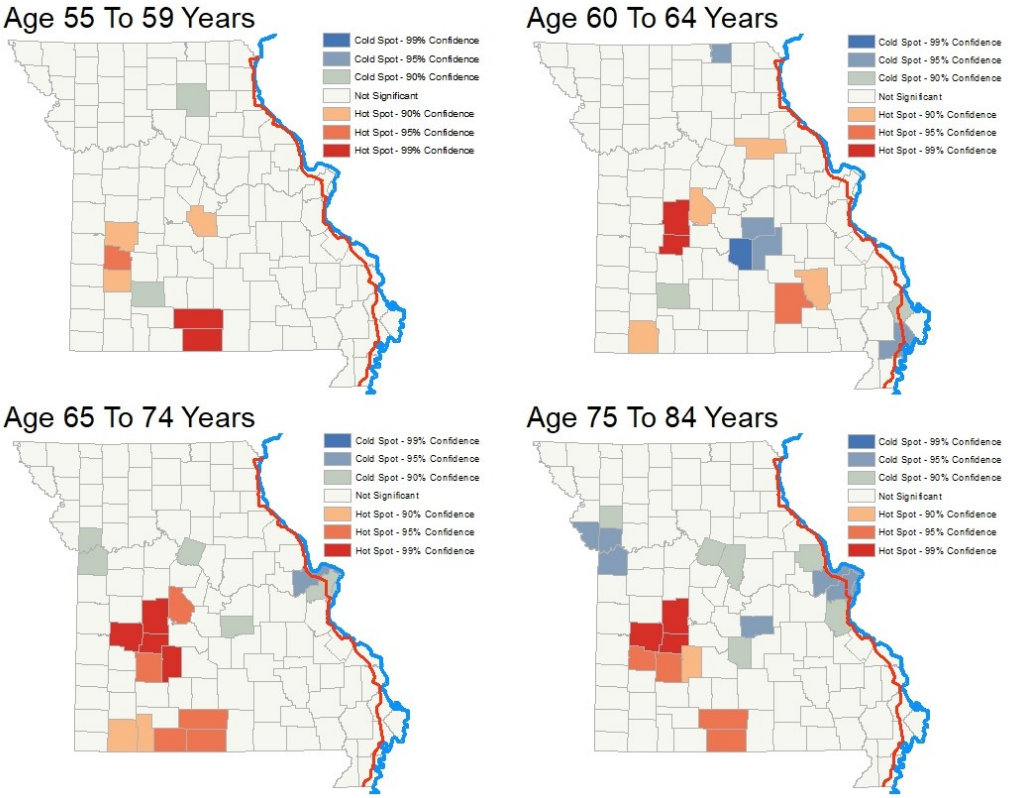

Figure 65: Getis-Ord GI representations of age from 55 to 84.

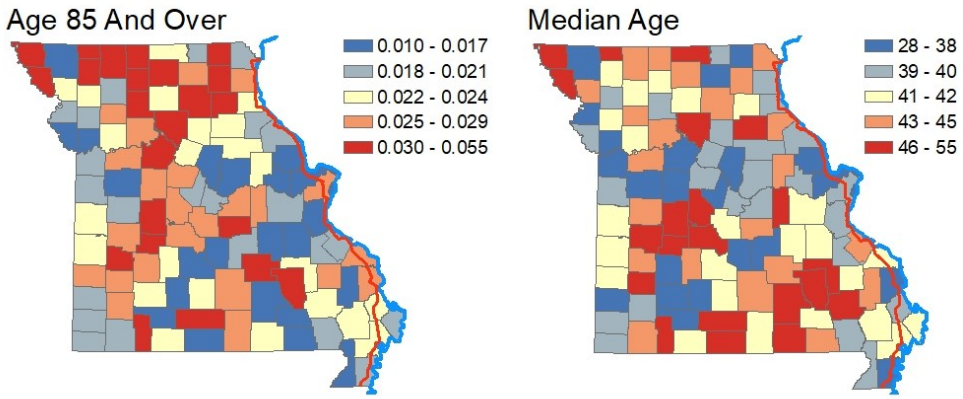

Figure 66: Quantile representations of age including 85 and over.

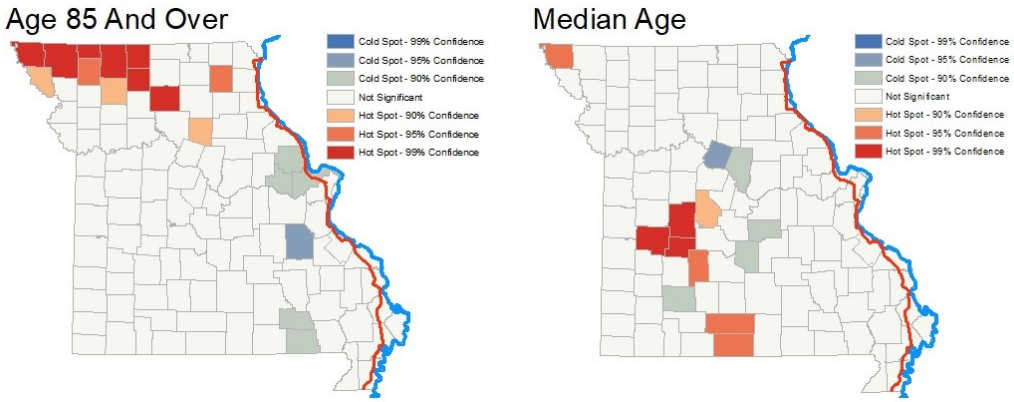

Figure 67: Getis-Ord GI representations of age including 85 and over.

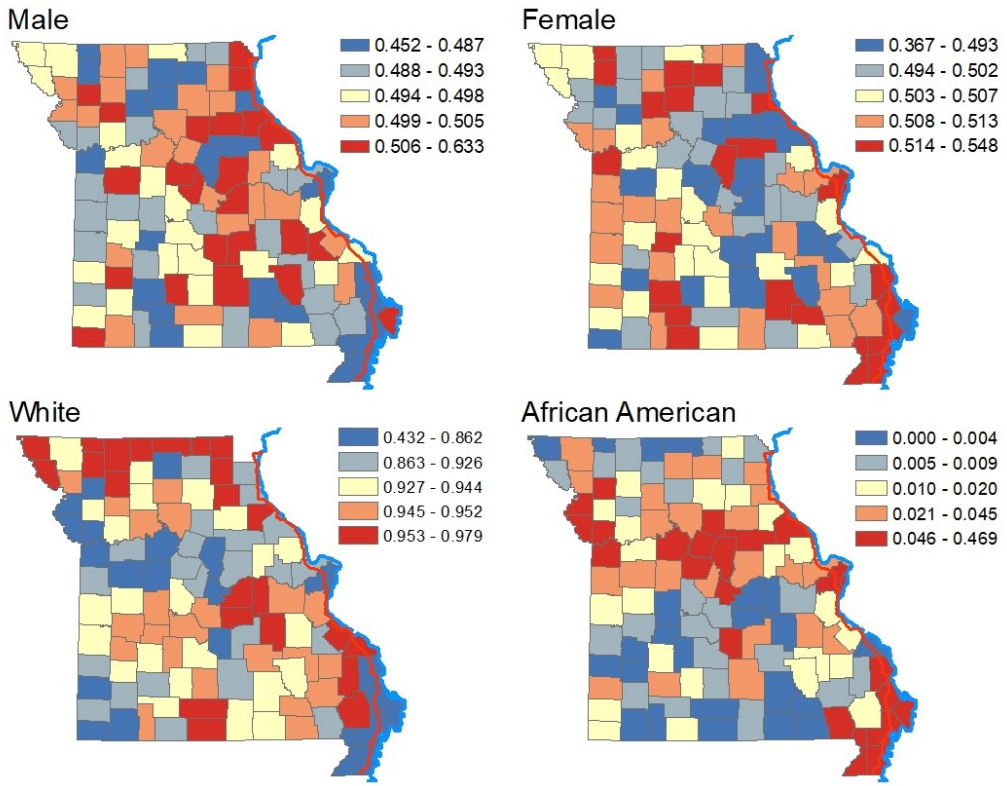

Figure 68: Quantile representations of race including male.

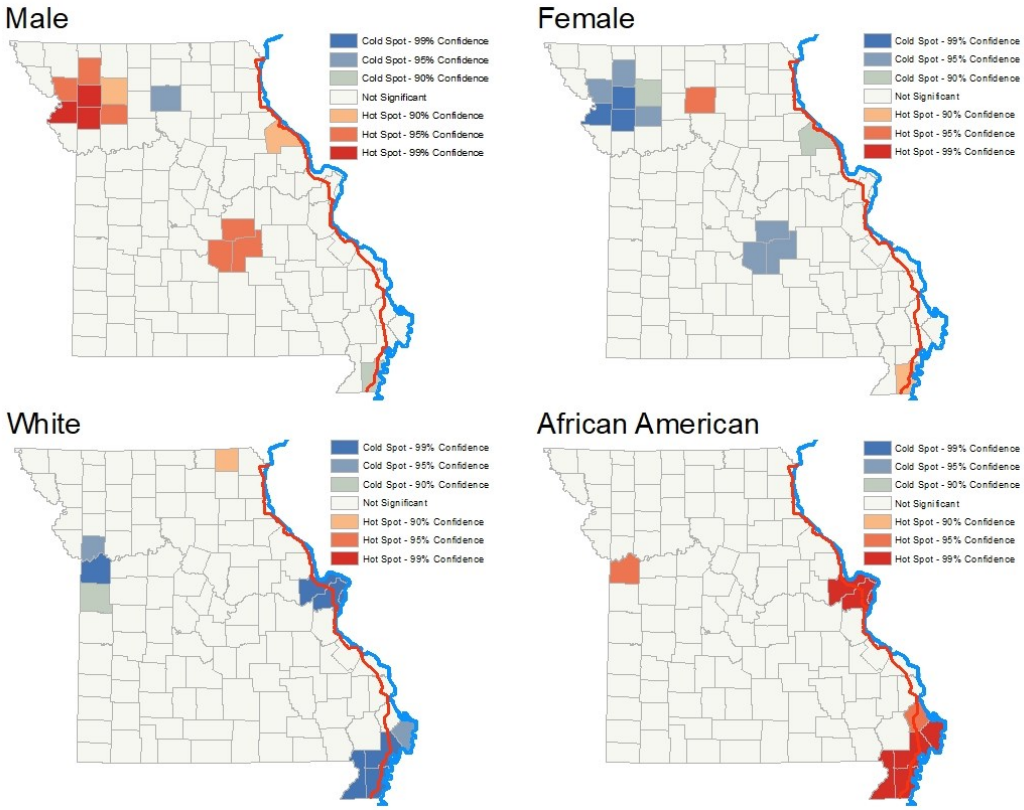

Figure 69: Getis-Ord GI representations of race including male.

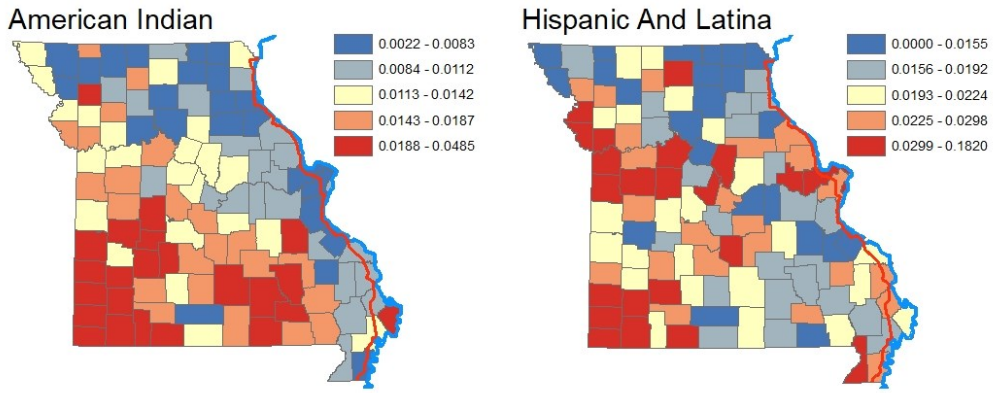

Figure 70: Quantile representations of race including American Indian.

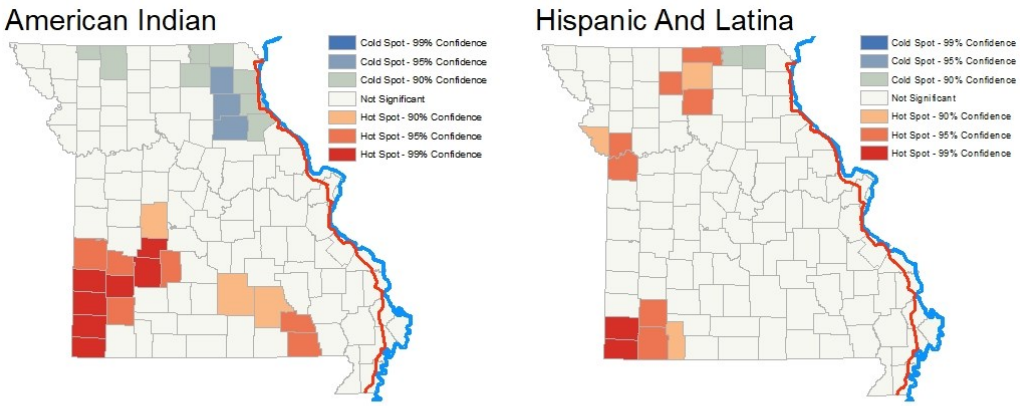

Figure 71: Getis-Ord GI representations of race including American Indian.

Conclusion

Defining a region is difficult. The GRR is located along the eastern edge of Missouri, going through urban and rural counties along the way. The variables discussed in the previous section showed a multitude of patterns and spatial correlations. This study set out to define a broader region based on socio-economic variables and comparison of Missouri counties. Although it is still unclear what the boundaries of the GRR region should be, the data did yield interesting results.

The presence of a single GRR region is still difficult to set, but several sub-GRR regions can be proposed. Based on the results of this research, we propose updates to the definition of the GRR as a region. We split the GRR region in Missouri into three subregions, adding several counties to each subregion. These subregions follow the economic regions of Missouri as established by the Missouri Economic Research and Information Center, but with some notable exceptions to better accommodate the coherence of the GRR as a region. Resultingly, they are the Northern GRR, the Greater St. Louis GRR, and the Southern GRR. Figure 72 shows the sectioning of each region, as well as which counties make up the original GRR.

The North GRR begins at the boarder of Iowa in Clark County and extends southward to Pike County. This subregion has no additional counties based on the analysis conducted in this study and consists of the five Missouri counties adjacent to the Mississippi River. The Northern GRR varies from county to county and across variables, making the addition of other counties into this subregion difficult. Counties in the Northeast region along the Missouri Iowa border share more similarities with counties along that border extending into the Northwest region of Missouri. For this reason, counties west of the original GRR region in the Northern GRR subregion appear to cluster, with other northern counties along the Missouri border favoring

characteristics of a northern Missouri region independent of the GRR. Pike County was chosen as the divide between the northern GRR and the regions south of the greater St. Louis subregion due to Lincoln County's proximity to St. Louis. Lincoln County's population and variable representations better align with St. Louis counties than northern GRR counties.

The greater St. Louis GRR begins in Lincoln County and extends to Cape Girardeau County. This subregion is the largest of the three, with eleven total counties (three of which were newly added to the GRR region: Warren, Franklin, and St. Francois Counties). These counties are more comparable with the demographics and socio-economic makeup of St. Louis than other regions in Missouri and the northern or southern GRR sub regions. Several variables define this greater St. Louis GRR region, including "median household income", "median home value", "associates degree", "bachelors degree or higher", "civilians in labor force", "females in labor force", "households with a computer", "with broadband internet", and "with private insurance". These variables reflect a clear divide from the Northern GRR above Lincoln County and a southern divide south of Cape Girardeau. The variables listed above also show the three counties (Warren, Franklin, and St. Francois Counties) share similar characteristics with the St. Louis area and the greater St. Louis GRR.

The southern "Bootheel" GRR begins in Scott County and includes the whole of the boot heel counties. A total of seven counties are included in this subregion, with three counties being added (Stoddard, Butler, and Dunklin Counties). This subregion consists of mostly the southernmost counties in the Southeast region, with Butler County being located in the South-Central region. These seven counties closely associate with one another within the several variables analyzed in this study. The variables, which support this southern "Bootheel" GRR region, are "unemployment", "associates degree", "bachelors degree", "wood", "median home

value", "average home value", "median household income", "year structure built 1940 to 1949", and "year structure built 1960 to 1969". Many of these variables demonstrate a greater pattern covering much of the Southeast and South-Central regions. The Bootheel is either a hot spot or a cold spot, depending on the variable being analyzed. This is why these counties (Stoddard, Butler, and Dunklin Counties) were added to the southern or "Bootheel" GRR region. Cape Girardeau provides a cutoff between the greater St. Louis GRR and the Southern GRR due to its increased median household income, education rates, and individuals participating in the labor force.

The counties in each subregion are characterized by the variables from this study mentioned above, and also exhibit similarities specific to that subregion compared to a wider GRR region. This might be caused by the urban counties centered around St. Louis skewing data analysis to an urban rural distinction. The differences between the Northern GRR and Southern GRR subregions show different variable values, but both regions are predominately rural. The southern GRR lacks the economic, education, and strong labor force seen in both the northern and greater St. Louis GRR subregions.

When evaluating so many variables covering such a wide array of data, boundary lines may be disputed and more specific analysis is warranted. The work completed over Missouri does not give a clear boundary for the GRR based solely on United States Census data. The five-year estimates are helpful in identifying regional patterns and urban and rural distinctions, but fall short when comparing Missouri counties to GRR counties inside the state. Future analysis may benefit from analyzing census data and including other forms of data analysis to further define the GRR. The process of defining a GRR region can also benefit from a more statistical analysis. Data covering hotel and Airbnb locations, restaurants, and recreational

activities along the scenic route can provide a clearer GRR region as seen through the eyes of travelers. Analyzing historic data such as population, income, and labor forces may also be needed to define a GRR region. Additional findings may be effective in defining a GRR region based on physical features along the Mississippi River, including topography, vegetation, and wildlife in and around the study area. The limitation of analyzing only socio-economic census data based on five year estimates hinder the final conclusions that can be made by this study.

Of the twenty-four variables analyzed in this study, eleven were shown to have urban rural, regional, and GRR distinctions. These variables include citizenship status, education attainment, employment status, heating fuel, home value, household income, internet use, race, workers by industry, workers by occupation, and year structure built. These variable sets were each used to help define the GRR subregions in Missouri, except for race and workers by industry and occupation. However, these three variables did show regional patterns and or urban rural county distinctions in Missouri, leading to further questions on the presence of larger regional patterns that extend outside the state borders of Missouri. For this reasons, each one of these variables is worth imploring further analysis within the ten states that the GRR runs through. Analyzing the GRR as a whole will help define a GRR region or determine what (if any) subregions exist along the GRR as it makes its way through the United States. The Great River Road is a long and distinctive feature in the heartland of the United States, but the cities, towns and country it crosses through are all unique.

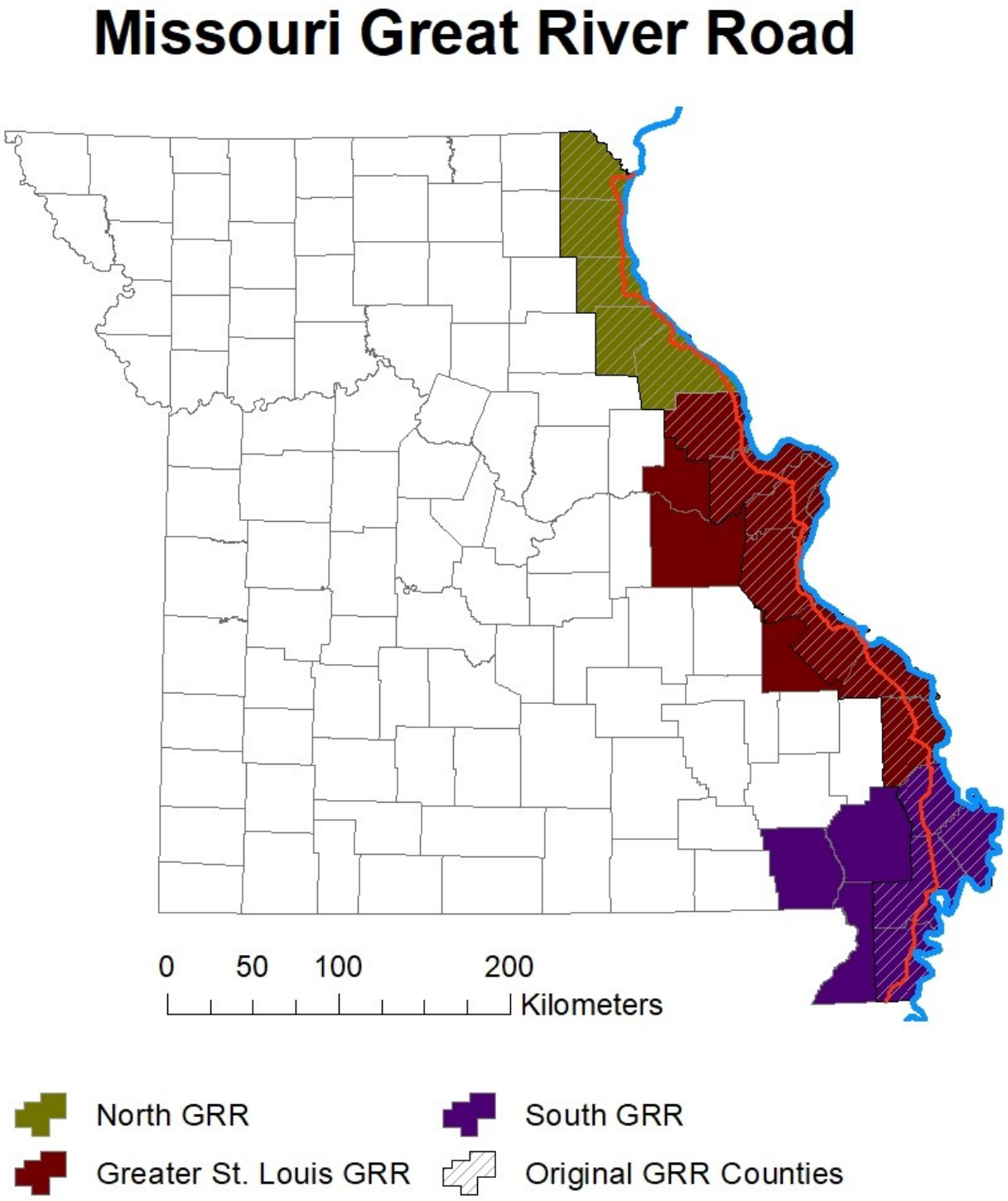

Figure 72: Proposed GRR subregions in Missouri.

CHAPTER TWO: DEFINING A REGION, THE GREAT RIVER ROAD ALONG THE MISSISSIPPI RIVER

Introduction

The Mississippi River crosses through the heartland of the United States. This mighty river touches ten states, often acting as the natural border between them. In the 1950s, Congressional backing would lead to the study and ultimately, the formation of the Great River Road (GRR). This set of scenic byways begins at the headwaters of the Mississippi River and travels along both the east and west banks until the river meets the Gulf of Mexico in the South. A former study reviewed the socio-economic conditions of counties the GRR crossed through while in the state of Missouri (Telle, 2021). Expanding on methodologies and results conducted in the study of the Missouri GRR, this study will review the GRR in its entirety to assess the GRR as a whole and coherent region beyond its proximity to the river.

The GRR is managed by the Mississippi River Parkway Commission (MRPC) headquartered in the state of Wisconsin. With the goal of maintaining and promoting the GRR, the MRPC works with its ten member states along the Mississippi River. This promotion is often tourism-based, focusing on the historic, cultural, and environmental aspects located along the Mississippi River. The MRPC provides a map for interested visitors, highlighting different towns, cities, and activities along the GRR ("Mississippi River plus", N.d.). This map, coupled with the GRR app "Driving Guide", defines the GRR region for this study. The GRR region based off these source materials includes one-hundred and thirty-five counties in ten states.

The GRR is recognizable while traveling along the scenic byway with the assistance of unique GRR road signs. These signs are designed in the shape of a river boat wheel with the

phrase “Great River Road” on the upper portion of the wheel and the name of the state the driver is currently situated in on the bottom. Figure 73 shows an example of a GRR road sign with the generic phrase “Canada to Gulf” in place of the name of the state.

Figure 73: Example of the GRR road sign (taken from MnDot’s official website.)

The GRR’s focus is to encourage both the trade of goods and travel of private individuals up and down the Mississippi River. In this way, the GRR tries to bring back the importance of the Mississippi River as a transit corridor throughout the Midwestern United States. However, the GRR has been largely understudied and underutilized. This study seeks to determine the social and economic border of the GRR based on county level census data to gain a better understanding of the importance this set of scenic byways has along the Mississippi River. The data analyzed through spatial and statistical methods are characterized as social, economic, housing, and demographic data based on a five-year estimate (2014-2018) overseen by the United States Census Bureau. The defining of regions discussed further in this paper are vital for fostering political attention and academic study. The work of defining a GRR region will

develop interest in the successes and failures of the GRR in the past, present, and looking towards the future.

Literature Review

History of the Great River Road. The Mississippi River is a unique physical, historical, and cultural landmark in the heartland of the United States. The trade of goods and the movement peoples along this corridor has been a unifying feature of the Mississippi River in the past. Mark Twain would write about this unique region in his book *The Adventures of Huckleberry Finn*. The scenic, historical, and cultural identity of the Mississippi River would inspire the concept of the Great River Road. In 1936, the Missouri Planning Board began working on a river road system along the Mississippi River, which would in time be known as the Great River Road (Smith, 1998). This river road would connect ten states along the Mississippi River, and even incorporated two Canadian provinces when completed. The work done by the Missouri Planning Board would be taken up by the MRPC, and the concept of the GRR gained popularity in both the public and private sectors. However, this popularity would not last when World War II halted any discussion of funds being allocated to a river road. The project would be picked up again after the war and in 1951, Congress issued a study of the Mississippi River to assess the condition of existing roads and determine a cost for the creation of a continuous river road (Smith, 1998).

Ohm (2000) mentions the report given to Congress entitled “Parkway of the Mississippi”, which included a cost analysis of the construction and maintenance of the proposed river road. This report concluded that the creation of such a road would be beneficial to the heartland of the United States, but it was deemed too expensive to construct new roads along the entire extent of the Mississippi River. The idea was not abandoned however; instead of building

a road spanning the full extent of the river, the GRR would take advantage of existing road infrastructure along the banks for the Mississippi River (Smith, 1998). The GRR would be classified as a scenic route instead of a parkway, allowing for the widening and improvement of existing roads. Construction of new roads would only be undertaken on sections of proposed route where absolutely necessary. This would cut the total cost of the GRR considerably, as new road construction would become the exception, and not the norm, when planning the scenic route.

Ohm (2000) details the restrictions placed on lands adjacent to the GRR in the form of easements to regulate future development along the scenic route. The easements would include three-hundred-and-fifty-feet from the centerline of the GRR and would require permission for new construction or alterations to public and private property. Existing structures such has homes, shops, powerplants, and warehouses could remain operational, but were not allowed to expand inside the easement zone. Problems would arise as private property owners looked to renovate and build within the easement zone. These problems with easement restrictions are often handled on a case-by-case basis.

Federal funding was granted for the creation of the GRR in the Federal Highway Act of 1954 (Smith, 1998). However, as the task of finding a suitable route along the Mississippi River grew too large, funding, construction, and road sign guidance was left to individual states. It was not until 1976 that federal aid would be given to states along the Mississippi River for the construction and maintenance of the GRR through the Federal Highway Administration. This funding, however, was predicated on states following federal guidelines for the selection of GRR routes and the building of new sections of the GRR. The GRR would consist of federal and state

roads focusing on the natural, historical, and recreational spots along the Mississippi River (Smith, 1998).

The GRR has since been an afterthought in the political arena, and little focus has been given to the scenic route in recent years. Minimal studies over sections of the GRR have been conducted but a wider analysis of the GRR region is not readily available. Berlin, and Chu (2006) wrote about a portion of the Northern GRR in which they photographed and documented the character of the Mississippi River. Care was given to photograph private homes, recreational activities, locks and dams, boating, and other aspects they felt characterized the Upper Mississippi River and GRR. Another article written by Bures (2008) highlights the cultural character of the GRR, discussing the musical and art community from Minneapolis, Minnesota to Davenport, Iowa. The increasing number of music studios and art museums described in the article gives evidence of what Bures calls a "Midwestern Renaissance".

An economic study of a small portion of the GRR was conducted by Measells and Grado (2008), who analyzed the impacts of tourists at two birding festivals in the state of Mississippi. One of these festivals was located on the Great River Birding Trail, a section of the GRR in the state of Mississippi. Taking surveys of travelers spending habits, Measells and Grado found that these festivals did in fact bring new money and increased spending into the local economies hosting these events. Mueller discussed the unique opportunities the GRR provides to residences and travelers along the Mississippi River, emphasizing the ability for an individual to travel from the headwaters to the mouth of the Mississippi River and enjoy the environmental, historical, and cultural aspects along the way. No other major river system in the world, including the Amazon and Nile River, can make such a claim due to a lack of infrastructure. The Mississippi River in

North American can be traveled and enjoyed in its entirety by any individual with a motor vehicle (Mueller, 1998).

The GRR does have brand recognition in the form of road signs along the route and an online presence. If an individual were to search for "The Great River Road", dozens of websites covering any aspect of the scenic byway would be available for further information. In 2021 eight of the states the GRR runs through were given All American Road status. The MRPC, maintains the GRR and helps add to its online presence. However, the GRR has been void of any regional analysis, and minimal academic research on the byway has been conducted within recent decades. The MRPC defines the GRR for travelers through a road map, showing the sites and activities available along the Mississippi River ("Mississippi River plus", N.d.). Determining how other regions in the United States and around the world are characterized can help in defining criteria for a more accurate border for the GRR region.

Defining a Region in the United States. The GRR is centered around the physical extent of the Mississippi River. A region can be defined based off physical, cultural, economic, historical, features or a combination of all four of these aspects (Baltalunga, & Dumitrescu, 2008; Czako, Fekete, & Poreisz 2014; Deaton, & Niman, 2012; Feser, Renski, & Goldstein, 2008; Gerbremarian, Gebremedhin, & Schaeffer, 2011; Joshi, & Geremedhin, 2012; Latanich, 2001; Nedea, Milea, & Pascu, 2012; Shutters, & Waters, 2020; Tabellini, 2010). County borders are often used when defining a political boundary in the United States. Governmental bodies, such as Congress, can set borders in alignment with county boundaries, physical features, and the economic conditions of an area. One of the more well-defined physical and economic regions in the United States is "Appalachia", centered around the Appalachian Mountain chain.

Within the United States, the Appalachian Mountains stretch from the New England

States in the Northeast and southward to Georgia and Alabama in the South. The Appalachian Regional Commission (ARC) was founded to help study and implement plans to promote economic prosperity in these eastern highlands of the United States. The ARC sets the boundary of the Appalachian region to four hundred and twenty counties in thirteen different states ("Appalachian counties", 2008). This boundary was set by Congress based on counties' economic and physical characteristics, with the intention to increase economic prosperity in a socio-economically depressed region of the United States. A study conducted by Joshi, and Geremedhin (2012) adhered to the regional boundary, including more than four-hundred counties in the Eastern Highlands. The study analyzed education rates, minorities, urban and rural areas, and the proportion of workers in varying industries. Joshi, and Geremedhin (2012) sought a better understanding of poverty rates and wealth disparages in the region. Gerbremarian, Gebremedhin, and Schaeffer (2011) used the ARC defined Appalachian region through the analysis of employment status, migration patterns, and median household income, aiming to better understand the economic conditions present within the region. This study presented evidence of a connection between employment status and poverty in individual counties within the Appalachian region. Deaton, and Niman (2012) studied extraction industries and their correlation to poverty within the Appalachian region. The work completed by Deaton and Niman failed to define the geographic or political extent of the Appalachian region, but found that exaction industry jobs do play a role in the economic stability of counties in the Appalachian region.

Feser, Renski, and Goldstein (2008) conducted a study over the Appalachian region within the boundaries set by the ARC, but also included outside counties with similar economic output and population density that were adjacent to the regional border. When analyzing industry

clusters, Feser, Renski, and Goldstein (2008) included these counties outside the ARC initial Appalachian region to ensure a more complete investigation into the impacts of industry clusters in and around the Appalachian region. Feser, Renski, and Goldstein (2008) concluded that industry clustering can have a positive impact on economic prosperity, if proper planning and collaboration is utilized when implementing such industry clusters. Douglas, and Walker (2012) questioned the ARC's Appalachian regional boundaries, evaluating income growth topography, county continuity, and historic slave populations in 1860. Douglas and Walker felt the unique economic activity of the Appalachian region discouraged the use of slavery due to the nature of the work being done at the time. Although the study was inconclusive in disputing or setting new regional borders, the discussion of how to improve regional definitions is worth further analysis.

Another region in the United States based on political boundaries focused on economic conditions in the Mississippi River Delta. Latanich (2001) studied the Lower Mississippi Delta Development Commission (LMDDC), which was established in 1988 and defined a Mississippi Delta region centered around the Lower Mississippi River. The region includes two hundred and nineteen counties centered around the Lower Mississippi River. These counties are located in seven states, stretching from Louisiana to southern Missouri and Illinois. The LMDDC determined that lower education rates, few incentives for outside investment, a lack of infrastructure, and a lack of new industries attributed to the region's low economic output. Shutters, and Waters (2020) studied metropolitan areas around the United States to form a better understanding the benefits and drawbacks of interconnectedness in labor markets. They analyzed three-hundred and ninety-five metropolitan areas, including adjacent counties with populations exceeding fifty thousand. Shutters and Waters determined that metropolitan areas are more

interconnected and beneficial for workers in these labor forces, but this connectedness makes disruptions in the labor system more impactful when problems do arise.

Defining a Region in Europe. Regional reviews and analyses are not confined to the United States. In Europe, many different studies have been conducted all over the continent, but the most relevant regional studies in Europe for this study are over the Danube River region located in Central and Eastern Europe. Czako, Fekete, and Poreisz (2014) analyzed countries along the Danube River and examined subsections of these countries based off the Nomenclature of Territorial Units for Statistics (NUTS). These subregions are based upon an area's population, with this study particularly focusing on NUTS-2 regions defined as population regions from eight-hundred thousand to three-million people. Further classifications were based on the geographic location of the NUTS-2 regions along the upper, middle, or lower Danube River. Czako, Fekete, and Poreisz (2014) studied unemployment, industry employment, and education rates in these counties and subregions. The study concluded that the economic prosperity and types of jobs varied based on one's location along the Danube, with noticeable differences in the upper, middle, and lower Danube River regions.

Baltalunga, and Dumitrescu (2008) analyzed the Danube River's role in water-based trade within Europe. The river gives access to both the Black Sea and ocean trade for many landlocked nations in Central and Eastern Europe. The study covers the importance of several canals linking the Danube to other major rivers on the continent and evaluates the economic characteristics and population densities along the entire geographic extent of the Danube River. Baltalunga and Dumitrescu conclude that the Danube River is a vital, but underutilized river system in Europe. Nedea, Milea, and Pascu (2012) considered the entire length of the Danube River, focusing on its role as a shipping lane for Central and Eastern Europe. The whole of the

Danube River is labeled as the Pan-European Transit Corridor VII. A designation given to the river in the Memorandum of Understanding was signed in Rotterdam Netherlands in September 2001. The study looked at the obstacles impeding economic output that could be generated through an increase of international trade. Such obstacles included physical and political bottlenecks, the volume of trade, and river ports inadequate for larger trading ventures. General conclusions were that it will take considerable capital from the European Union and multinational cooperation from nations along the Danube River before trade along transit corridor VII can be fully realized.

Tabellini (2010) examines eight countries in western Europe with further divisions based on NUTS-1 regions, which are based on areas with a population of three million to eight-million people. Sixty-nine of these NUTS-1 regions were identified and analyzed in this study. Tabellini (2010) studied historic literacy rates and historic political institutions with regards to economic prosperity in the present day. The study based economic prosperity on a cultural identity of trust, respect, and confidence in oneself and the individuals around them. Tabellini found that historic literacy rates, and historic political institutions are useful measures for higher economic output in these NUTS-1 regions today.

The Great River Road. The GRR is based upon one of the largest river systems in the world, but is largely unstudied with little socio-economic reviews available to the public. This lack of literature has slowed research and studies over the region. The MRPC provides a basic border based on the Driving Guide GRR App, and also maps listing attractions along the route posted online. This GRR region includes one-hundred and thirty-five counties. The GRR acts just as the Mississippi River itself: a unifying feature worth further analysis deciphering what makes the region unique. This study over the entire extent of the GRR based

on social, economic, housing, and demographic data will give a more comprehensive examination into what it means to be a part of the GRR region. This study will spatially and statistically analyze eleven variables provided by the United States Census Bureau, as well as Airbnb locations in each county, to try and determine a sociocultural border for the GRR from Minnesota to Louisiana.

Methodology

Study Area. Ten states are included in the study area and share a border with the Mississippi River. From north to south they include Minnesota, Wisconsin, Iowa, Illinois, Missouri, Kentucky, Tennessee, Arkansas, Mississippi, and Louisiana. With nine-hundred and eleven counties in ten states, focus was placed on the one-hundred and thirty-five counties along the Mississippi River and within the Great River Road (GRR). Analysis and spatial representations were created over all nine-hundred and eleven counties in the study area. This larger political region is used to assess regional characteristics of the one-hundred and thirty-five counties associated with the GRR. Table 3 shows the number of counties and GRR counties in each state along the Mississippi River. These GRR counties were selected using a map produced by the Mississippi River Parkway Commission (MRPC), intended for general use and to promote stops along the scenic byway ("Mississippi River plus", N.d.). This study will determine if the boundary set by the MRPC can be altered based upon socio-economic conditions in the region. The exact route of the GRR was taken from the GRR app "Driving Guide", which details the route recommended for travelers by the MRPC. These roads are often marked with the GRR road signs, indicating which state the driver is located while on the scenic byways. The GRR is

located on both sides of the Mississippi River for most of its journey through the heartland of the United States.

The Mississippi is one of the longest rivers in North America, with its headwaters from Lake Itasca in central Minnesota flowing 2,350 miles (3781.958 kilometers) before emptying into the Gulf of Mexico and Louisiana ("Mississippi River facts", 2018). The exact length of the Mississippi River can vary due to erosion or sediment deposition occurring in the delta region, and also by newly created meanders in the lower Mississippi River. Lengths reported are as

Table 3: List of total counties and GRR counties in each state along the Mississippi River.

List of Counties in Each State

State Name	Total Counties	GRR Counties
Minnesota	87	27
Wisconsin	72	9
Iowa	99	10
Illinois	102	20
Missouri	115	17
Kentucky	120	5
Tennessee	95	5
Arkansas	75	10
Mississippi	82	13
Louisiana	64	19

followed: 2,552 miles (4107.046 kilometers), the United States Geological Survey (USGS) 2,300 miles (3701.491 kilometers), and, the Environmental Protection Agency (EPA) 2,320 miles

(3733.678 kilometers). The Mississippi River is regularly divided into “upper” and “lower” regions; however, the dividing line of these two territories is often disputed. The two prevalent dividing lines for the upper and lower Mississippi River are placed at the conjunctions of two separate tributaries: the first and most southern cutoff point being the Ohio River, and the second cutoff being at the conjunction of the Mississippi River and the Missouri River.

The Mississippi River is classified as a “mature river” for much of its extent, but does show “old river” features as it moves further south. A “mature river” exhibits moderate velocity in flow and is flanked by bluffs or cliffs that are close to, but not budding up against, the waterline of the river. The channel is often a U-shape, with some meanders present; however, fewer meanders compared to an “old river” system. A mature river also has many tributaries feeding into it, which is true of the Mississippi River throughout its entire extent (Immoor, 2006). The Upper Mississippi River north of the geographic meeting point of the Ohio River is considered a “mature” river. The Lower Mississippi River shows more physical features resembling that of an “old river” system. The velocity of water flow slows and the channel becomes much wider, but still maintains a U-shape. Meanders in the river become more numerous, with channels being separated from the river that create “oxbow” lakes near the main channel. Finally, the floodplains of an “old river” are much wider; highlands are not seen as cliffs and bluffs, but gradual elevation changes over a geographic area (Immoor, 2006). This better encapsulates the physical features found in the Lower Mississippi River system.

The width of the Mississippi also changes considerably. At its headwaters, the Mississippi River is twenty feet (6.096 meters) to thirty feet wide (9.144). The widest point is found close to Bena, Minnesota, widening to eleven miles (17.703 kilometers) wide. The largest navigable portion of the river is adjacent to Goodhue County in Minnesota and spans two miles

(3.219 kilometers) across to Pierce and Pepin Counties in Wisconsin. The Mississippi River discharges 593,003 cubic feet (16,792 cubic meters) of water into the Gulf of Mexico every second, making it the fifteenth largest river by discharge in the world, according to National Park Service findings.

The Illinois River, the Missouri River, the Ohio River, the Arkansas River, and the Red River are major tributaries running (north to south) of the Mississippi River. The Mississippi River watershed is the largest in North America stretching from the Appalachian Mountains in to the Rocky Mountains. Figure 74 shows the Mississippi River's main tributaries.

Figure 74: Five major tributaries feeding into the Mississippi River.

Figure 75 is a county-level map of the ten states bordering the Mississippi River and the GRR running through each state. This study area includes many areas with diverse economic, social, and political characteristics. The ten states in this region have a combined total population over fifty-five million residents. Urban centers are found throughout the region, not always located directly on the Mississippi River. Major metropolitan areas with populations over three-hundred thousand along the Mississippi River include; Minneapolis, Minnesota, St. Louis, Missouri, Memphis, Tennessee, and New Orleans, Louisiana. Other city centers not located along the Mississippi River, but are located in the general region of analysis include; Milwaukee, Wisconsin, Madison, Wisconsin, Chicago, Illinois, Des Moines, Iowa, Kansas City, Missouri, Louisville, Kentucky, Frankfort, Kentucky, Little Rock, Arkansas, Nashville, Tennessee, Knoxville, Tennessee, and Chattanooga, Tennessee. Figure 76 shows the total population of each county using Jenks Natural Breaks Classification Method.

Data Collection and Analysis. Data was first collected by the American Community Survey (ACS), which is overseen by the United States Census Bureau. The American Community Survey produces five-year estimates, and data for this study was taken from the 2014 – 2018 five-year survey. This was the most current survey at the time research commenced. The data is obtained through the United States Census Bureau's website and includes the ten states that border the Mississippi River. Two main forms of analysis are utilized: spatial analysis through ArcGIS and statistical analysis through the software package SPSS.

Similar studies also used census data to evaluate the economic condition of an area. A study done by (Stoilkovic, 2017) analyzed unemployment, age, and labor statistics along the Serbian border to interpret income disparities in these areas. (Vinje, 1977) conducted a study over Indian reservations, analyzing labor forces in either manufacturing, agriculture or

government industries, labor participation, unemployment, and geographic characteristics compared to per capita income. A study conducted by (Brasington, Hite, & Jauregui, 2015) compared housing prices with race and education attainment to correlate which neighborhoods have higher valued homes and what the demographic makeup of these neighborhoods consists of. Daly, Jackson, and Valletta (2007) analyzed the increase in education attainment and age compared to unemployment and the income gap across the United States.

For this study, eleven variables are used to compare and determine a GRR region. These variables were chosen based on prior research completed over the GRR in the state of Missouri (Telle, 2021). Missouri located in the center of the Mississippi River system offers a unique look at the river as it transitions from a "mature river" to a "old river" system. The social and economic impacts of this transition can be studied in counties along the Mississippi River in Missouri. Table 4 lists the variables chosen for this research in alphabetical order.

Table 4: list of variables analyzed.

Eleven Variables in Alphabetical Order		
Citizenship Status	Home Value	Workers by Industry
Education	Household Income	Workers by Occupation
Employment Status	Internet Use	Year Structure Built
Heating Fuel	Race	

County-level data was collected for each of the ten states and added to a United States county-level shapefile in ArcMap. The data is represented using quantile classification. Quantile classification takes the sample size of the data into account when creating each group and equally distributes data points (counties) into each category for an even distribution of

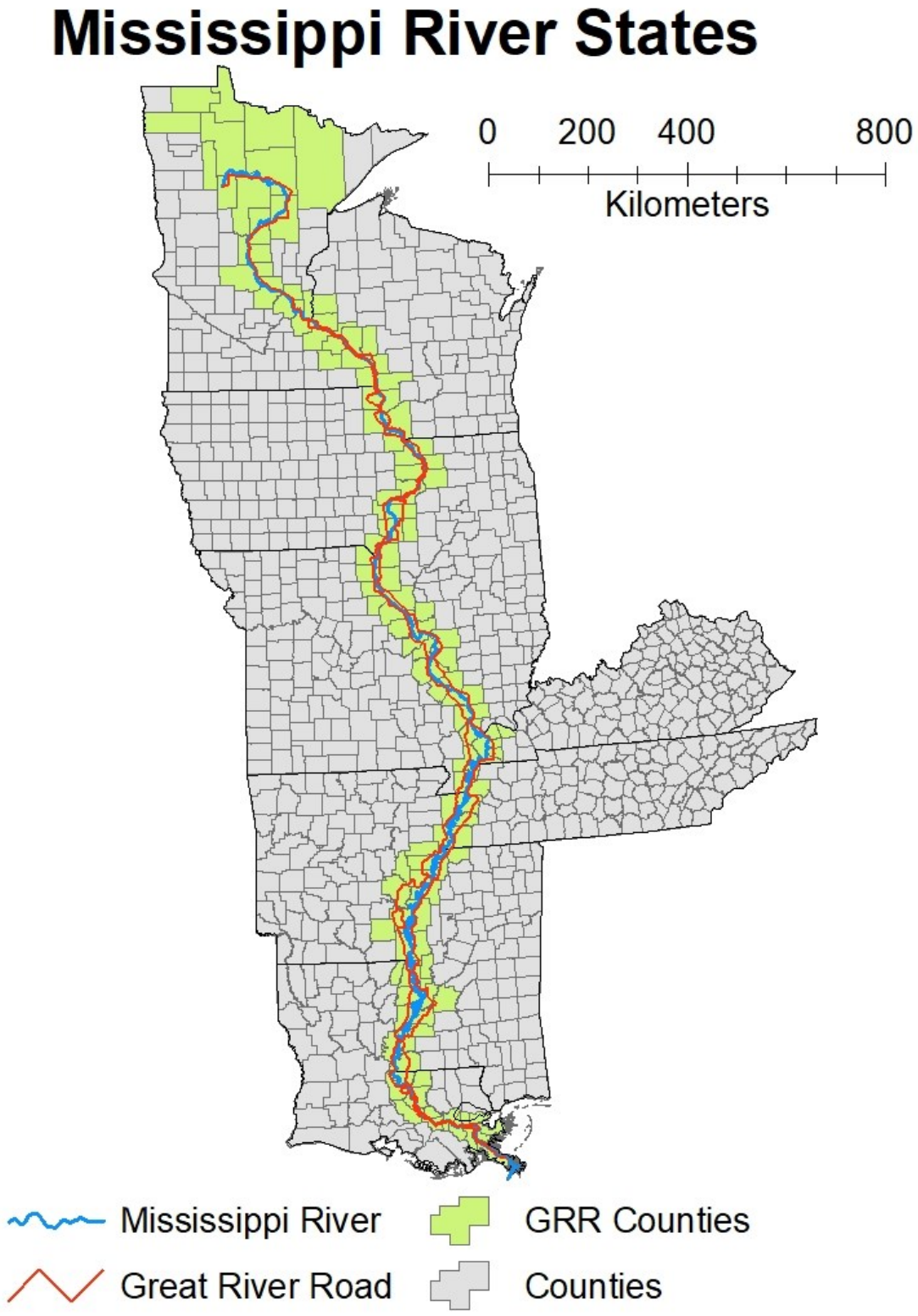

Figure 75: Map of counties in states bordering the Mississippi River.

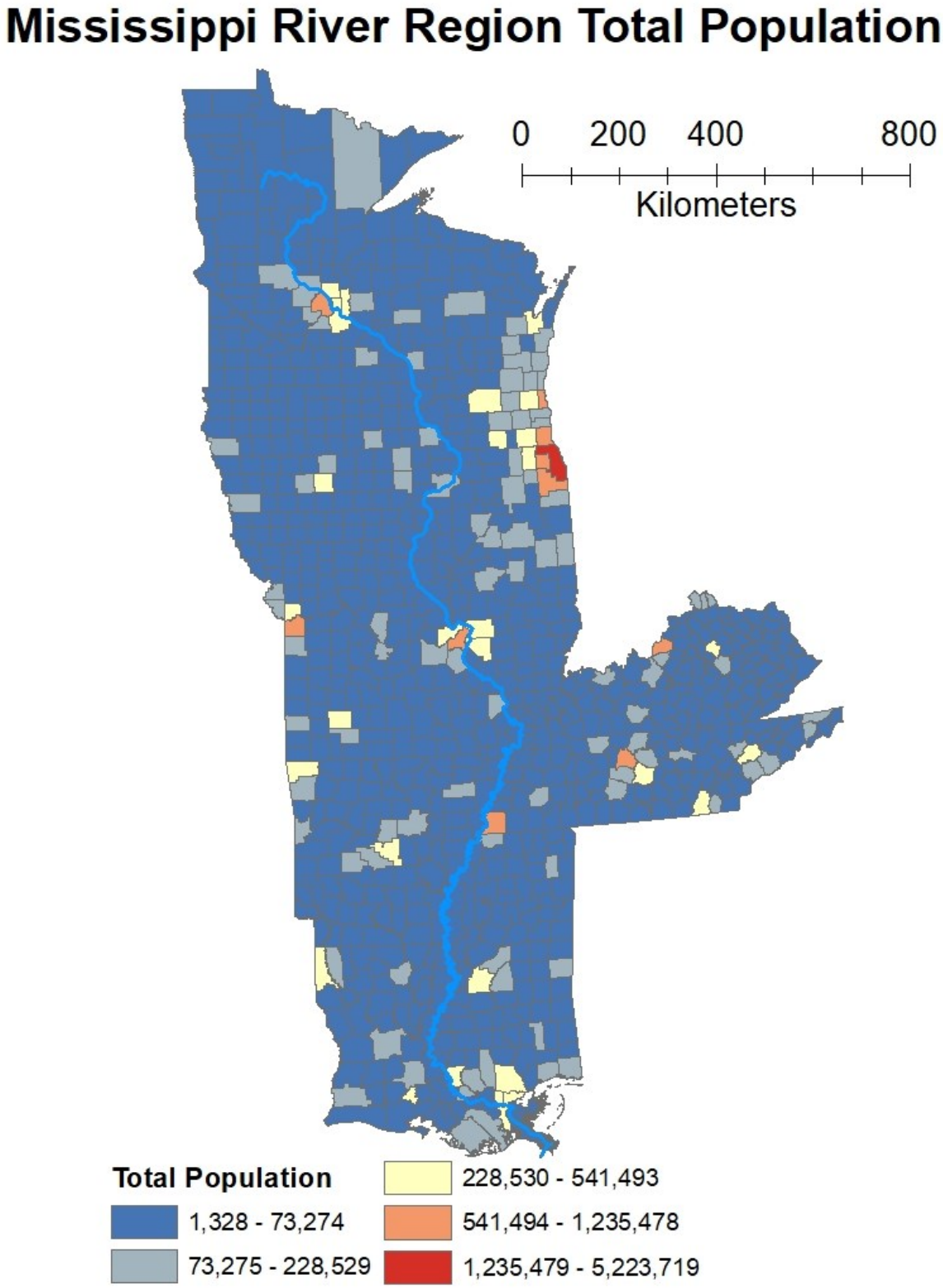

Figure 76: the population of each county represented by Jenks natural breaks classification.

represented data. Using a five-grouping quantile classification system, each group contains one hundred and twenty-eight counties. This form of classification is excellent for comparing multiple variables at a time, as the number of samples (counties) in each category are equal. When analyzing variables that are not scaled in the same way, comparisons are able to be conducted with higher accuracy when utilizing quantile classification over other classification methods (Slocum, McMaster, Kessler, & Howard, 2009). For example, "home value" and "household income" are scaled using USD amounts, while "workers by industry" is based off populations. When comparing these variables, it is difficult to discern any meaningful patterns when the represented data is scaled on two different values.

Another benefit to using quantile classification method is the mollifying of outliers in the dataset. Other classification methods can skew spatial representations caused by high or low valued outliers. This can give a false representation when mapping each variable; however, quantile classification adds outliers to the "highest" or "lowest" valued category, depending on the nature of the variable represented (Slocum, McMaster, Kessler, & Howard, 2009). This reduces the weight of these outliers when spatially representing each variable. The five-category scale used is represented by a "blue to red" color scheme. Figure 77 shows the total population of Mississippi River states using the quantile classification method.

Issues arose when representing the data through ArcGIS. Most of variables in this study are concerned with populations. Urban counties with greater population were always represented as hot spots when mapping these population-oriented variables. Instead of working with raw population totals, ratios based off the population in each county were assessed for a more accurate analysis. This was done by normalizing (averaging) each variable by another variable. The utilized normalization variable differs depending on the variable being represented.

For example, workers by occupation and industry are divided by the number of citizens over the age of sixteen. Similarly, the number of citizens with a high school diploma, associates, or Bachelor degrees are divided by the total population over the age of twenty-five. Household income and home value is normalized based off the number of households or homes in each county.

Autocorrelation was conducted using Getis-Ord GI hot spot analysis model. This autocorrelation tool determines hot and cold spots inside the dataset. By comparing the values of a county to each adjacent county, Getis-Ord GI can statistically calculate and represent correlations in the dataset with 90%, 95%, or 99% confidence. This allows for more accurate analysis in ArcGIS, while also representing the data is a clear way. Figure 78 shows the Getis-Ord GI hot spot analyzing total population in the study area.

Emphasis was placed on three different questions while reviewing the data. This helped guide and focus the spatial analysis for this study.

1) Is the variable represented a strictly urban or rural county distinction? Urban and rural counties are based on the percentage of a county's population living in urban areas and the percentage of a county's area being urban. Figure 79 shows the percent of urban population and the percentage of urban area in each county.

2) Is the variable represented a GRR regional or non-GRR regional distinction? The MRPC defines the GRR as counties adjacent to the Mississippi River, with a few other counties being included in Minnesota and Arkansas. Is this regional boundary set by the MRPC bolstered through socio-economic data, or should this regional border be changed to better fit existing patterns?

3) Is the variable represented by a northern or southern Mississippi Regional distinction? Often times, the dividing line for the Upper and Lower Mississippi River is placed at either the confluence of the Missouri River near St. Louis, Missouri, or at the confluence of the Ohio River near Cairo, Illinois. Which variables show a northern or southern regional distinction, and where should the divide for these two larger regions be placed?

Primary data covering Airbnb listings along the GRR are also analyzed in this study. Only counties directly adjacent to the Mississippi River, or counties with the GRR running through it, are included in this data and documented by a research team based at Missouri State University in Springfield Missouri. This dataset also focuses exclusively on rural counties, with urban areas including; Minneapolis, Minnesota, Davenport, Iowa, St. Louis, Missouri, Memphis, Tennessee, and New Orleans, Louisiana being excluded. Several northern GRR counties located in Minnesota are also excluded. These counties are not considered urban areas but were not identified as GRR counties when the research was being conducted. These northern GRR counties and urban counties along the Mississippi River are omitted from future spatial representations. This data was analyzed and formatted into an Excel table to be joined to a United States county-level shapefile in ArcGIS.

The Airbnb data was represented using the Quantile classification method used to represent other variables in the study. However, Getis-Ord GI hot spot analysis was not used to represent this data. This hot spot analysis was not done over Airbnb data due to the size and shape of the study area with county breaks in urban areas and narrow width of counties in contact with the Mississippi River. Representing and analyzing Airbnb listings helps determine where tourism entrepreneurship is taking place.

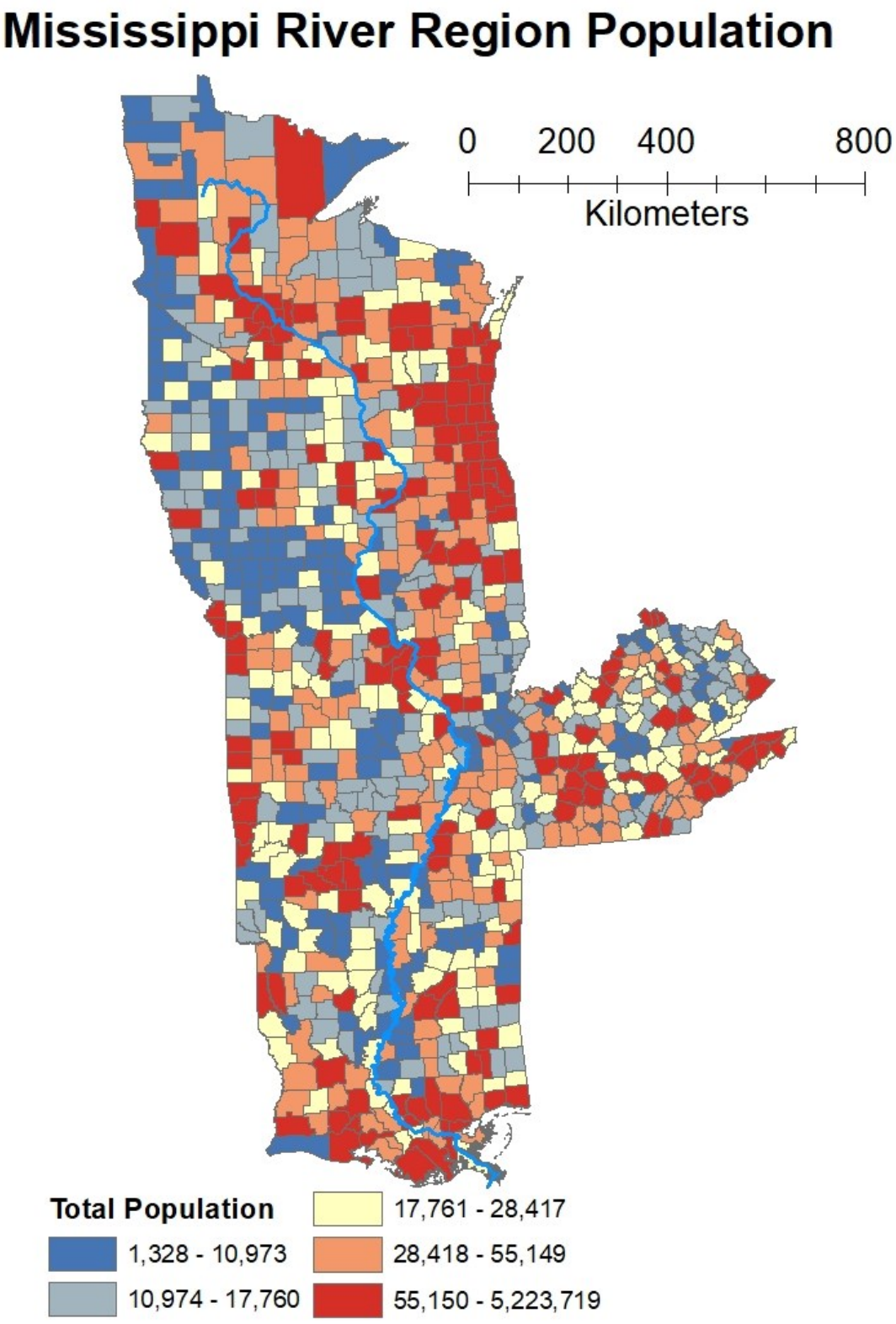

Figure 77: Populations in each county based on the quantile classification method.

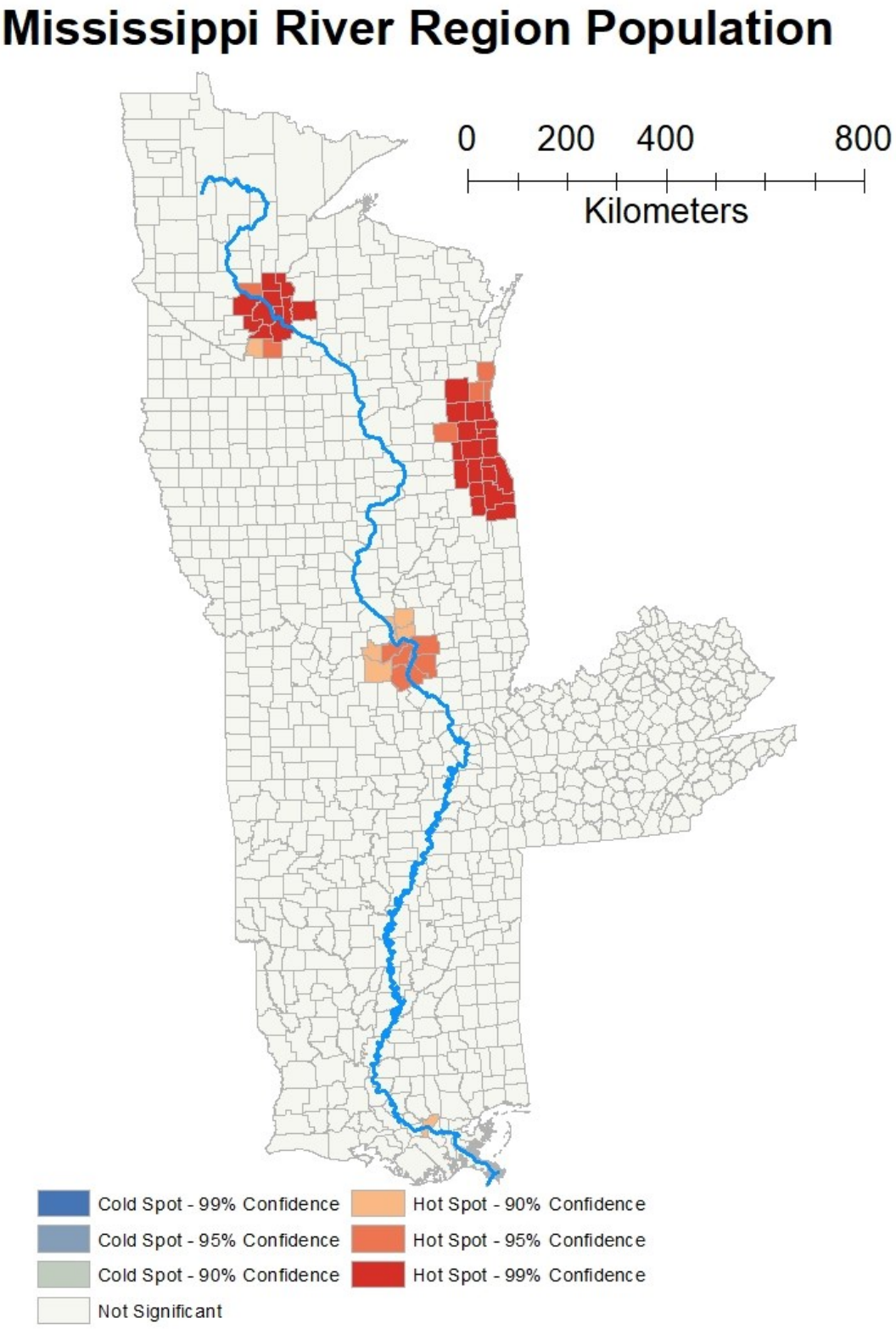

Figure 78: Population hot spots represented using Getis-Ord GI hot spot analysis.

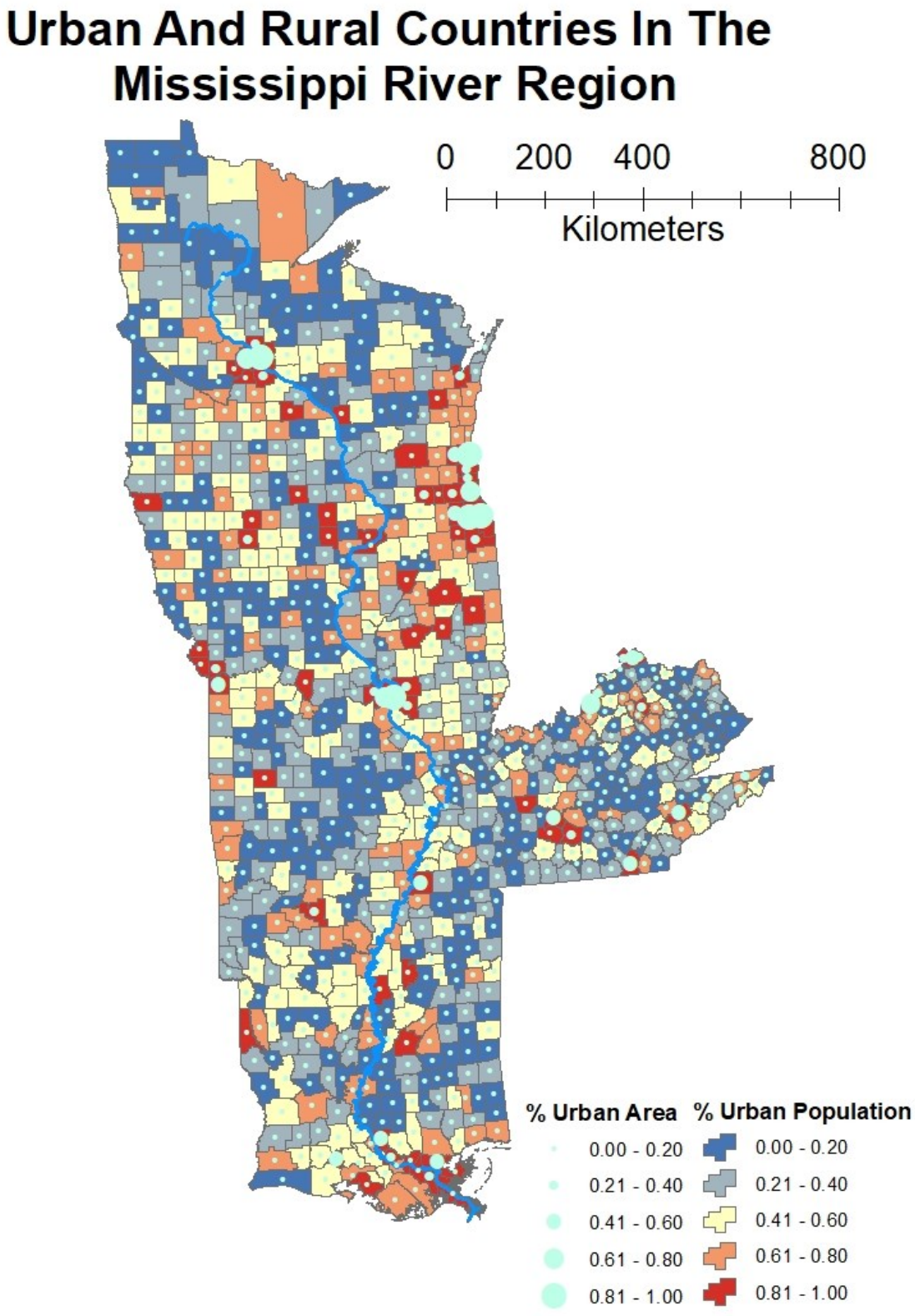

Figure 79: The percentage of urban population and area in each county.

Results and Discussion

Variables shown are ordered based on the United States Census Bureau's classification of social, economic, housing, and demographic characteristics. Airbnb locations in each county are also represented and assessed within this section. Every variable analyzed is not included in this section- variables showing spatially insignificant patterns are located in Appendix B. Each map representation is based on (1:12,000,000) scale. With the same scaling used in each map a scalebar is present in the first set of map representations but omitted for the remaining maps in this section.

Social Characteristics. Citizenship status variables are associated with citizenship of residents in each county. Additional map representations are located in Appendix B, as they do not demonstrate any significant spatial patterns study. Represented variables are normalized by the total population of each county. The most interesting variable represented in Figures 80 and 81 is "born in current state of residence". This variable shows a spatially significant pattern in the lower Mississippi River through hot spot analysis. Hot spots are present in each state, generally in the center of that state. Southern counties show higher percentages of residents remaining in the state of their birth along the Mississippi River. This may be caused by the Mississippi River acting as a physical barrier to the migration of individual and labor forces across the lower sections of the river. This phenomenon is not identifiable in counties directly adjacent to the Mississippi River, as seen in the southern states. Urban counties show as cold spots for both variables in this section throughout the study area. The GRR is also indistinguishable as a separate region from other counties in each state.

Educational attainment variables represented in this section pertain to the highest level of

education each individual in a county has achieved. These variables are normalized with the population over twenty-five years of age in each county. Figures 82 to 85 show the spatial representations of each variable in the educational attainment group. The first variable represented, "9^{th} to 12^{th} grade no diploma", demonstrates higher percentages of individuals without a high school diploma in the southern counties. This hot spot shows this phenomenon throughout the lower Mississippi River, and is unclear if it is a GRR regional distinction or simply a southern regional distinction. A similar pattern can be seen in "high school diploma", and both variables have higher percentages in rural counties compared to urban ones. "Associates degree" holders are more prevalent in the North, with Minnesota, Iowa, and parts of Illinois being major hot spots for this variable. An urban-rural distinction is not as prominent when compared to previous variables in this section. "Bachelors degree or higher", in similar fashion to "associates degree", are more prevalent in the North. However, this variable is correlated with urban areas in each state. This can be somewhat distorted, due to the location of higher education institutions in different areas along the Mississippi River.

Internet use variables represented in this section signify the availability of computers and internet access in each county. These variables are normalized by the total number of occupied houses in each county. Figures 86 and 87 are the spatial representations of each variable pertaining to internet use. "Households with a computer" and "with broadband internet" are spatially correlated to one another. In general, households in the North have greater access to broadband internet and at least one computer in a housing unit. Urban counties show higher values of internet and computer availability, regardless of a northern or southern location along the Mississippi River. Rural counties in the South are less likely to have a computer or broadband internet in the home when compared to the North. However, this appears to be a

southern region distinction, as cold spots are prevalent throughout these states with little distinction based on a county's proximity to the Mississippi river and the GRR. Based on internet use, it is difficult to define a GRR region; however, an urban rural and northern and southern distinction is spatially represented.

Economic Characteristics. Employment status variables in this section pertain to employment along the Mississippi River. Variables were normalized by the population over the age of sixteen in each county. Figures 88 and 89 show the spatial representation of these variables. "Civilians in labor force" shows a higher percentage of individuals in each county in the North or upper Mississippi River Region, with urban study areas showing higher percentages of civilians in the labor force. This cold spot is prevalent along the GRR, but also extends throughout counties in southern states. "Unemployment" shows an inverse pattern, with higher numbers of individuals in southern counties categorized as unemployed. Unlike civilians in the labor force, urban and rural areas show high numbers of unemployed persons. The main divide in this variable is the northern-southern division, generally located in Cairo, Illinois. Counties along the GRR in Louisiana, Mississippi, and Arkansas identify high numbers of unemployed individuals, correlating to cold spots in the variable "civilians in labor force". This pattern can be seen throughout these states when viewing the hot spot analysis map. The GRR region is not significantly identifiable while looking at employment status.

Workers by occupation variables communicate the number of workers in each occupation defined by the United States Census Bureau. The variables in this section were normalized by the population over the age of sixteen in each county. Figures 90 through 95 show the spatial representation for these five variables. The "service" variable shows a high correlation of workers in this occupation along the southern portion of the GRR, beginning south of St. Louis,

Missouri and continuing north of New Orleans, Louisiana. Urban counties including St. Louis, Memphis, and New Orleans show lower numbers of workers in the service occupation compared to rural counties. The "management, business, science, and arts" variable is positively correlated to urban counties, with an average percentage of 34% of the workforce in management and business jobs; rural counties compare with only 29%. in this study area. "Construction, extraction" and "production transit, material movement" are both associated with rural areas. The average percentage of workers in construction in rural areas is 12% and 9% in urban areas. The percentages for product transit jobs is 20% in rural counties and 16% in urban counties. These two variables are also correlated with southern Mississippi River counties more so than northern counties. Memphis, Tennessee is an exception, showing high percentages of workers in the production transit occupation. This can be explained with the presence of FedEx hub, in Memphis. "Management, business, science, arts" shows hot spots in the northern counties, with larger cold spots in the southern portion of the study area. The service occupation is the best indicator of a GRR region when studying the number of workers in each occupation, but other occupation sectors show little to no adherence to the GRR or the Mississippi River.

Workers by industry variables discussed in this section cover the number of workers in each industry. The variables are all normalized by the population over the age of sixteen in each county. Figures 96 to 109 show the spatial representations of these variables. "information", "finance, insurance, real estate", and "scientific management" industries are all prevalent in urban centers throughout the study area. "Wholesale trade" and "education, healthcare" show higher percentages throughout the study area, with some hot spots being located along the GRR. "Arts, Rec., food services" are prevalent in northern Minnesota and southern Louisiana. A portion of the state of Mississippi also shows an increase of workers in this industry along the

GRR. “Public administration” jobs are much more prevalent in the South, but do not appear to be impacted by the presence of the GRR. Agriculture increases along the lower portions of the Mississippi River, as seen through the hot spot analysis representation. However, counties along the northern Mississippi also show high percentages of workers in this agriculture, but no hot spot is identified. The lower GRR also shows a substantial cold spot in the number of workers in the construction industry in Arkansas and Mississippi. As with occupations, it is difficult to determine a definitive GRR region based off workers by industry. However, there is a definite distinction between urban rural and northern southern counties in states along the Mississippi River.

Household income contains several income brackets listing each household’s earnings. These map representations have been placed in Appendix B, and only the median and mean household income variables are shown below. This is due to patterns in each household income bracket showing consistent patterns to both median and mean variables. Variables in this section are normalized by the total number of households in each county; however, median and mean values are not normalized, as each one is already formatted as an average. Figures 110 and 111 show the spatial representations for household income. “Median household income” and “mean household income” are, unsurprisingly, very similar, with several urban areas being marked in a higher value category. For both median and mean data representations, urban areas are hot spots of households with higher incomes than rural counties. The northern portion of the study area also shows higher numbers of households with increased incomes compared to the South. Lower household income counties are located along the Southern GRR, but hot spot analysis consistently reflects this throughout southern states. The dividing line along the Mississippi River is located between St. Louis, Missouri and Cairo, Illinois in Cape Girardeau County in

Missouri. The GRR region is difficult to define using household income, but a clear divide between the Northern and Southern Mississippi is apparent.

Housing Characteristics. Heating fuel variables pertain to the type of energy used to heat an individual's home. Each variable in this section is normalized by the total number of occupied homes in a county. Several variables listed under heating fuel did yield interesting patterns, but were not relevant to the GRR regional study and are located in the Appendix B. Figures 112 to 115 are the maps created for these variables. First, "utility gas" is most prevalent in the northern portion and urban counties of the study area. A small portion of counties in the state of Mississippi along the GRR have a higher percentage of occupied houses that use "utility gas". Utility gas appears to be a major fuel used for heating homes along the GRR. Next, "bottle tank, LP gas" is more prevalent within the northern counties of the study area; however, the state of Mississippi does have a hot spot of homes that use this fuel. "Electricity" is inverse of the previous two heating sources, with a higher percentage of homes in the South depending on electricity for heat. The Southern GRR does show a pattern of fewer homes using electricity compared to other counties in the South, but is far greater in percentages of homes compared to the Northern GRR. Lastly, "fuel oil, kerosene" is used in Minnesota and Wisconsin, with small hot spots in Eastern Kentucky and Tennessee. Overall, the type of fuel used to heat the home appears to be based on which state the county is in, as well as its geographic position north or south along the Mississippi River. The natural climate based on northern or southern locations may also impact the kinds of fuel used when heating homes. Heating fuel "utility gas" and "electricity" show interesting spatial patterns, but it is difficult to discern a GRR region based off these two variables alone.

Year structure-built variables pertain to the homes in each county, evaluated based on the

decade constructed. Note that the latest decade, “year structure build 2010 or later”, is only available to 2018, as that was the current year of data collection. The variables in this section are normalized by the total number of housing units in each county. Figures 116 to 125 show the map representations of these variables. These variables seem to be based on regional patterns and demonstrate no distinction between urban and rural counties. That is to say, no decade of construction favors strictly urban or strictly rural counties, but whole regions are hot spots or cold spots for homes that are still standing today. Homes built before 1939 and in the 1940s are more prevalent in northern counties in the study area. In the 1950s, this shifts to a more equal north-south distribution of homes being built. This shift would be fully realized in the 1960s through the 1980s, may as homes first along the Mississippi River and the GRR were built and are still standing today. In the 1990s, homes in Kentucky and Tennessee were being constructed. In the 2000s, homes started to be built in larger numbers throughout the study area, regardless of location north or south in the study area. Finally, after 2010 homes were being built in southern Louisiana and other places in the South, central Minnesota also increased in the percentage of homes built in this time period. Overall, a distinction between urban and rural counties is absent when looking at the year a structure was built. The study area seems to experience more building construction and maintenance based more so on a regional pattern than on urban and rural distinctions. The GRR region is more distinct when evaluating the prevalence of home built in the 1960s and 1970s.

Home value variables in this section represent the value of homes in each county in the study area. These variables are normalized by the number of owner-occupied homes in each county, excluding “median home value”. Figures 126 to 135 show the map representations for each variable in this grouping. Generally, lower valued homes are more prevalent in southern

counties, and this pattern does coincide with counties along the Mississippi River and the GRR. Urban counties generally see higher home values throughout the study area, regardless of geographic location in the study area. “Median home value” shows these patterns visible in each individual value bracket, with urban homes generally valued higher than homes in rural counties. There is a significant cold spot with homes valued lower in southern counties, following the Mississippi River north and beginning to follow the Ohio River where the two meet near Cairo, Illinois. The Southern GRR is in the center of this cold spot, but these lower home values are prevalent throughout the South. It is difficult to determine a GRR region based off home value, but a clear distinction between urban-rural counties and north-south location along the Mississippi River does play a role in the value of homes in each area.

Demographic Characteristics. Race variables discussed in this section pertain to the race of individuals in each county. The variables in this section were normalized by the total population in each county. Figures 136 to 139 show the resulting map representations of each variable. “White” populations in the study area predominate in the North, but show a drop in the percentage of the population in urban counties throughout the Mississippi region. The “African American” population centers around the southern states of Louisiana, Mississippi, and parts of Arkansas and Tennessee. This increase in African American populations does appear to follow the Mississippi River, moving north through Cairo, Illinois and up to St. Louis, Missouri. “Hispanic or Latina” populations also increase in urban counties, but regionally, this race is located in the western portions of the study area. Northern Illinois and southern Wisconsin are significant hot spots for “Hispanic and Latina” populations. Lastly, “American Indians” (Native Americans), are prevalent in rural counties throughout the Mississippi River. The larger hot spots for Native American populations are found in northern Minnesota, where the Mississippi River

begins. The “African American” population variable does show some correlation based on the Mississippi River and the GRR heading north, but this seems to be the only population that shows any pattern pertaining to the GRR. Race and the variables analyzed in this section are inconclusive when defining a GRR region.

Airbnb Data. At its founding, the GRR was promoted as a tourism corridor. This aspect of the GRR has not been prevalent throughout most of this study. Occupation sector “service” and industry sector “arts, Rec., food services” touch on the number of professions that can be considered a part of the tourism industry. The service occupation had a high percentage of workers in the southern GRR region, based on the spatial representations of this study. The arts, rec., and food services industry are prevalent in the northern counties of Minnesota, as well as counties centered around the southern GRR. This could be showing the abundance of jobs created by tourism throughout the GRR regions. However, based on industry and occupation data alone it is difficult to determine the true impact of tourism in the area.

Airbnb’s can be another indication of a tourism industry in the GRR region or the availability for added tourism ventures in a county or area. As seen in “median household income” and “median home value” representations, the southern portion of the GRR is in need of some kind of economic simulation though new industry opportunities. Tourism may bolster economic activity in areas in the southern GRR regions (Kim, Uysal, & Sirgy, 2013; Tyrrell, & Johnson, 2001). Such economic stimulators can help reverse economic stagnation or depression in counties and local communities. Future research over the specific impact tourism has on the GRR in modern times and in the future may lead to interesting conclusions. This study looks at Airbnb as a minor aspect of what may be an underutilized tourism corridor. The GRR can lend a

helping hand in encouraging and facilitating travel all across the Mississippi River. From large cities to small towns the benefit of tourism industries can be widespread.

Airbnb locations were collected off the Airbnb website and documented based on their location in small towns and across rural counties. This previous research conducted by members of Missouri State University was formatted using Excel workbooks. These locations were processed and titled with the county name where each Airbnb was located. Metropolitan areas, including from north to south Minneapolis, Minnesota, Davenport, Iowa, St. Louis, Missouri, Memphis, Tennessee, and New Orleans, Louisiana, were omitted from this research collection. The northern-most counties in Minnesota were also excluded from research collection, due to their distance away from the physical GRR route. Figure 140 shows the spatial results of this research, represented using the quantile classification method with metropolitan counties along the GRR colored gray.

Airbnbs are more prevalent in the northern portion of the GRR between Minneapolis, Minnesota and Davenport, Iowa. A higher number of Airbnbs are present north of Minneapolis. This data shows the readiness of the Northern GRR for tourism and recreational visits by travelers experiencing an entirety, or just a small portion of, the GRR. Compared to counties in the southern portion of the GRR, the availability for relatively low-cost lodging is a hinderance for any future tourism growth in the area. This contrasts with the number of workers in the service occupation and arts, rec., and food service industries seen in these southern GRR counties. There is a noticeable distinction between the Northern and Southern GRR when analyzing Airbnb locations, and the divide is more noticeable north and south of St. Louis, Missouri.

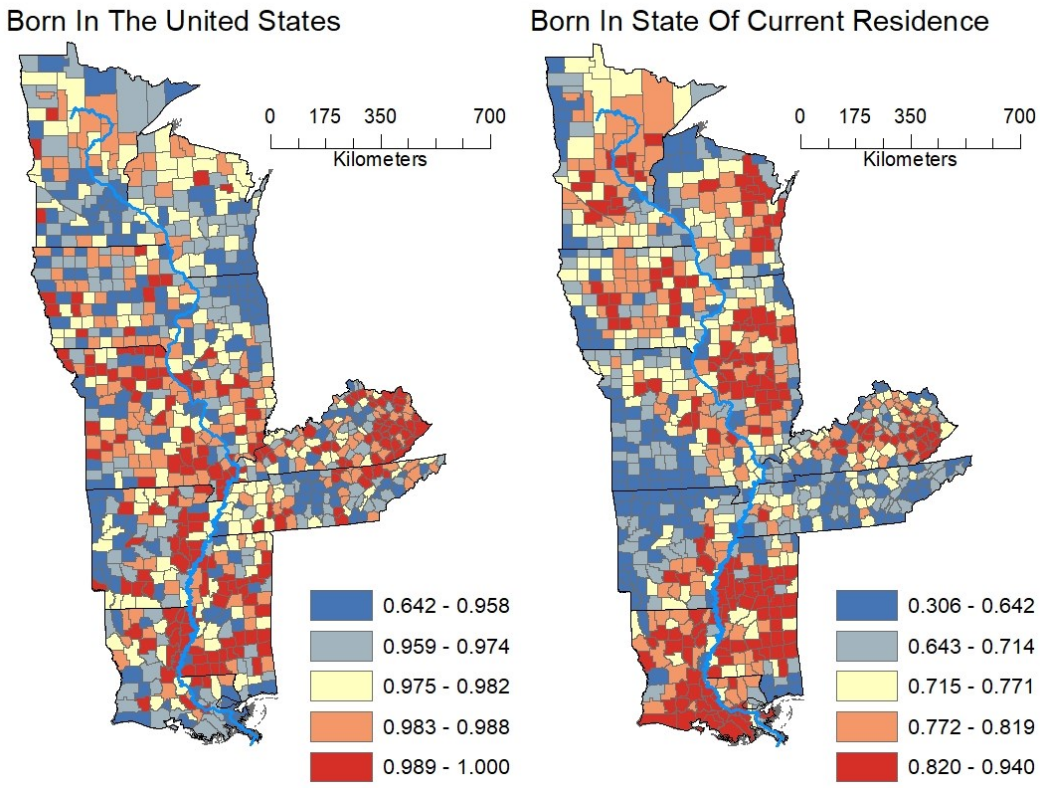

Figure 80: Quantile representations of citizenship status.

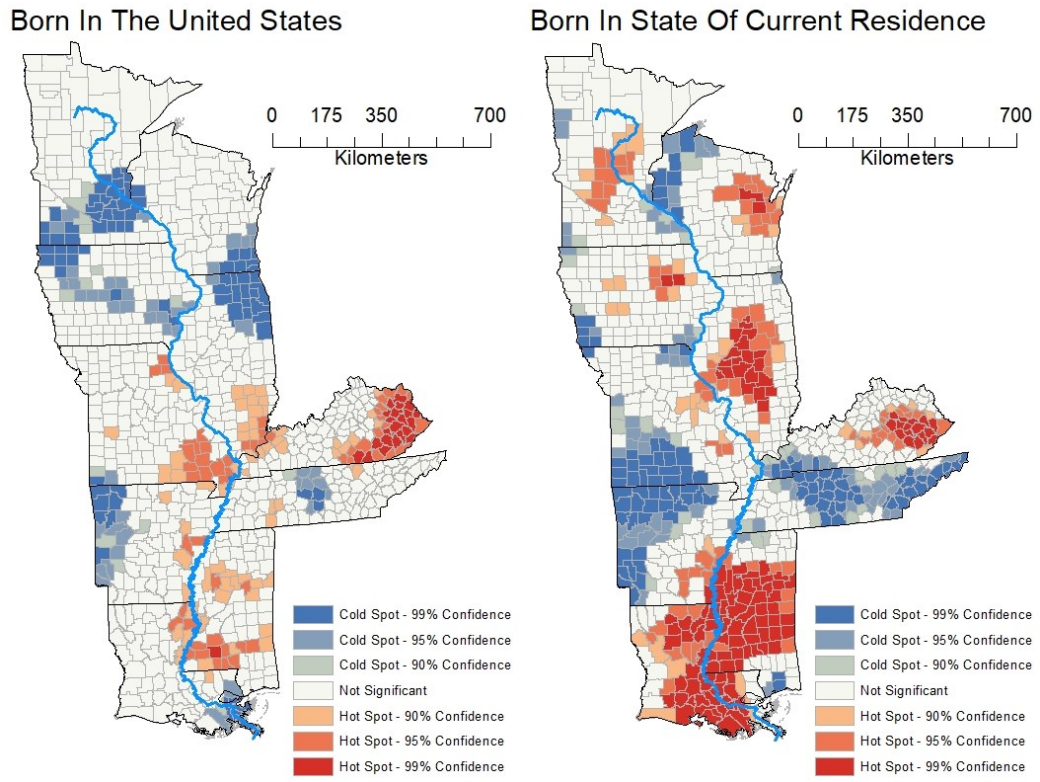

Figure 81: Getis-Ord GI representations of citizenship status.

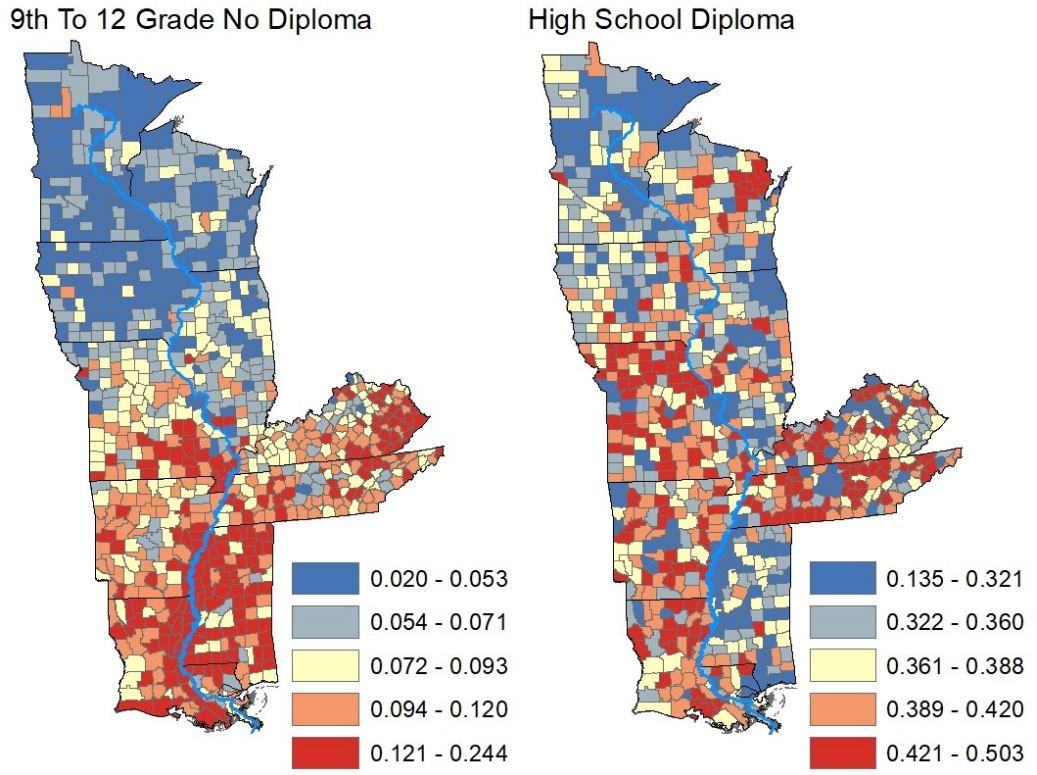

Figure 82: Quantile representations of high school educational attainment.

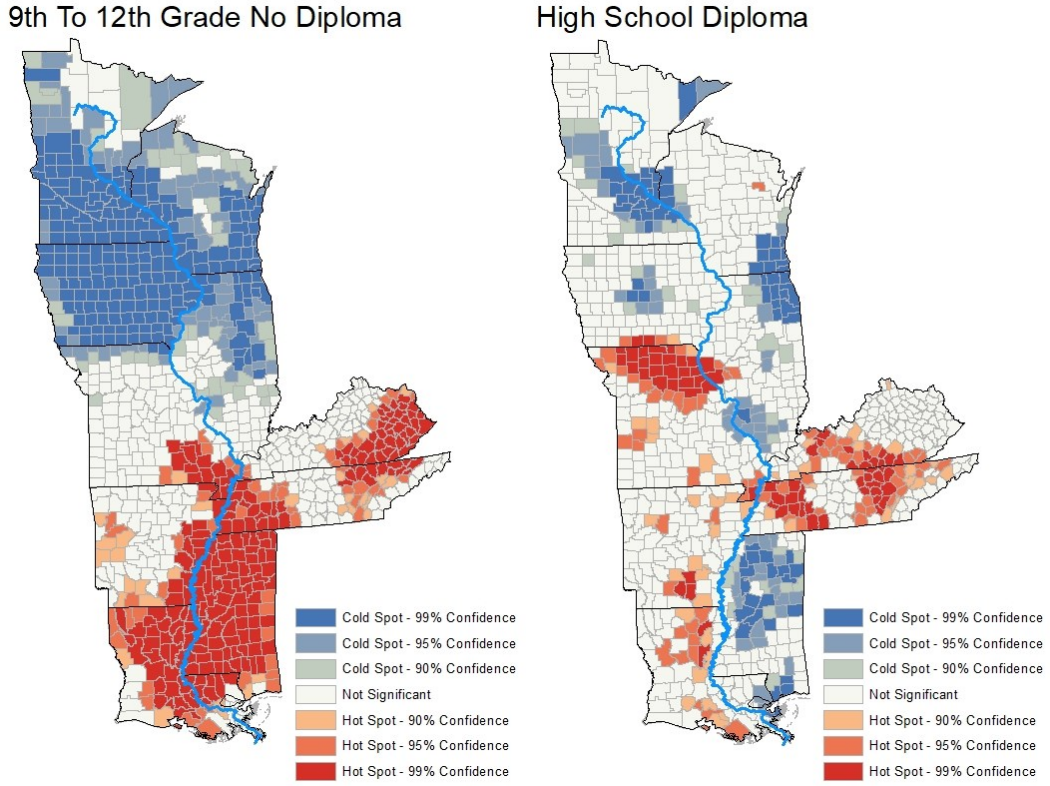

Figure 83: Getis-Ord GI representations of high school educational attainment.

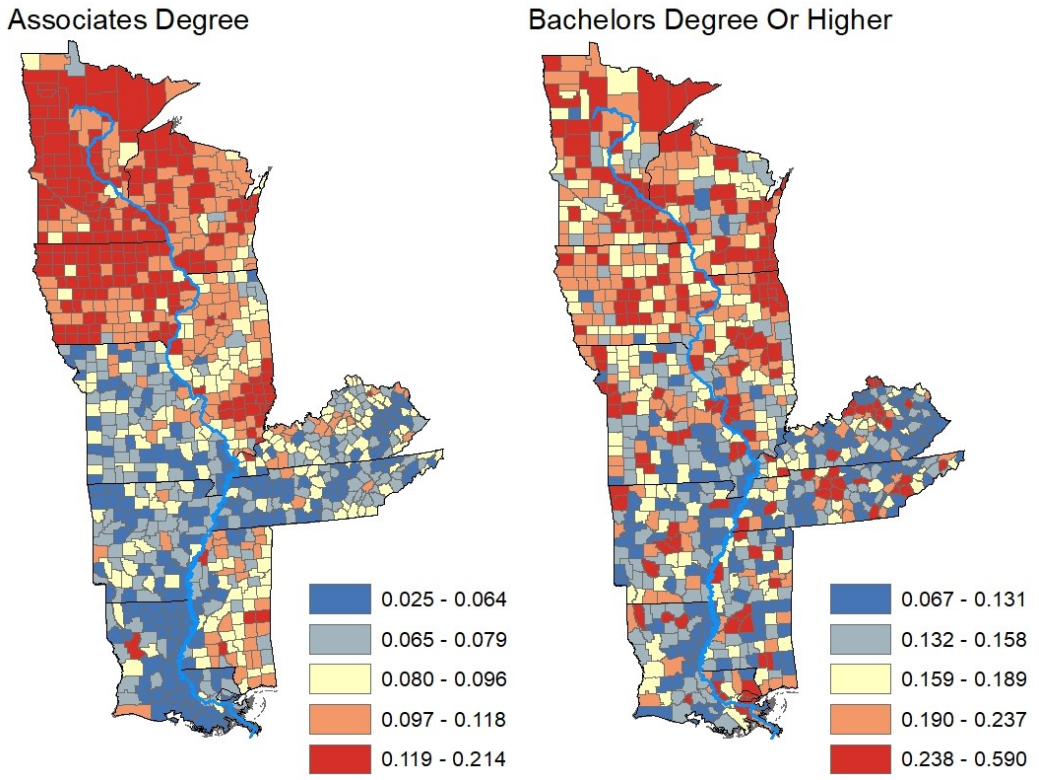

Figure 84: Quantile representations of higher learning educational attainment.

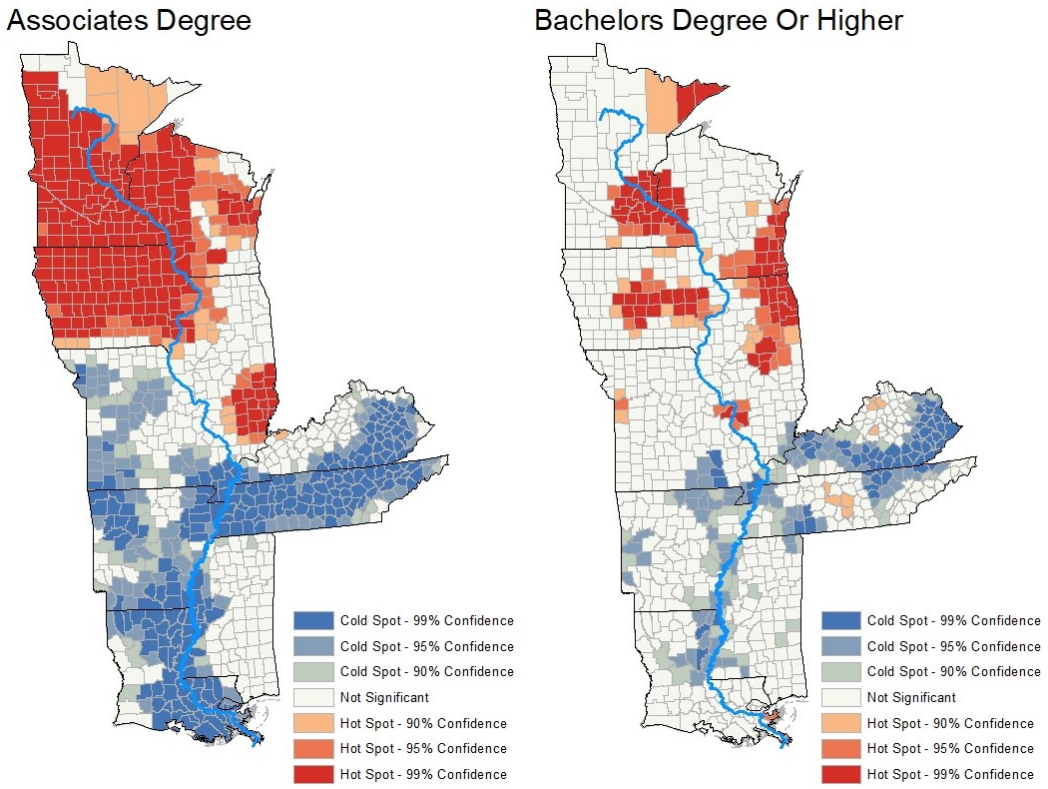

Figure 85: Getis-Ord GI representations of higher learning educational attainment.

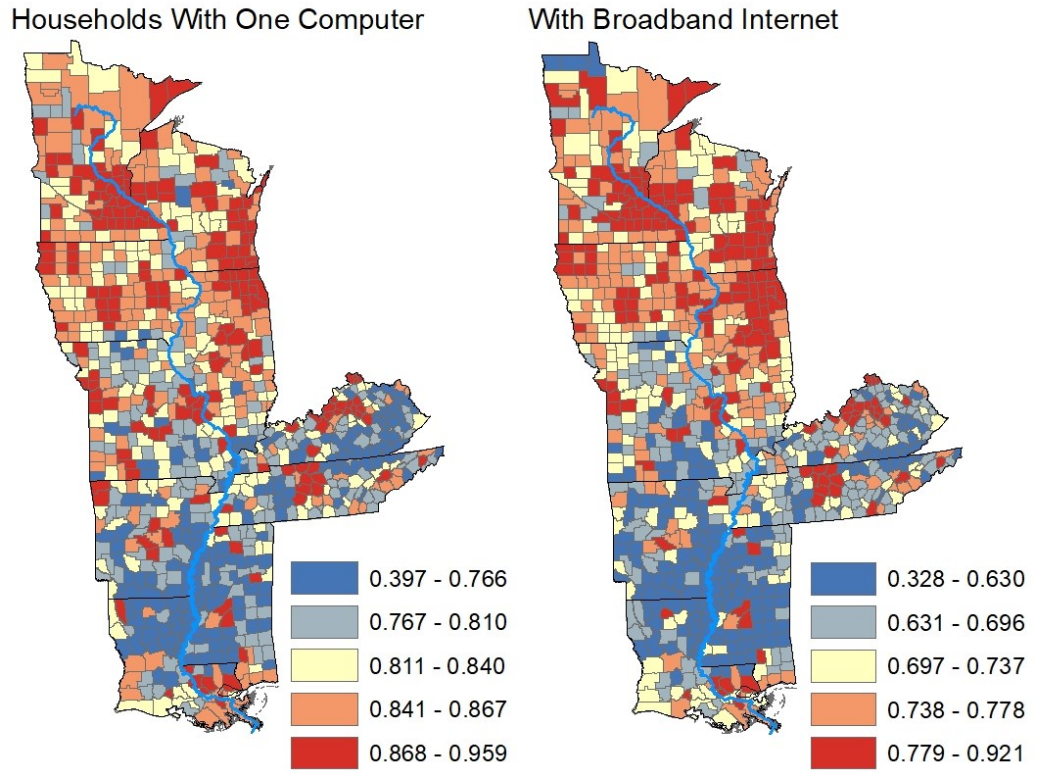

Figure 86: Quantile representations of internet use.

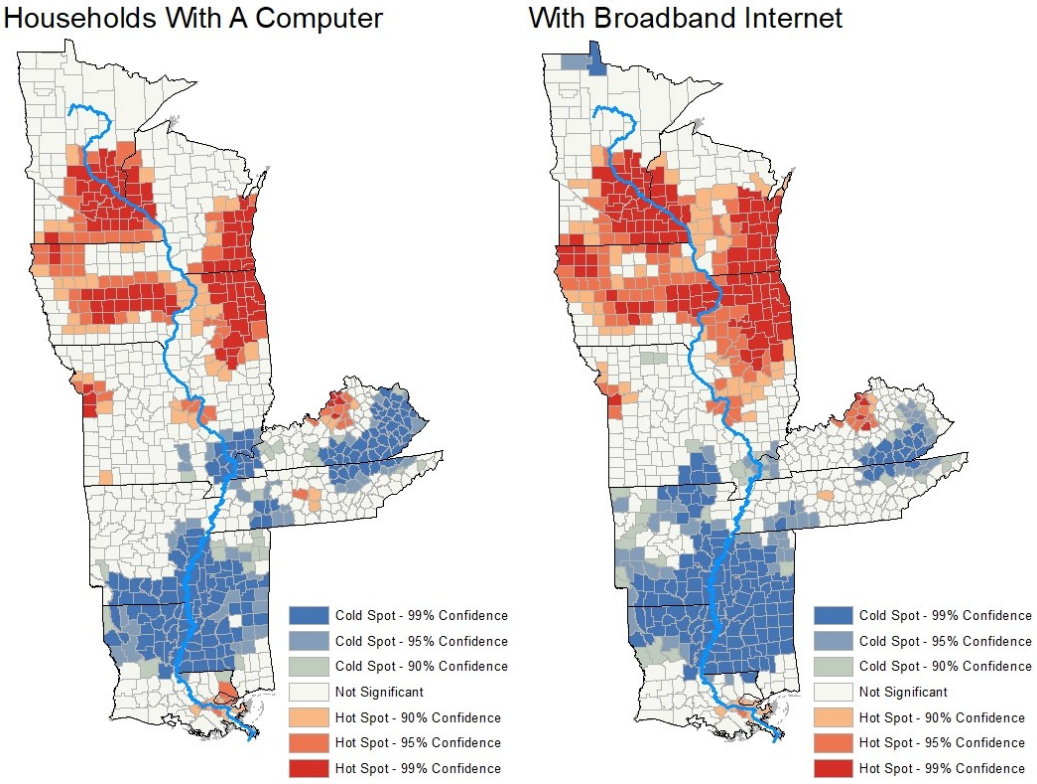

Figure 87: Getis-Ord GI representations of internet use.

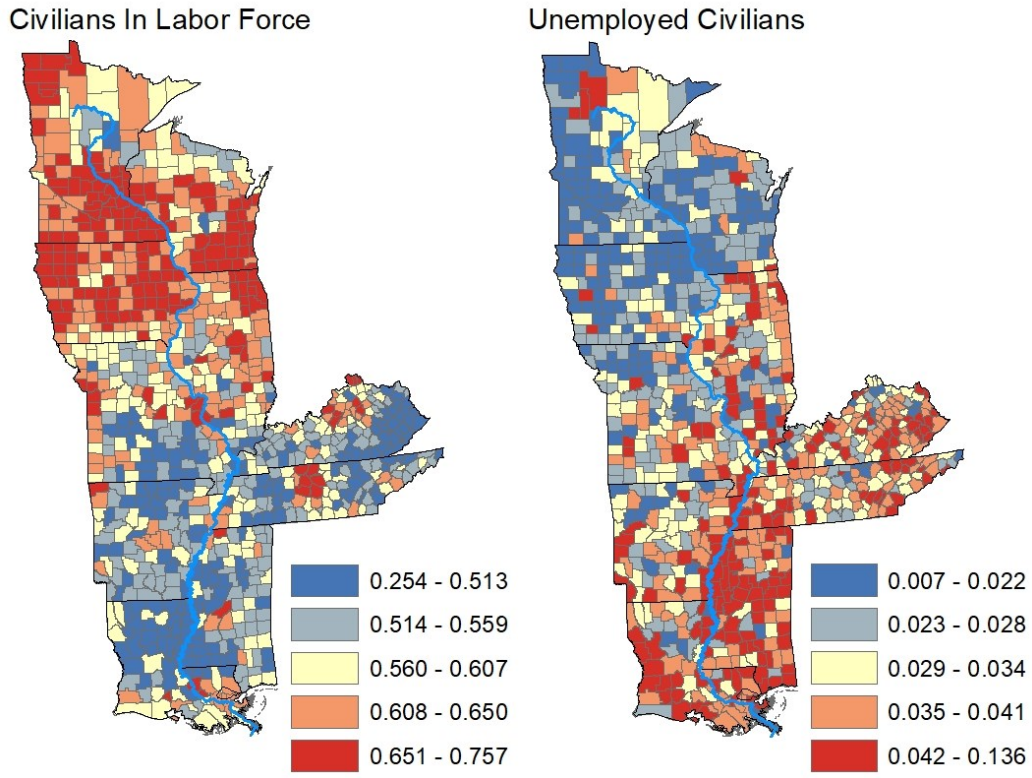

Figure 88: Quantile representations of employment status.

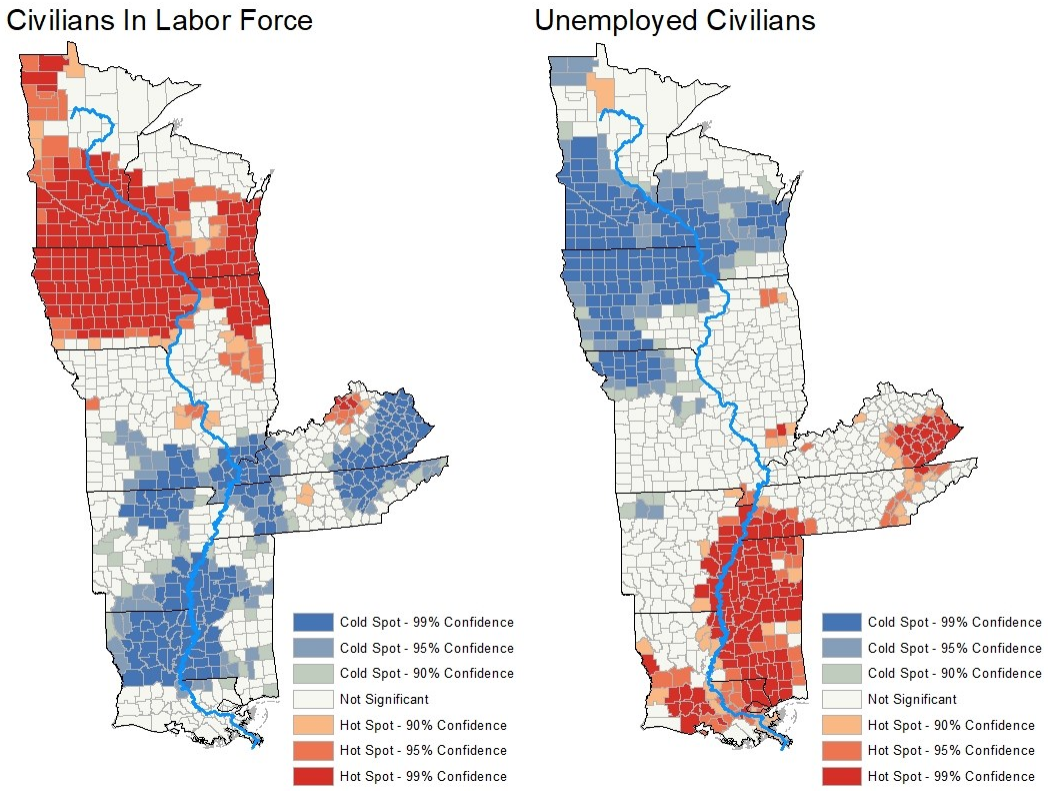

Figure 89: Getis-Ord GI representations of employment status.

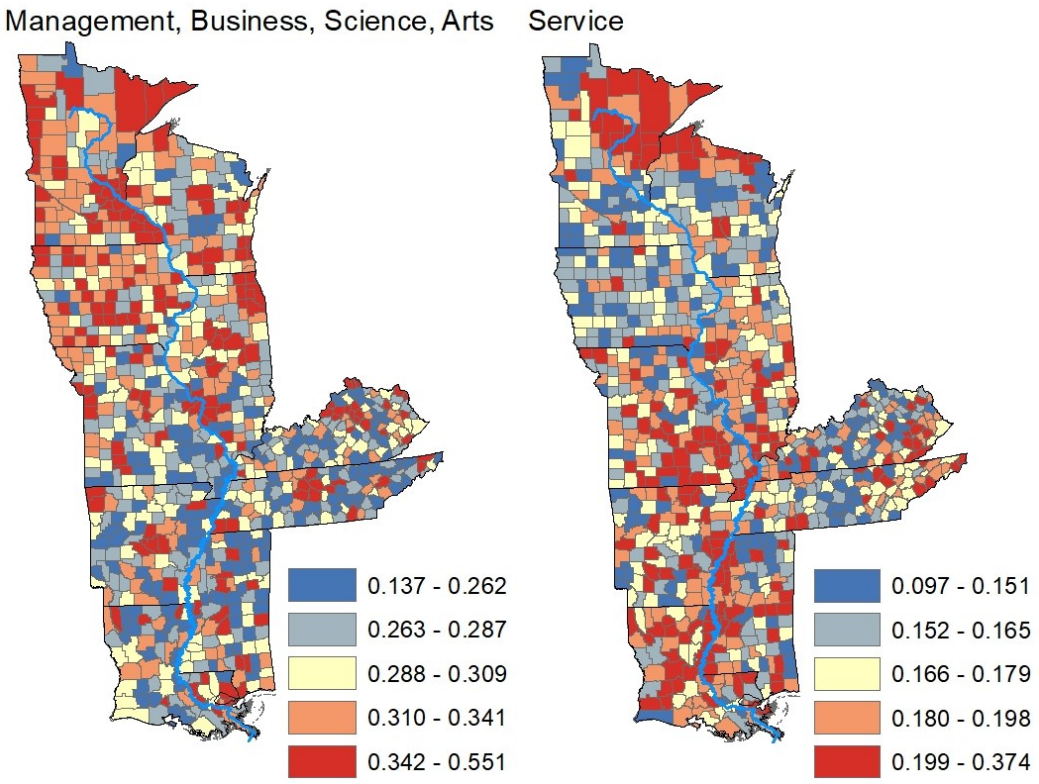

Figure 90: Quantile representations of workers by occupation including management.

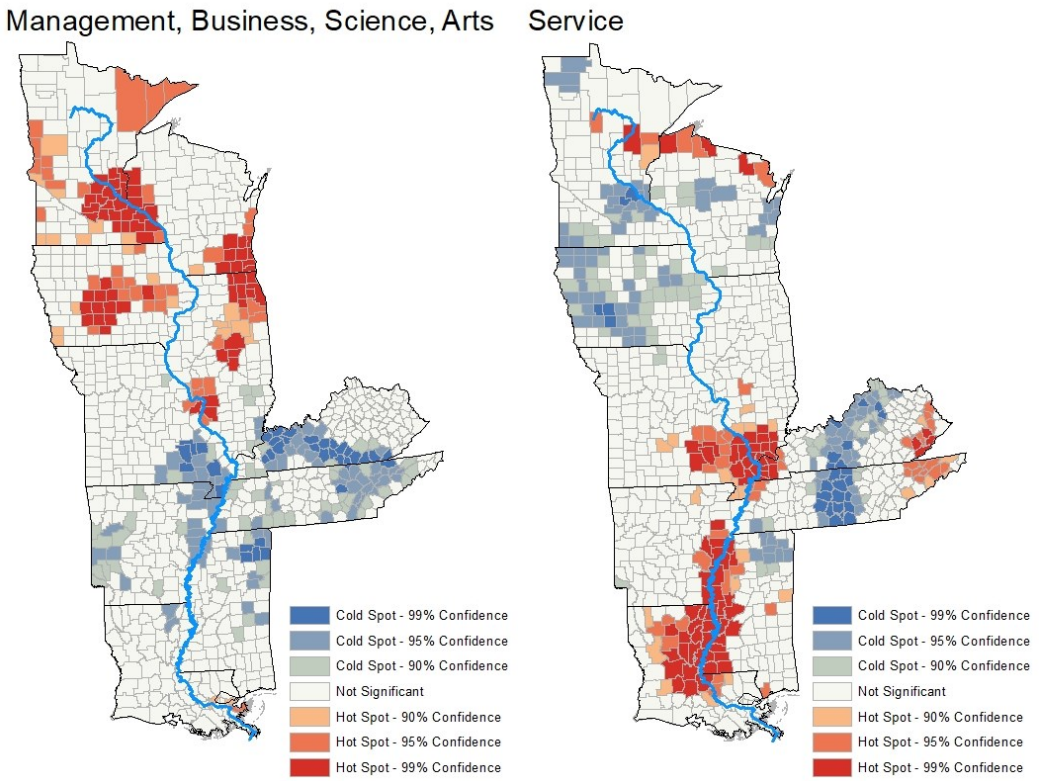

Figure 91: Getis-Ord GI representations of workers by occupation including management.

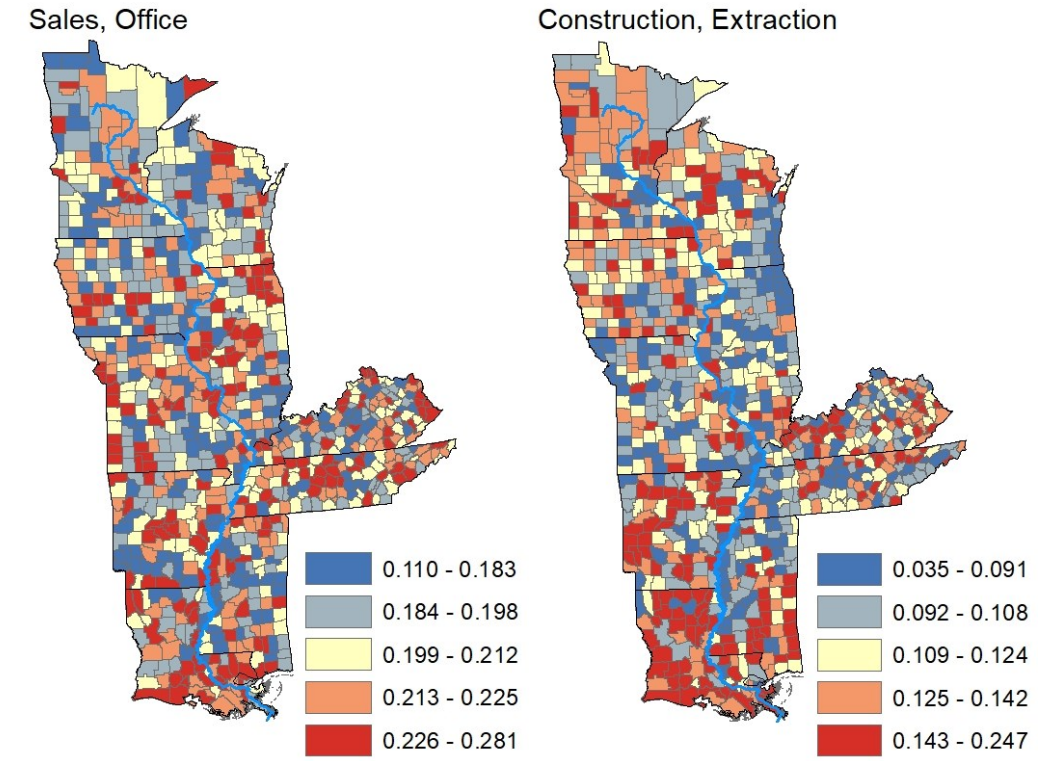

Figure 92: Quantile representations of workers by occupation including sales, office.

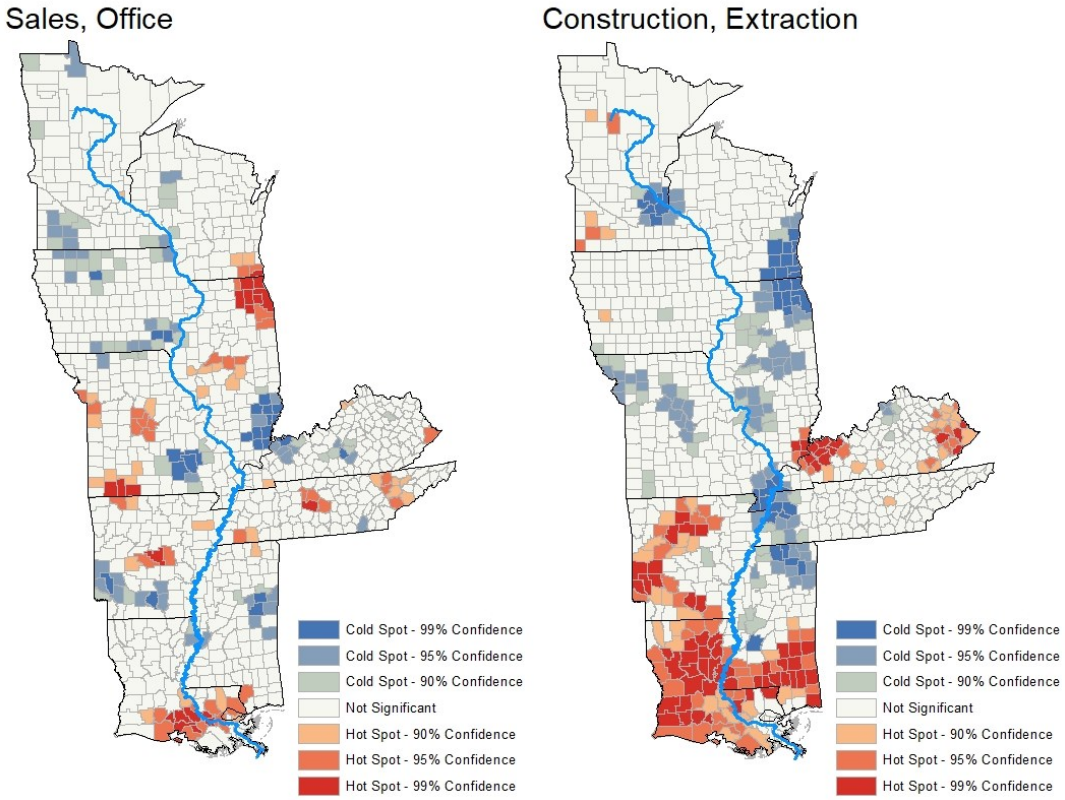

Figure 93: Getis-Ord GI representations of workers by occupation including sales, office.

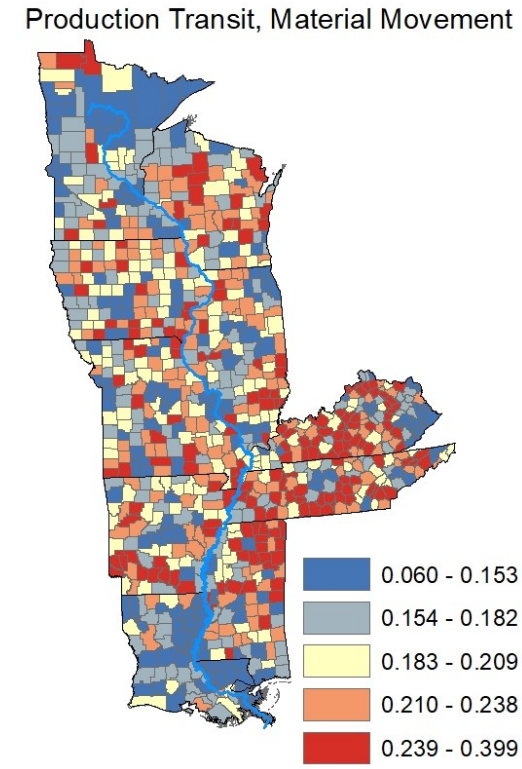

Figure 94: Quantile representations of workers by occupation including production transit.

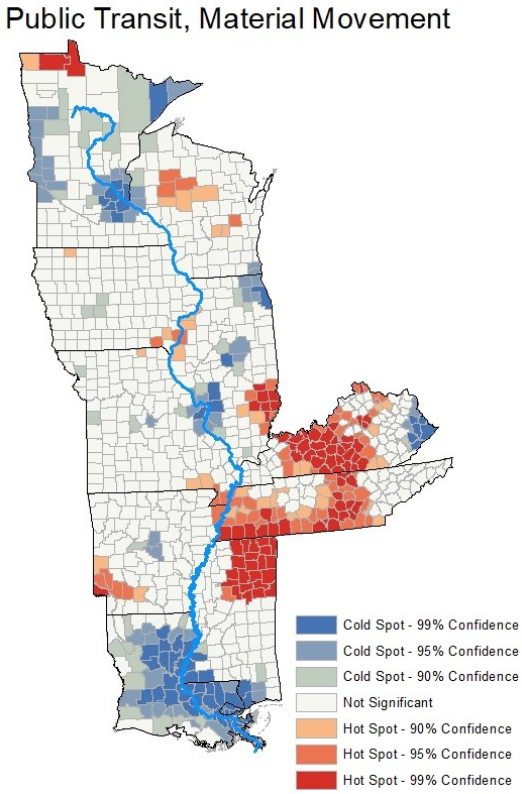

Figure 95: Getis-Ord GI representations of workers by occupation including production transit.

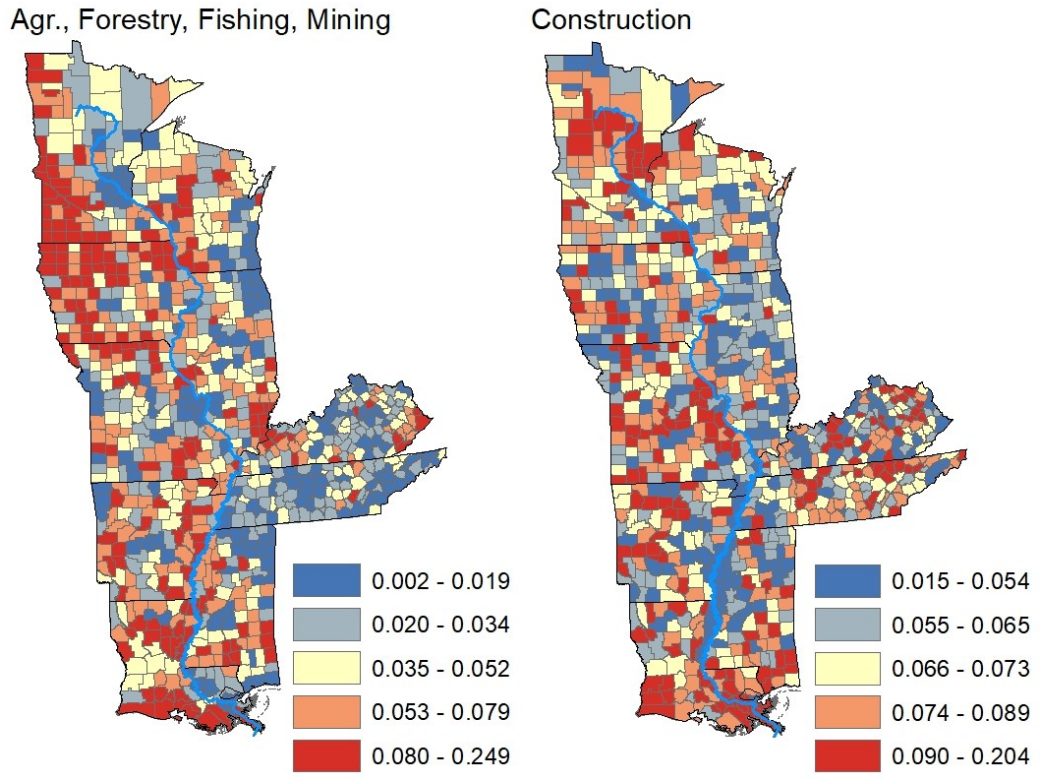

Figure 96: Quantile representations of workers by industry including agriculture.

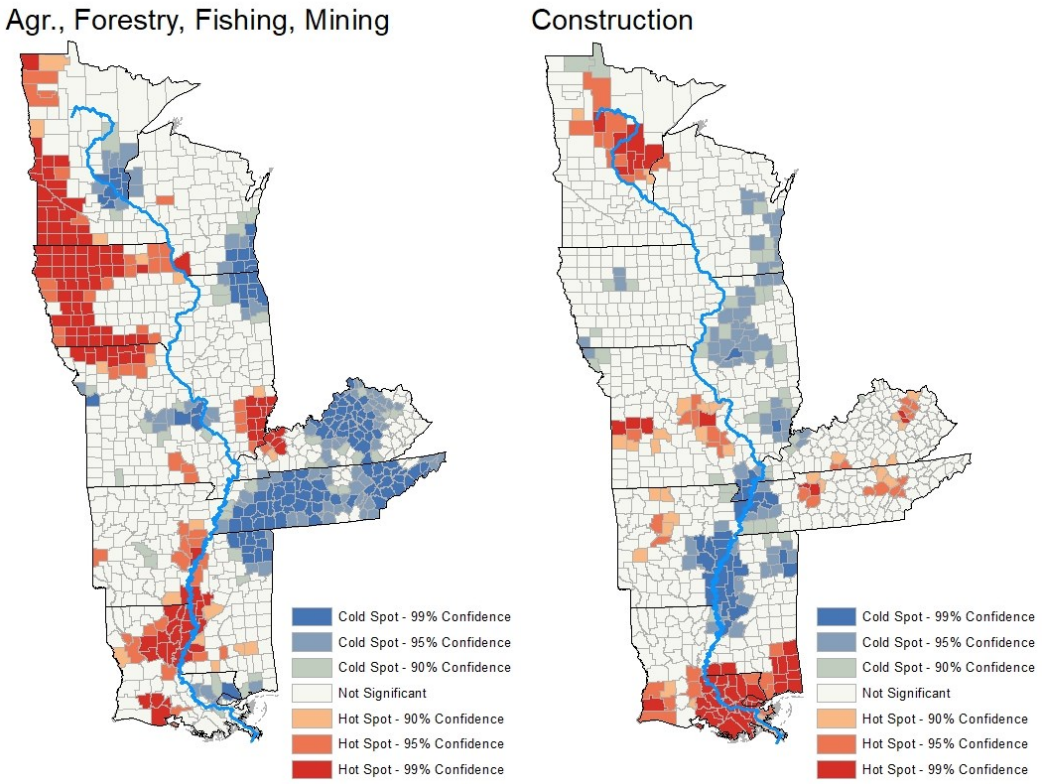

Figure 97: Getis-Ord GI representations of workers by industry including agriculture.

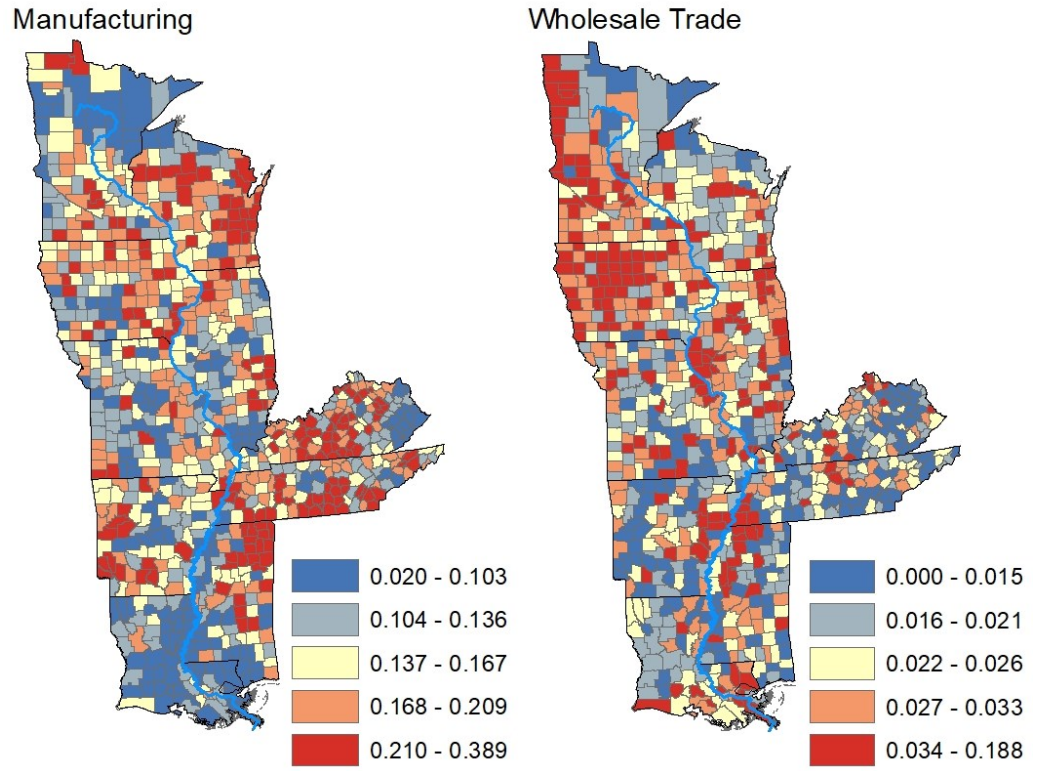

Figure 98: Quantile representations of workers by industry including manufacturing.

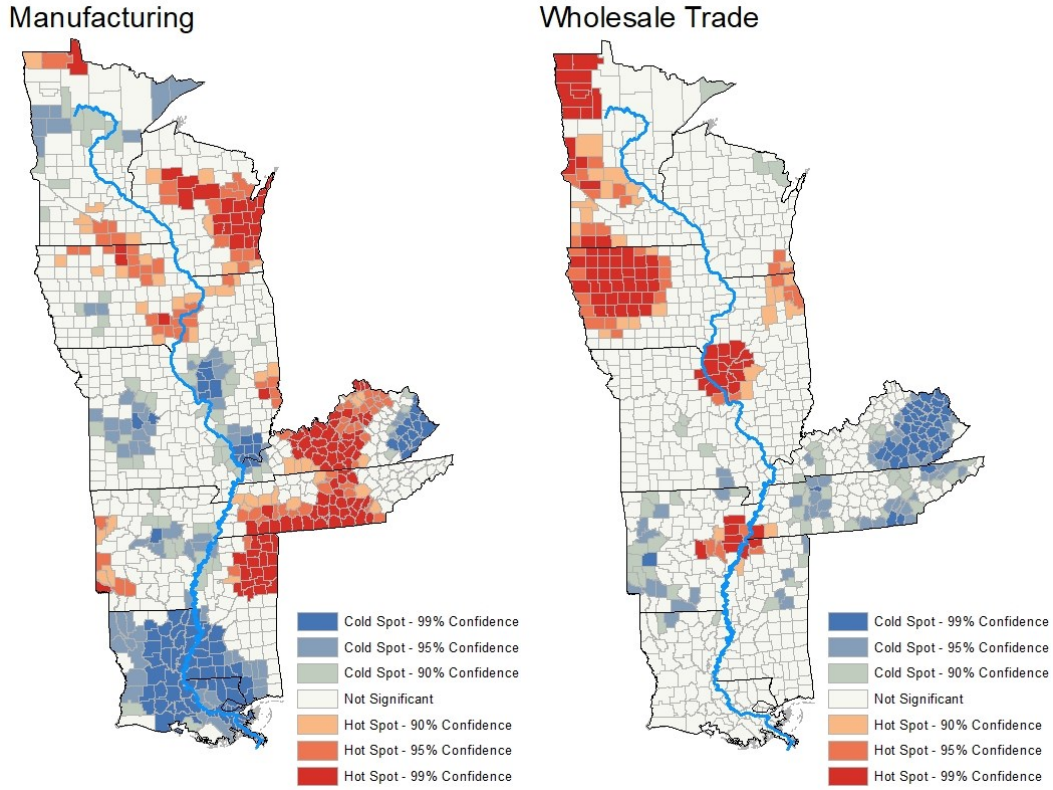

Figure 99: Getis-Ord GI representations of workers by industry including manufacturing.

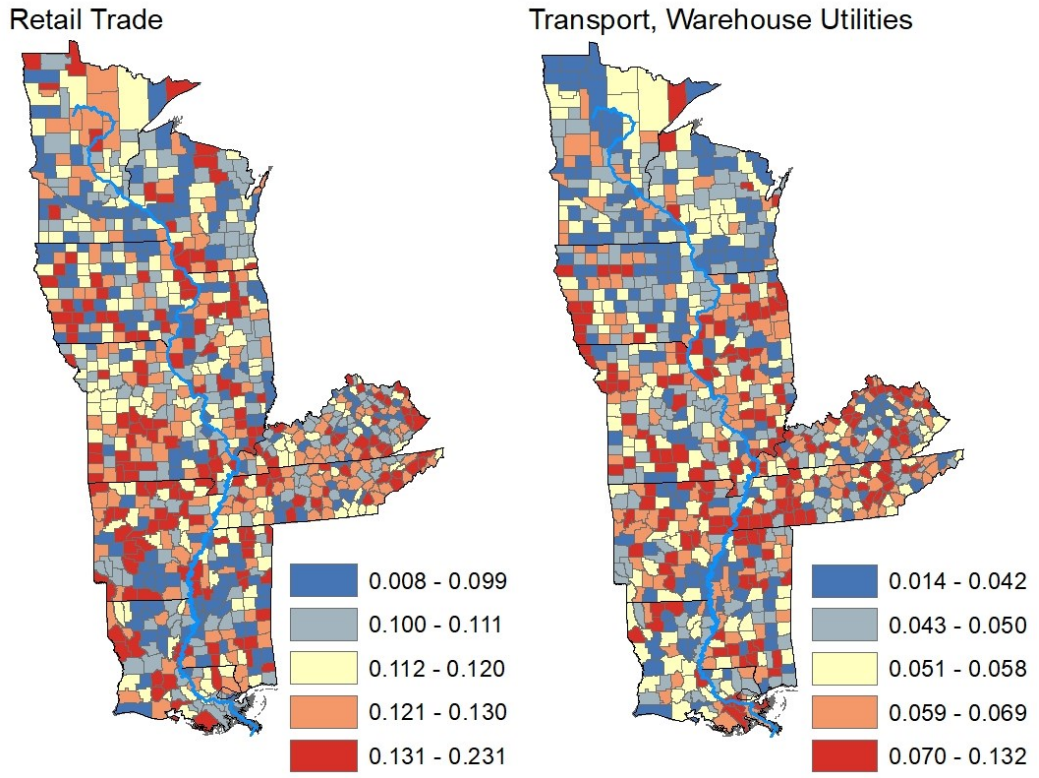

Figure 100: Quantile representations of workers by industry including retail trade.

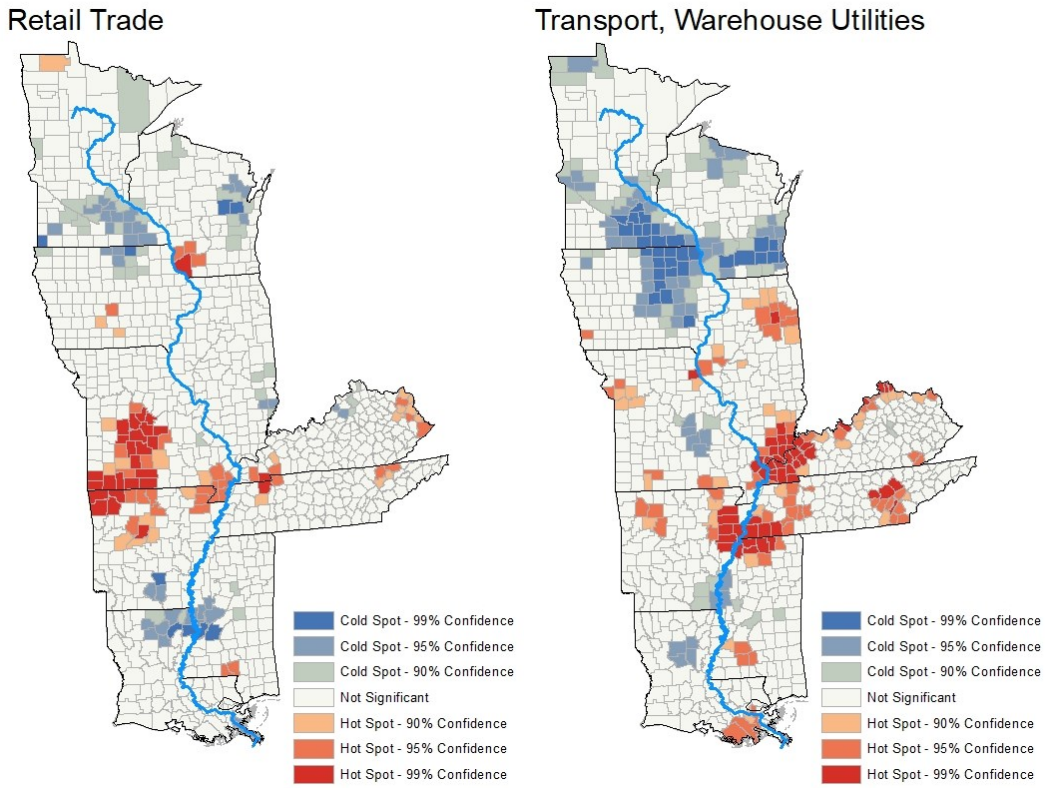

Figure 101: Getis-Ord GI representations of workers by industry including retail trade.

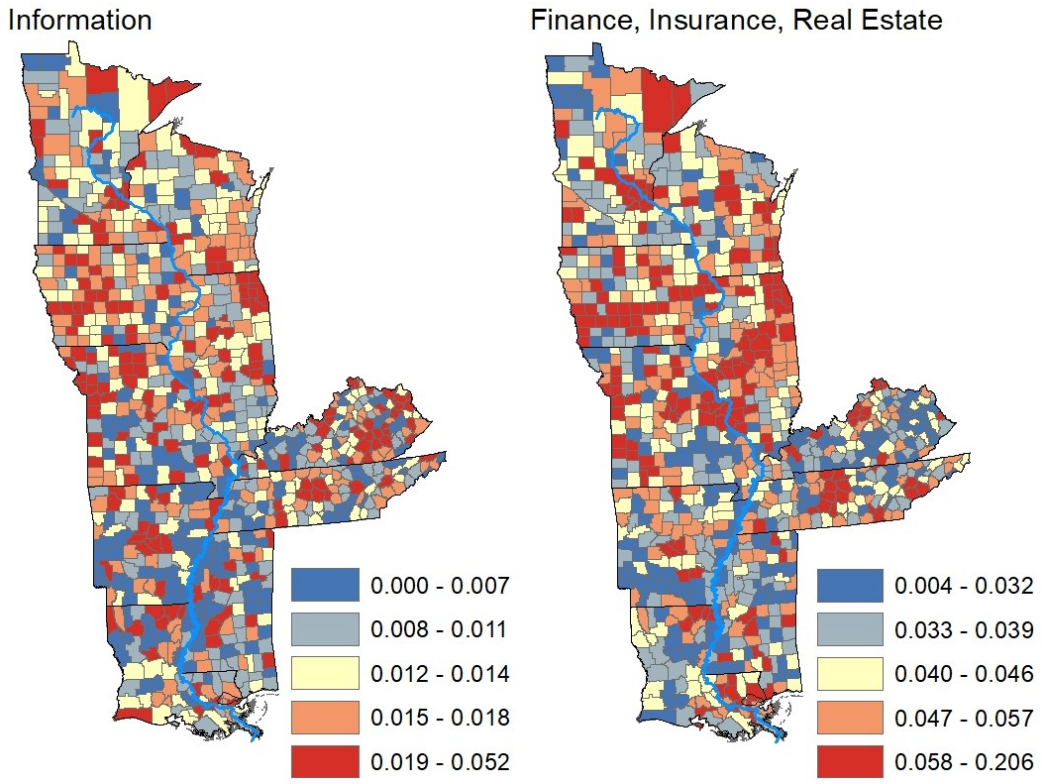

Figure 102: Quantile representations of workers by industry including information.

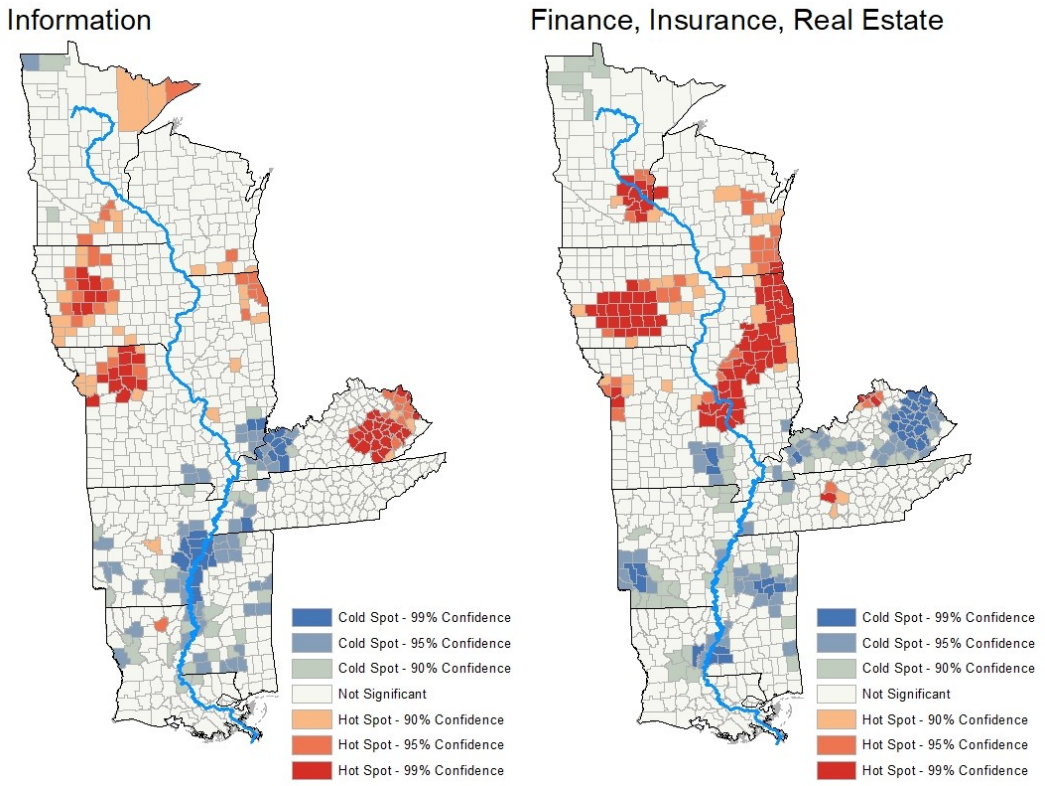

Figure 103: Getis-Ord GI representations of workers by industry including information.

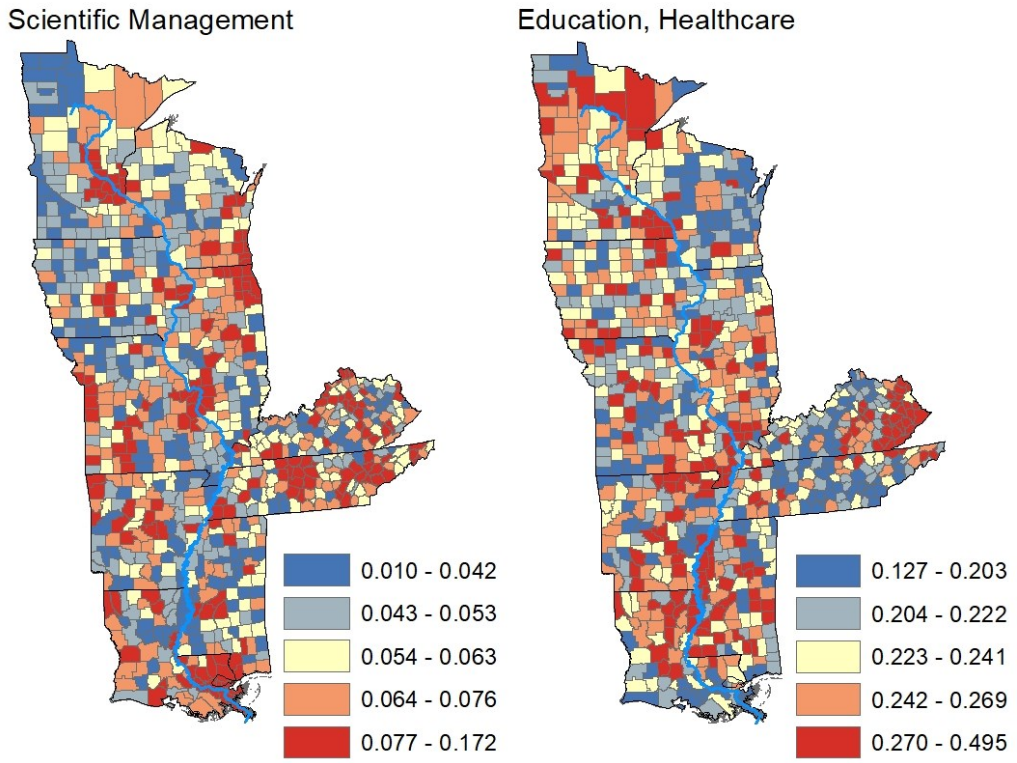

Figure 104: Quantile representations of workers by industry including scientific management.

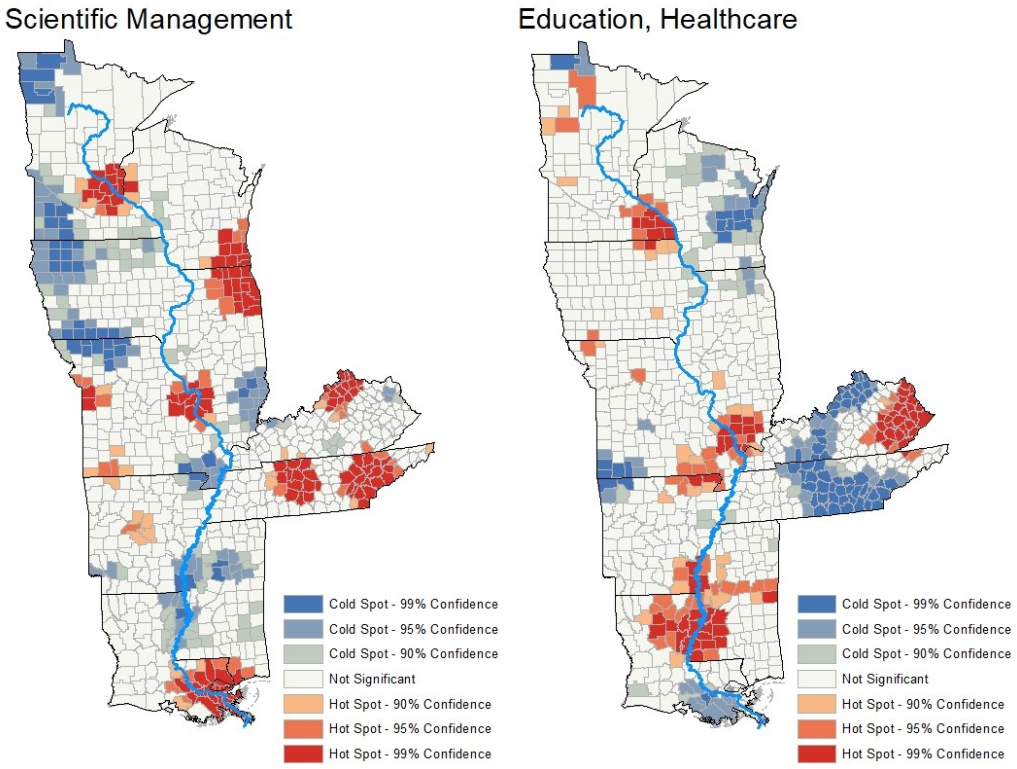

Figure 105: Getis-Ord GI representations of workers by industry including scientific management.

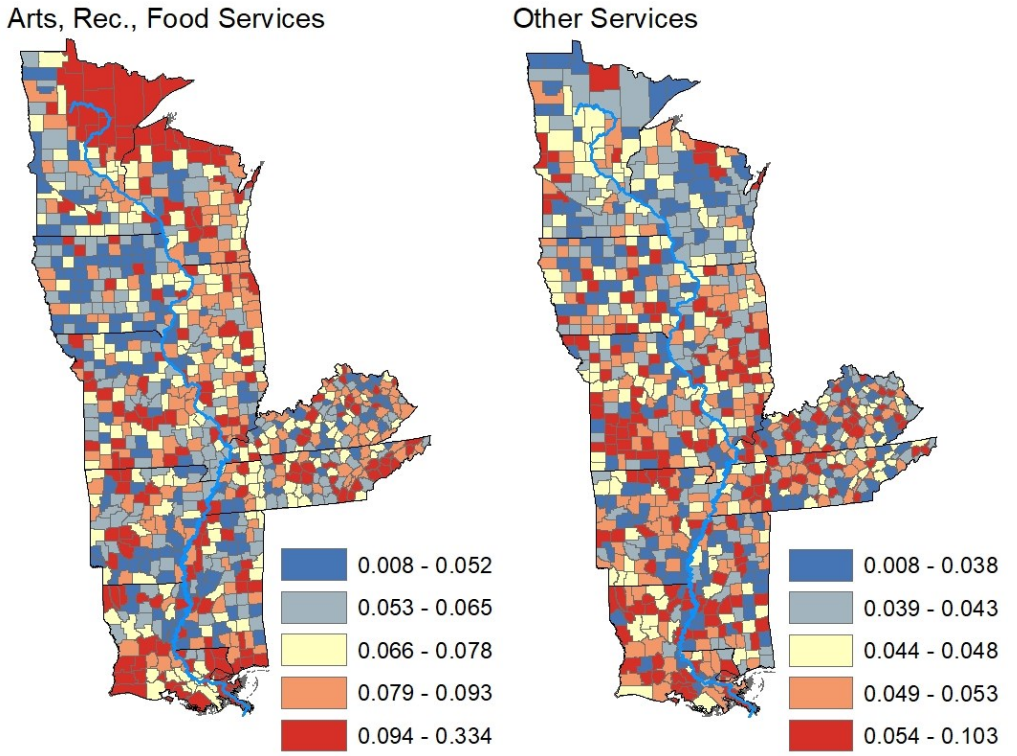

Figure 106: Quantile representations of workers by industry including arts, rec., food service.

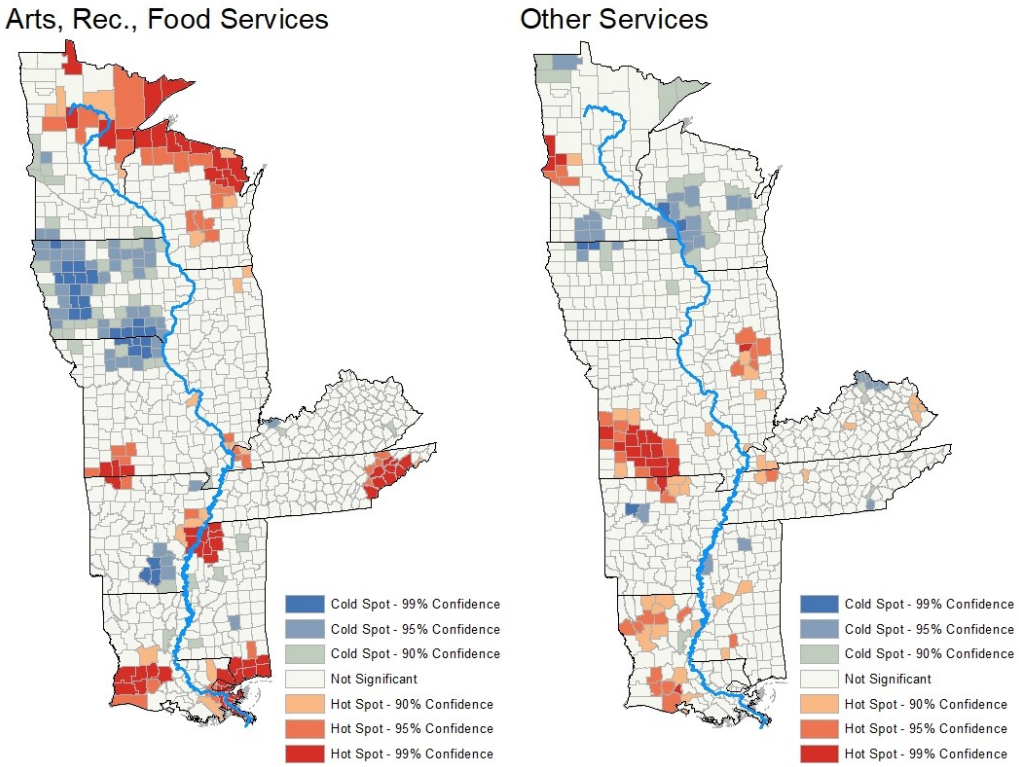

Figure 107: Getis-Ord GI representations of workers by industry including arts, rec., food service.

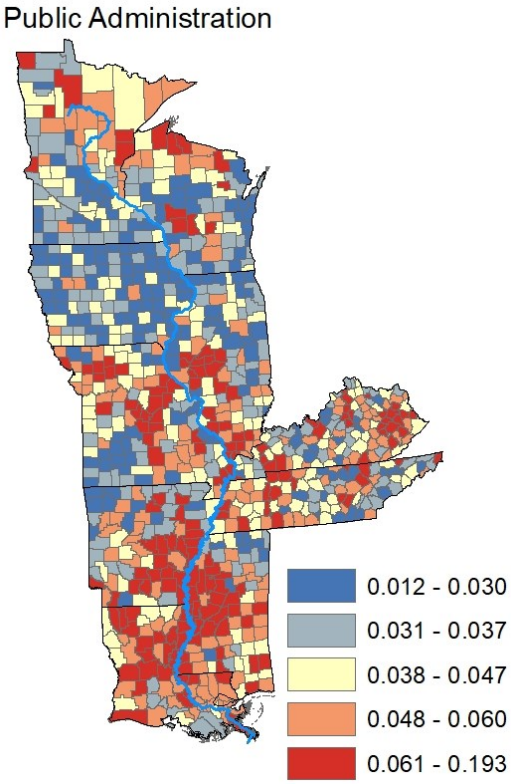

Figure 108: Quantile representations of workers by industry including public administration.

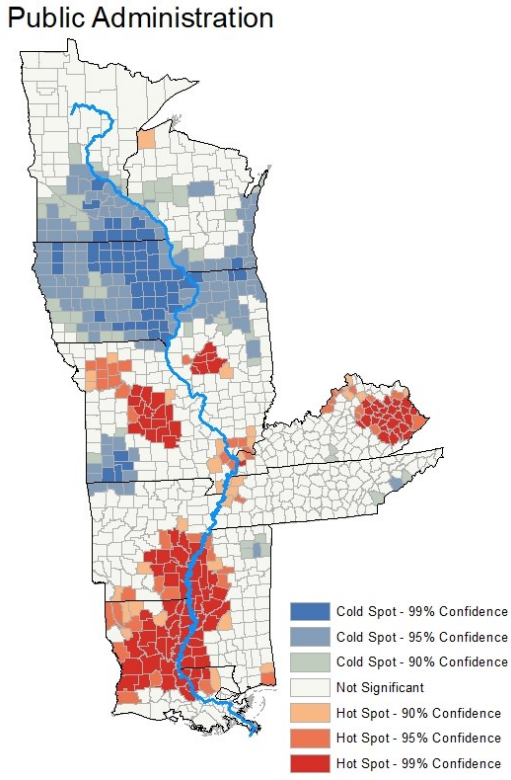

Figure 109: Getis-Ord GI representations of workers by industry including public administration.

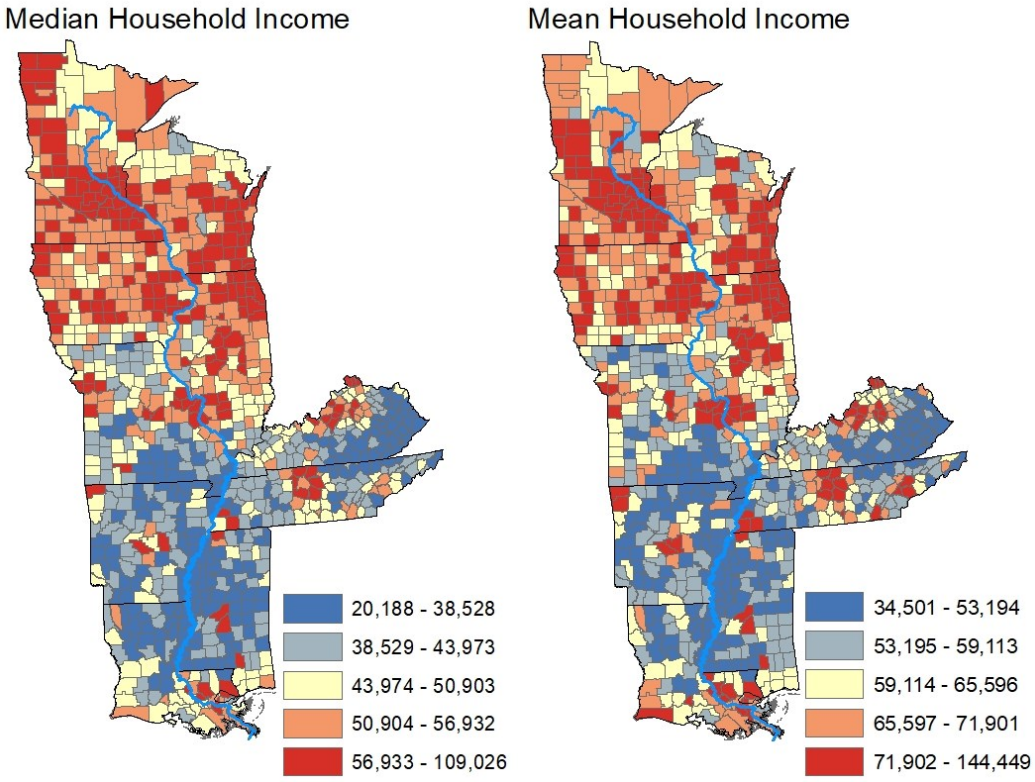

Figure 110: Quantile representations of household income.

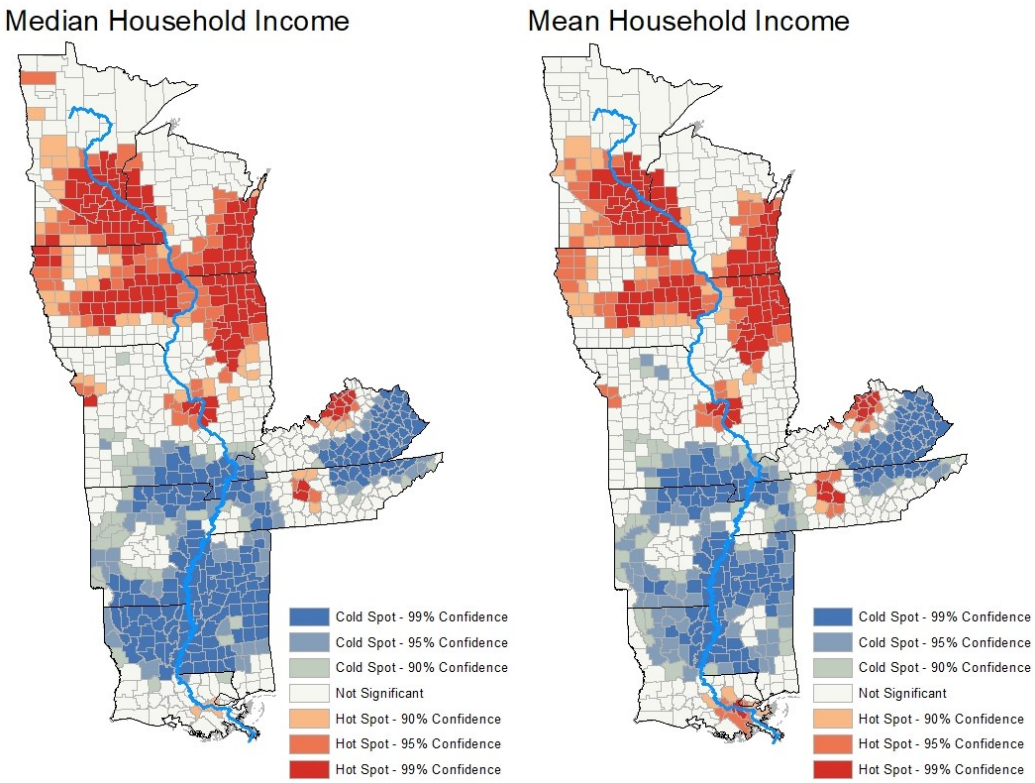

Figure 111: Getis-Ord GI representations of household income.

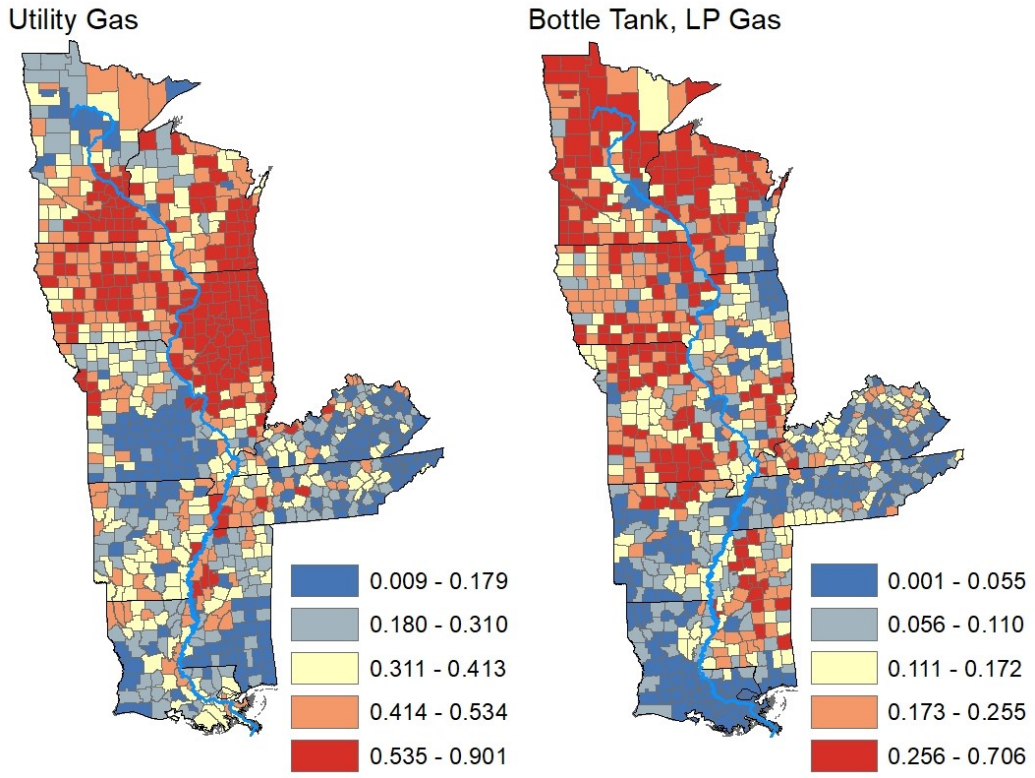

Figure 112: Quantile representations of heating fuel including utility gas.

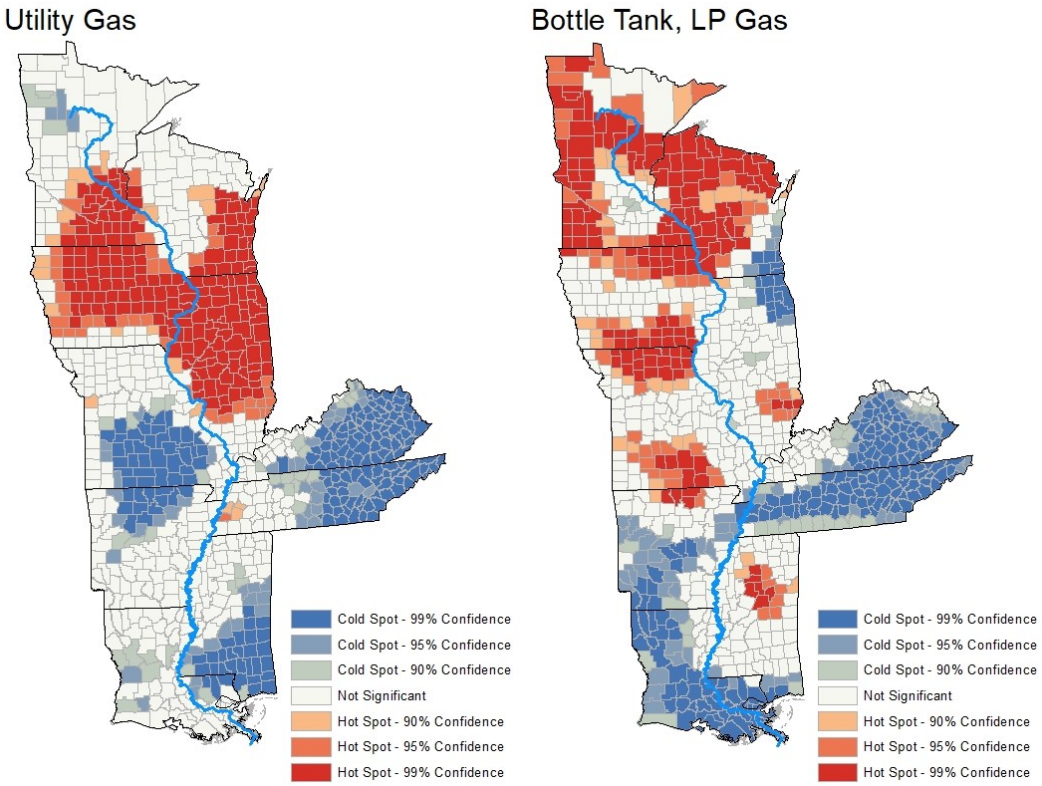

Figure 113: Getis-Ord GI representations of heating fuel including utility gas.

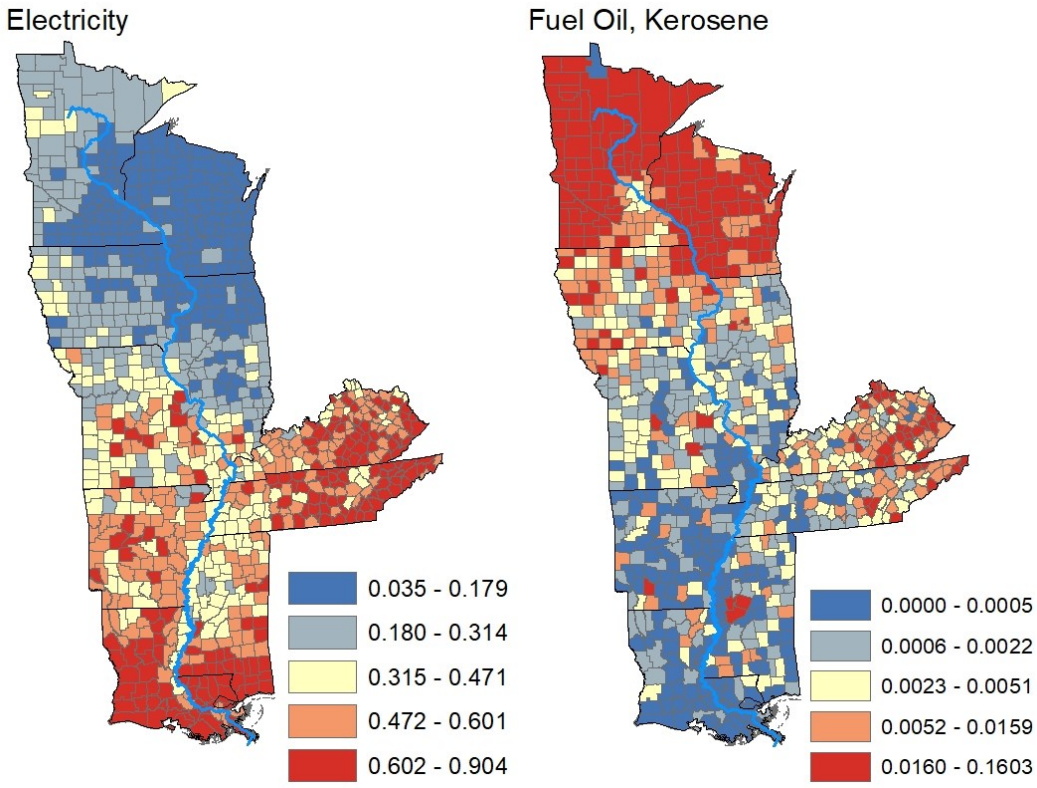

Figure 114: Quantile representations of heating fuel including electricity.

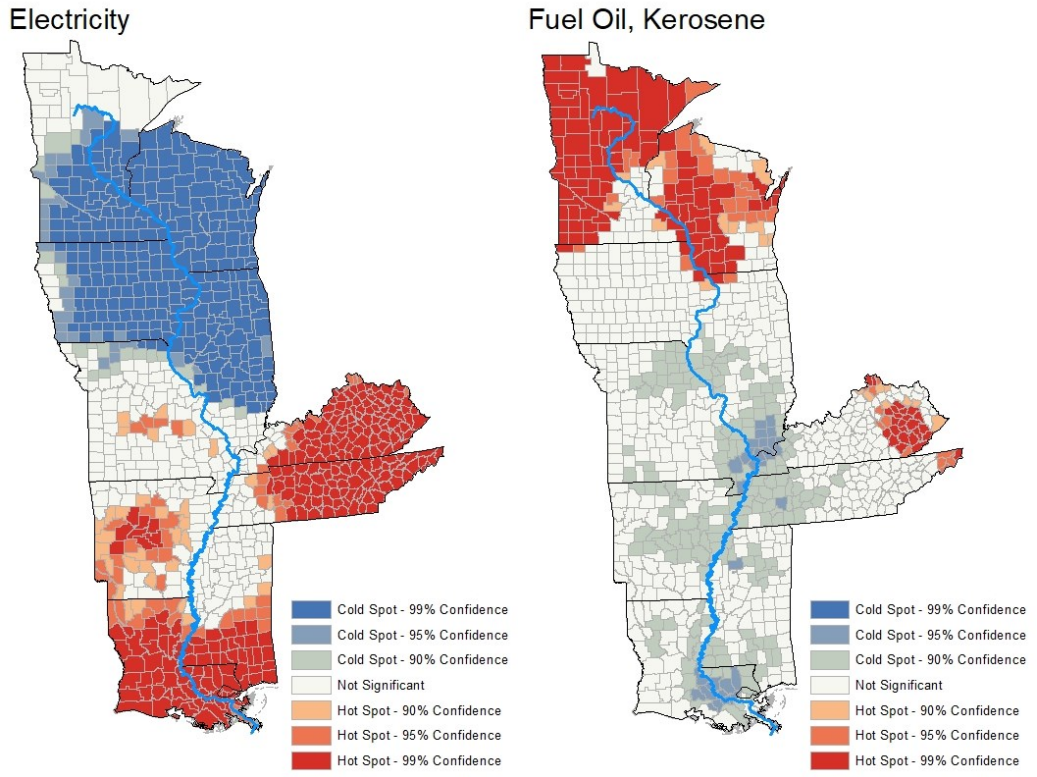

Figure 115: Getis-Ord GI representations of heating fuel including electricity.

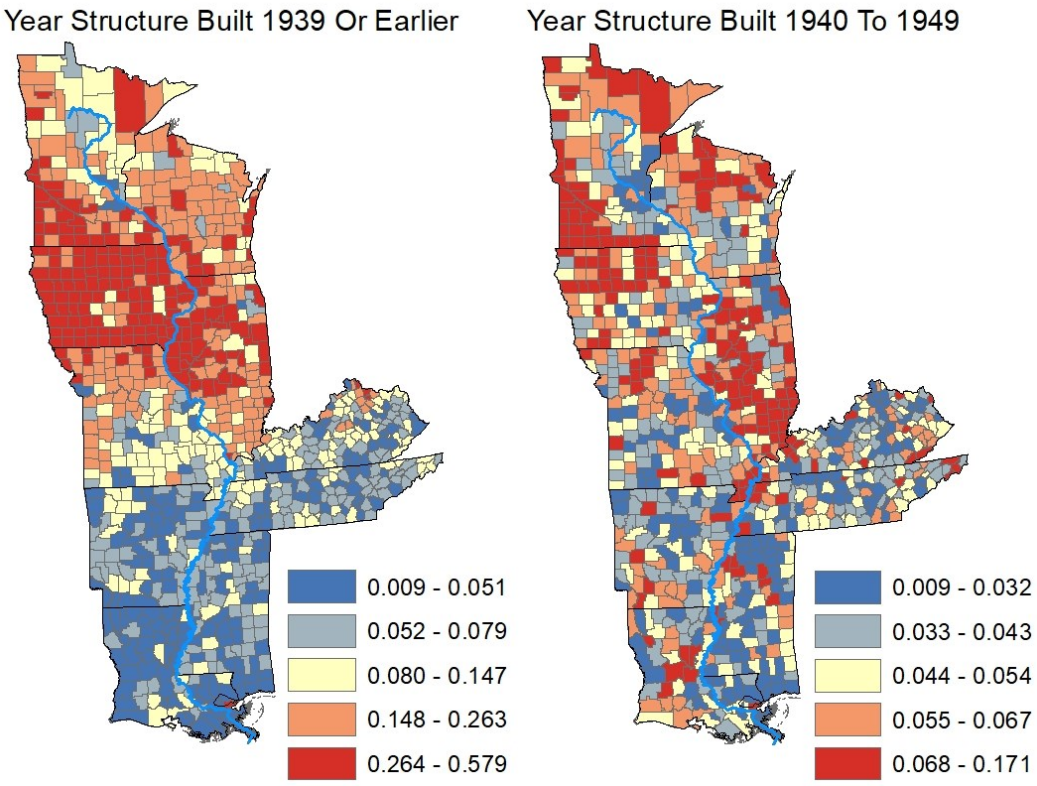

Figure 116: Quantile representations of year structure built from 1939 to 1949.

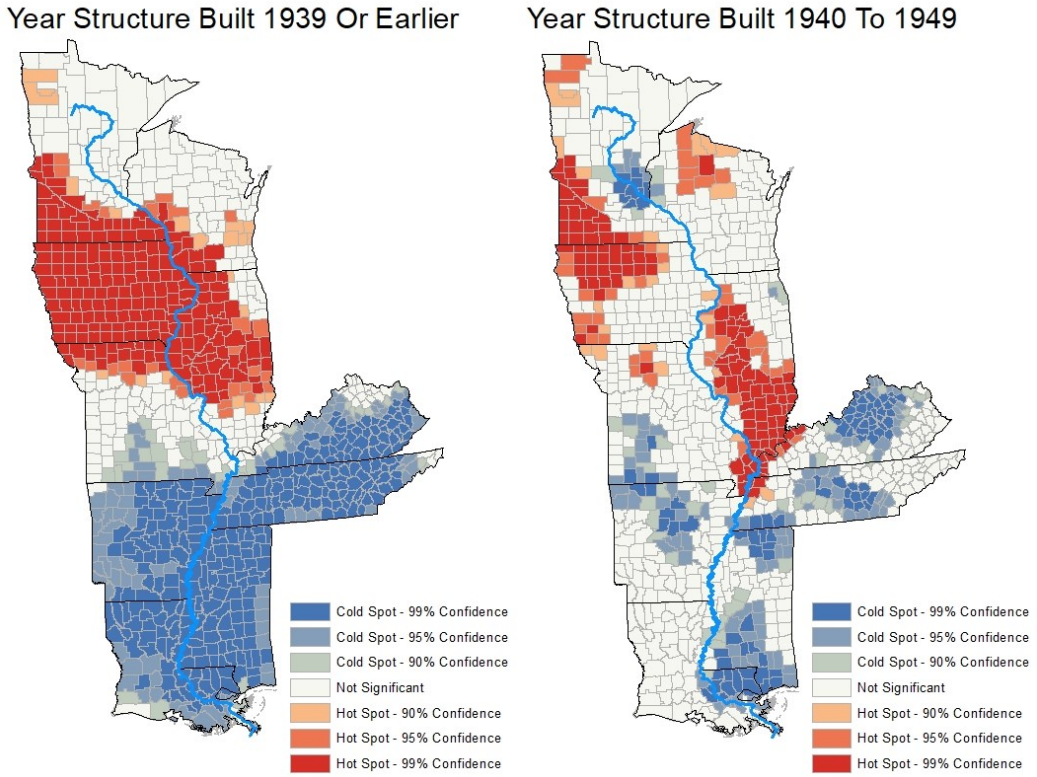

Figure 117: Getis-Ord GI representations of year structure built from 1939 to 1949.

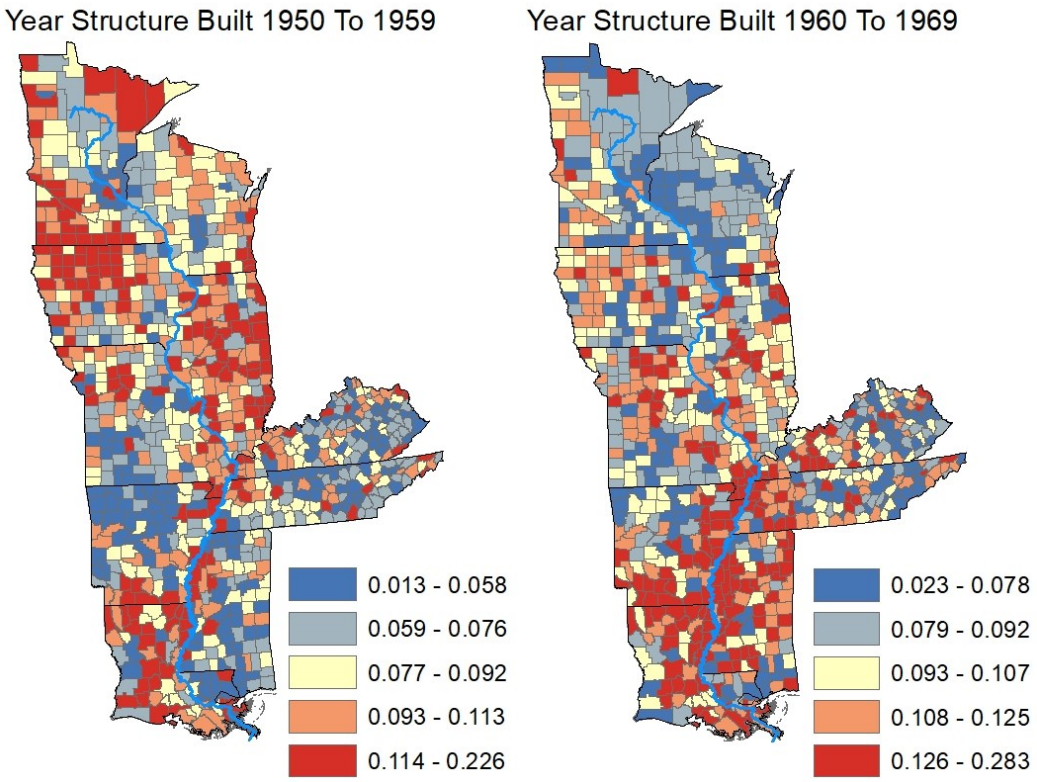

Figure 118: Quantile representations of year structure built from 1950 to 1969.

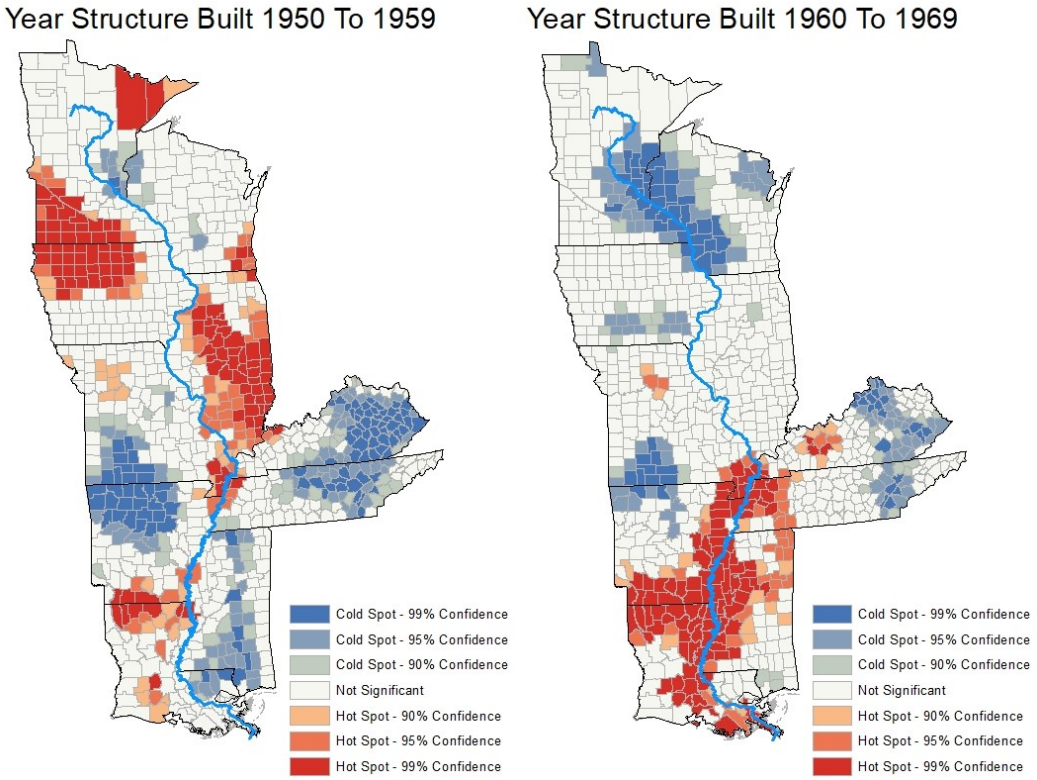

Figure 119: Getis-Ord GI representations of year structure built from 1950 to 1969.

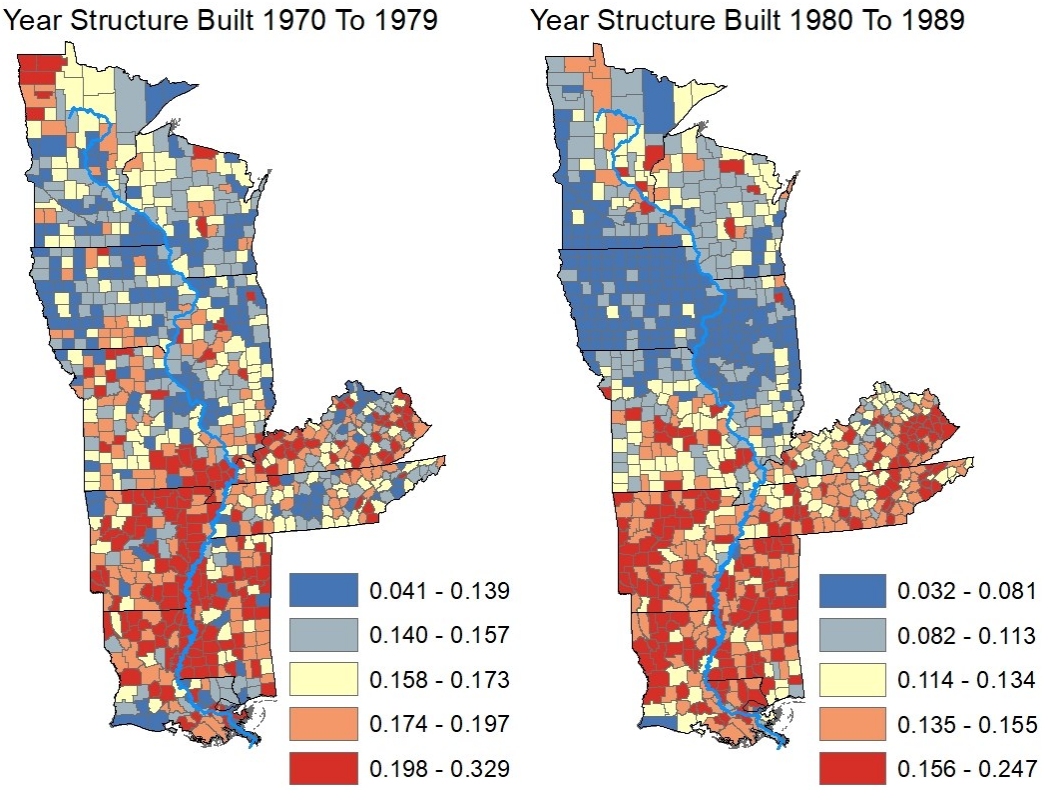

Figure 120: Quantile representations of year structure built from 1970 to 1989.

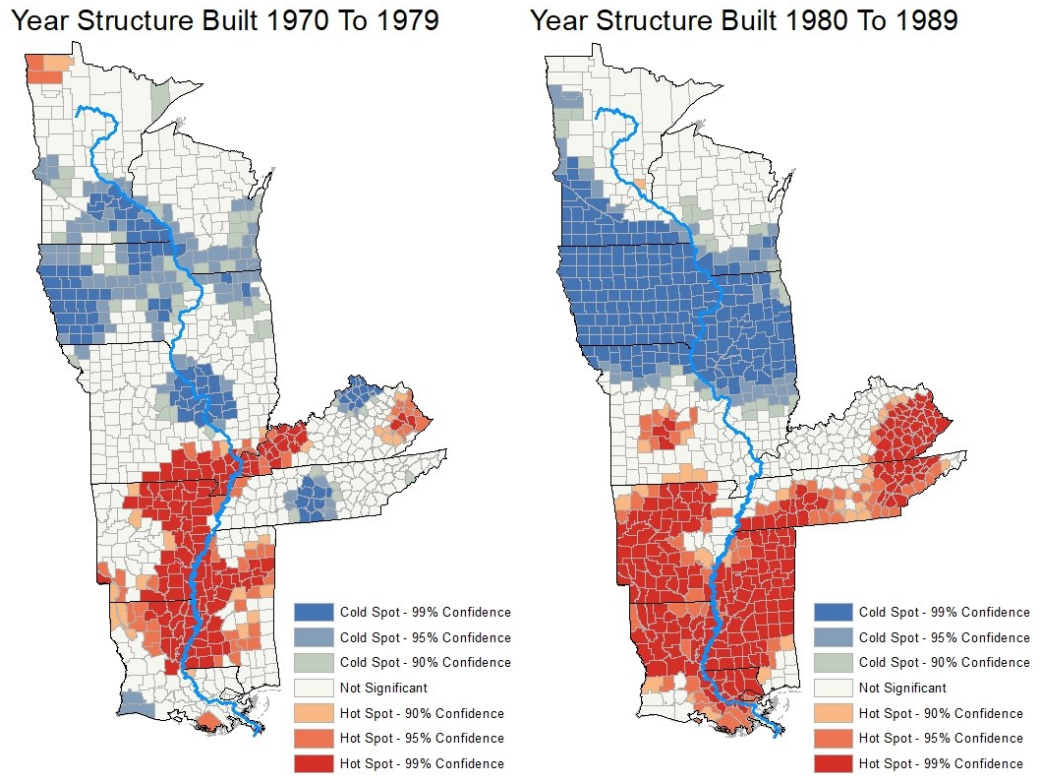

Figure 121: Getis-Ord GI representations of year structure built from 1970 to 1989.

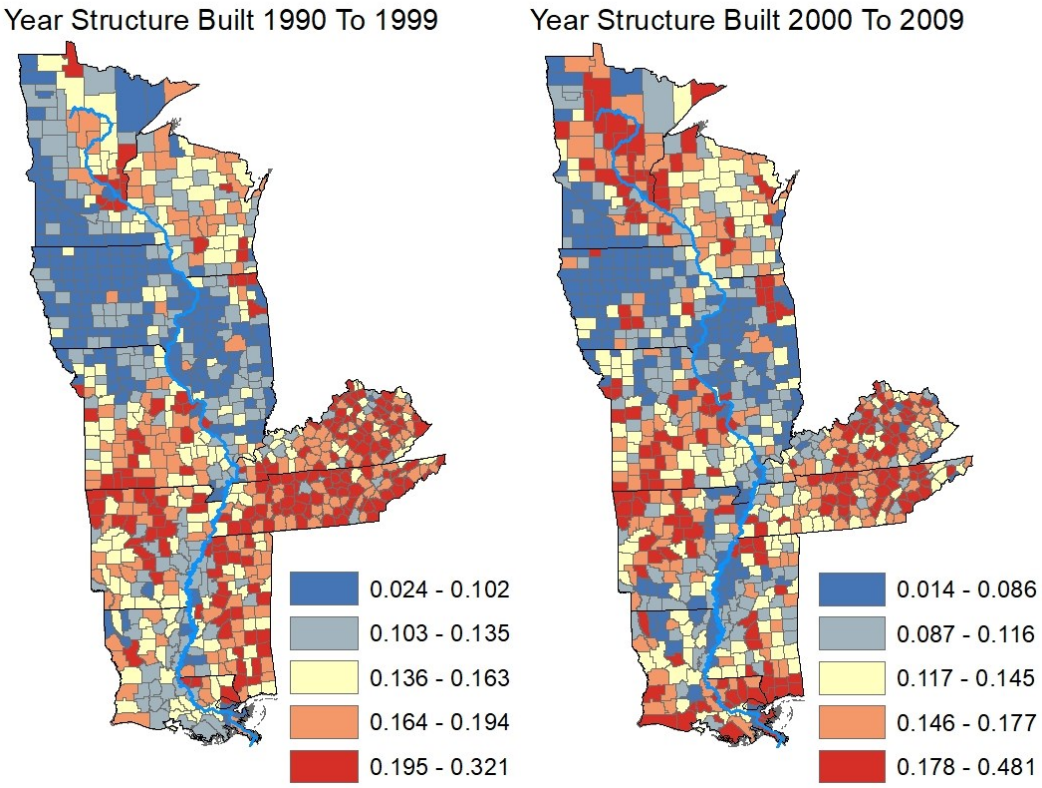

Figure 122: Quantile representations of year structure built from 1990 to 2009.

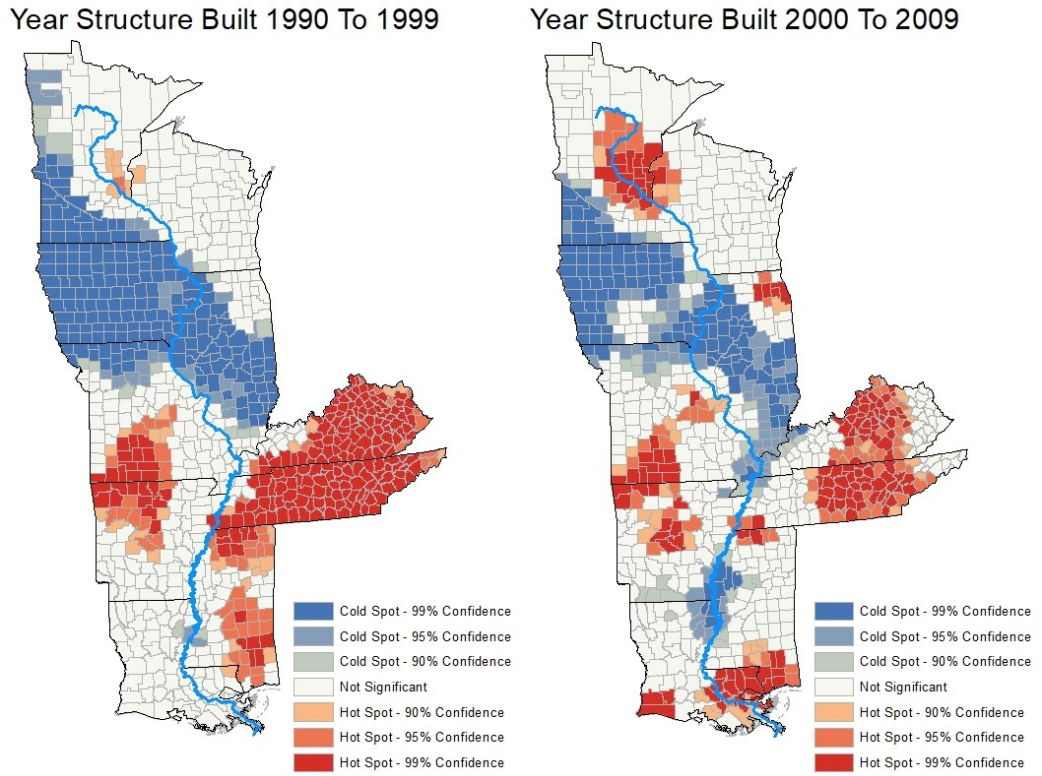

Figure 123: Getis-Ord GI representations of year structure built from 1990 to 2009.

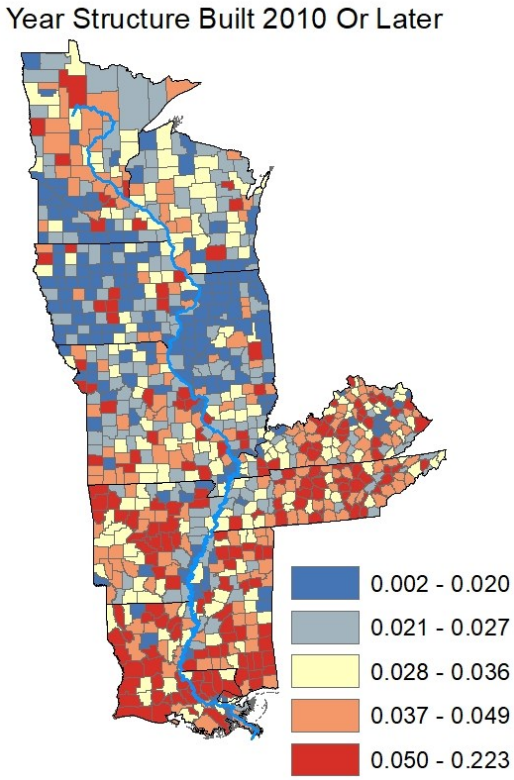

Figure 124: Quantile representations of year structure built from 2010 to present.

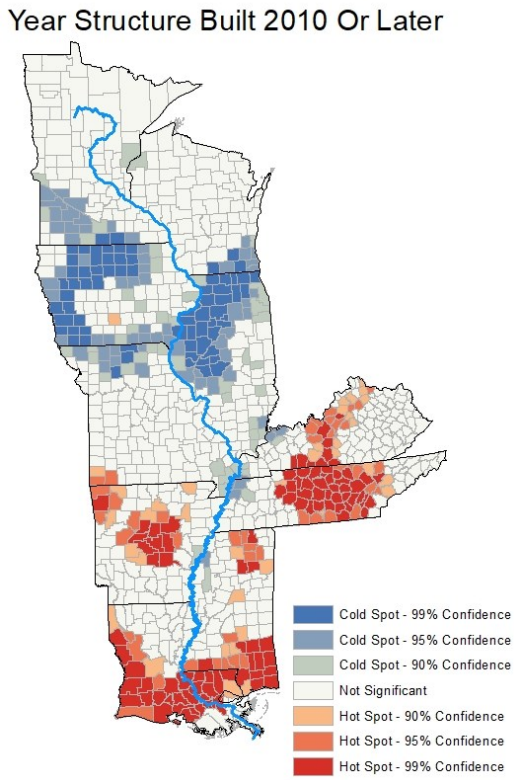

Figure 125: Getis-Ord GI representations of year structure built from 2010 to present.

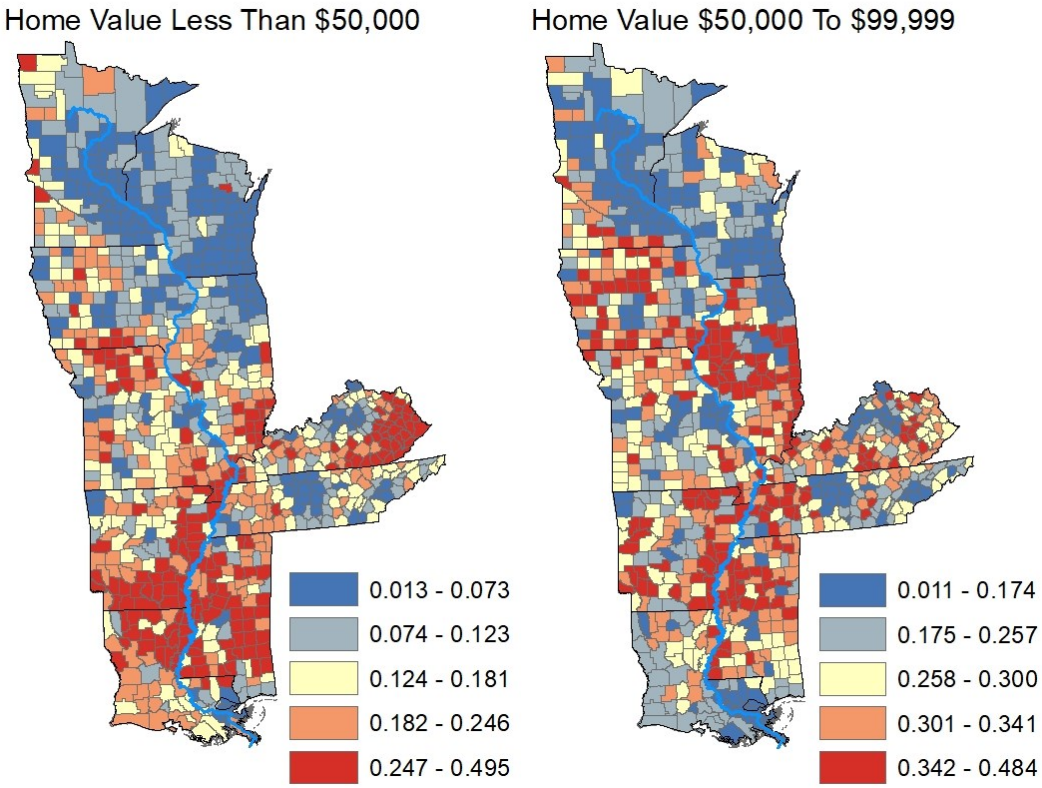

Figure 126: Quantile representations of home value including less than $50,000.

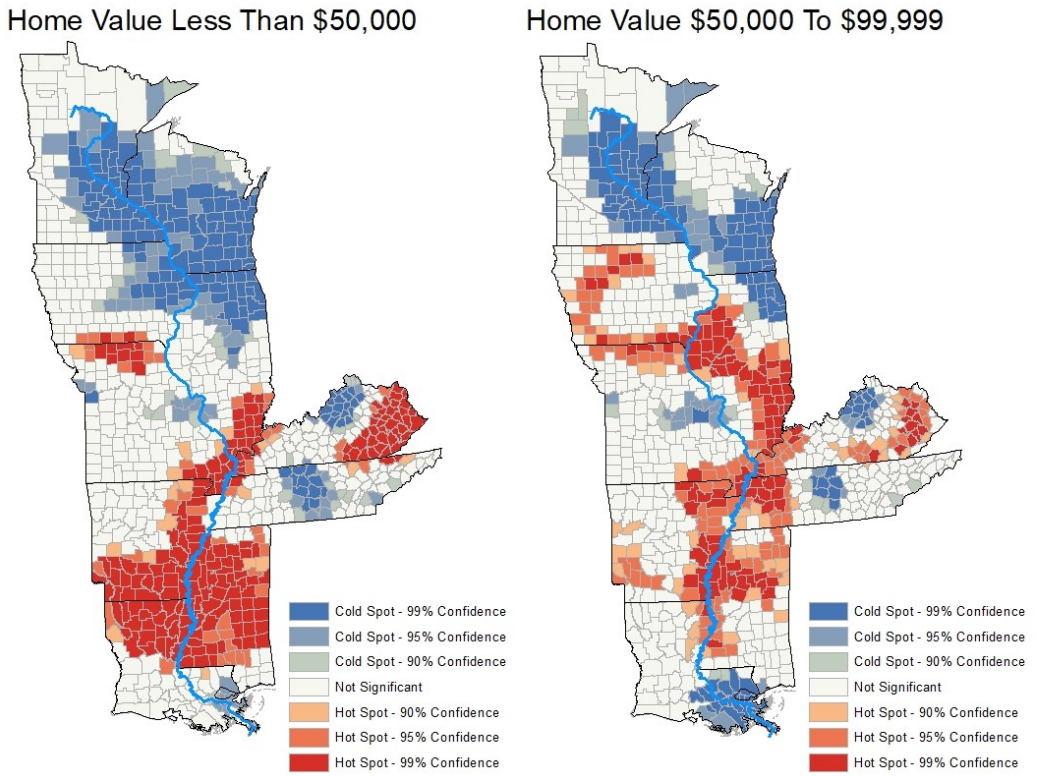

Figure 127: Getis-Ord GI representations of home value including less than $50,000.

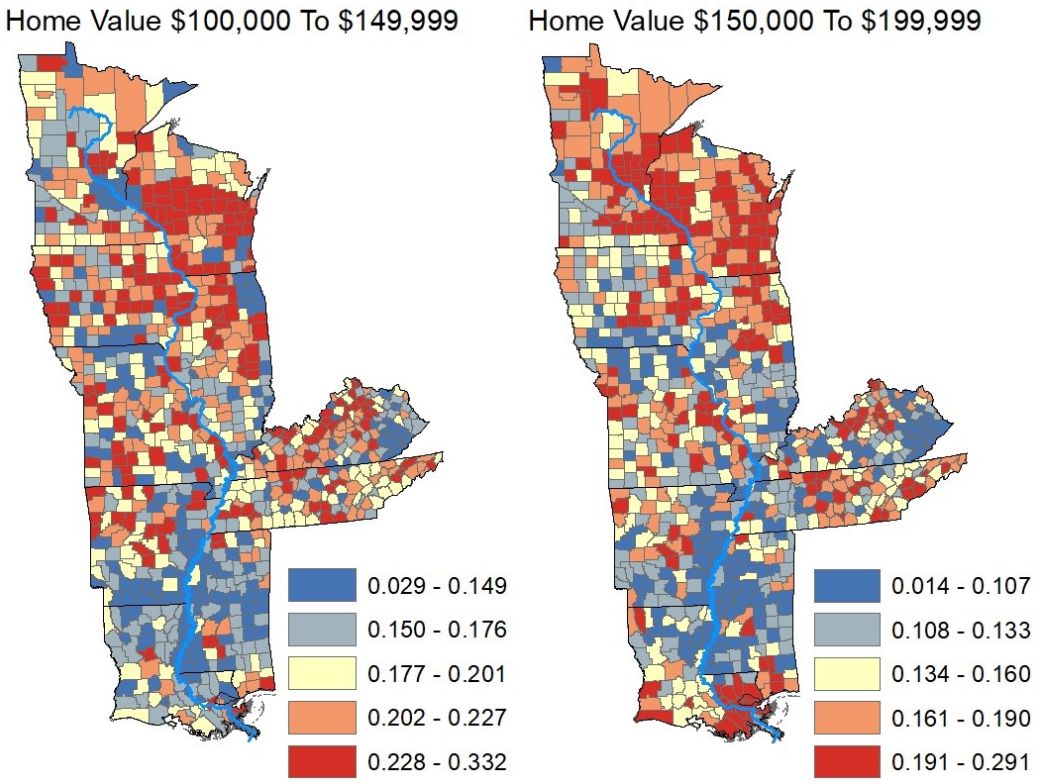

Figure 128: Quantile representations of home value including $100,000 to $149,999.

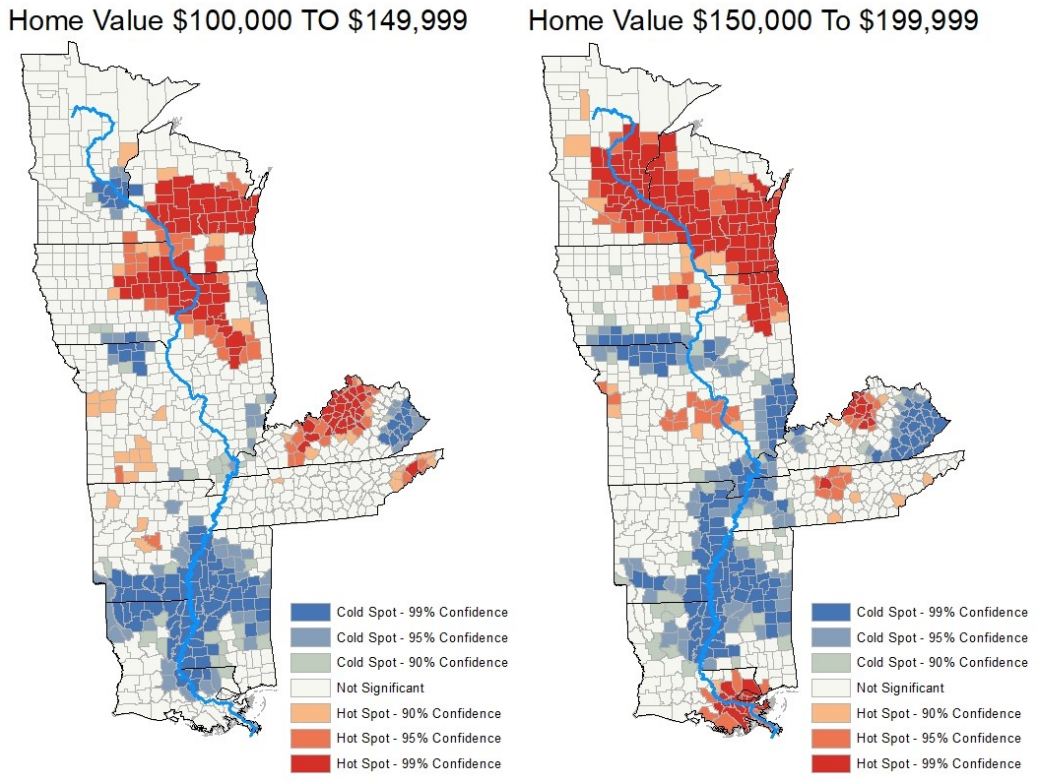

Figure 129: Getis-Ord GI representations of home value including $100,000 to $149,999.

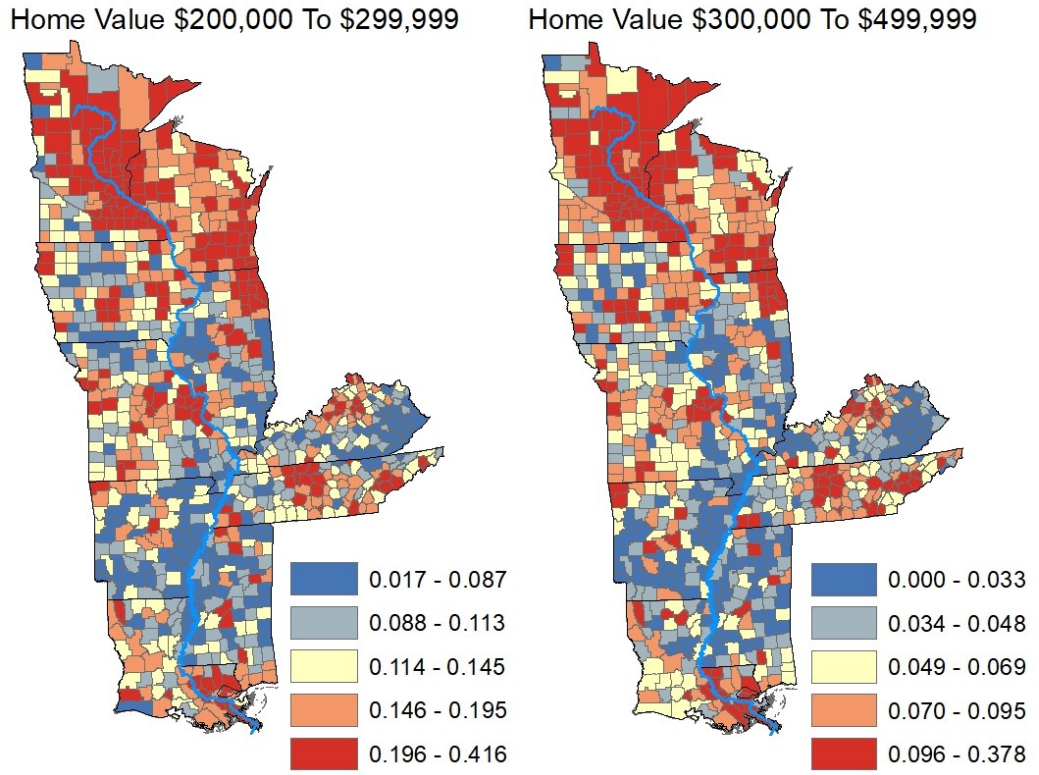

Figure 130: Quantile representations of home value including $200,000 to $299,999.

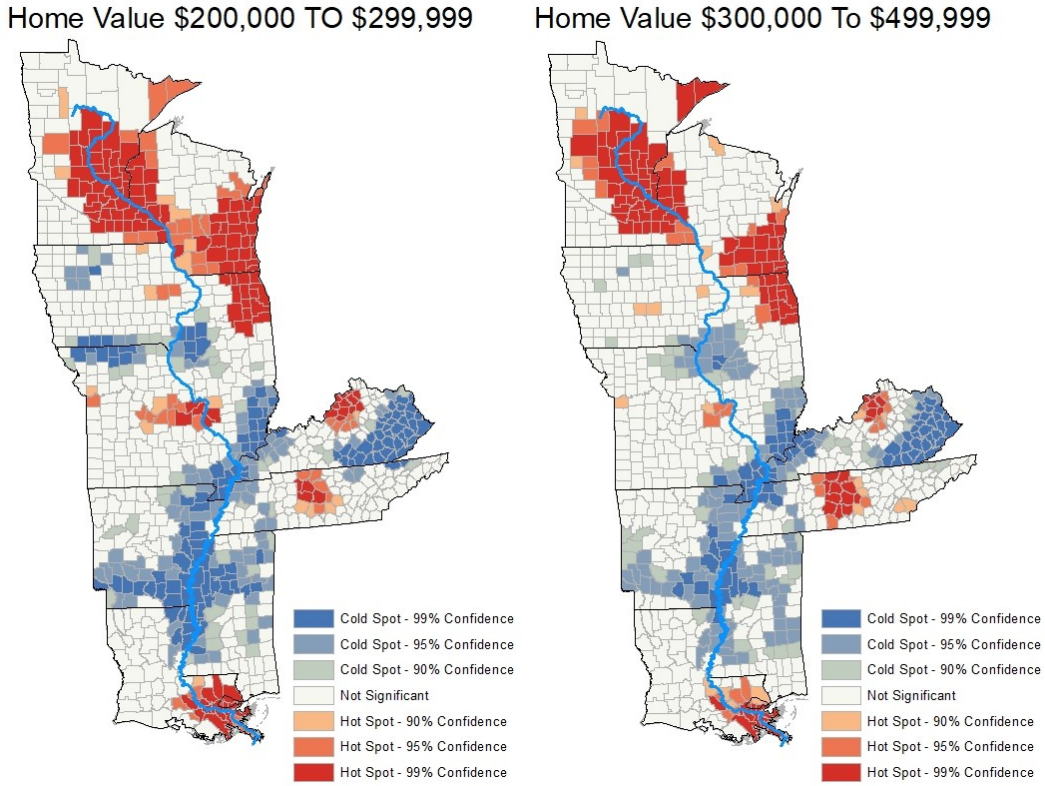

Figure 131: Getis-Ord GI representations of home value including $200,000 to $299,999.

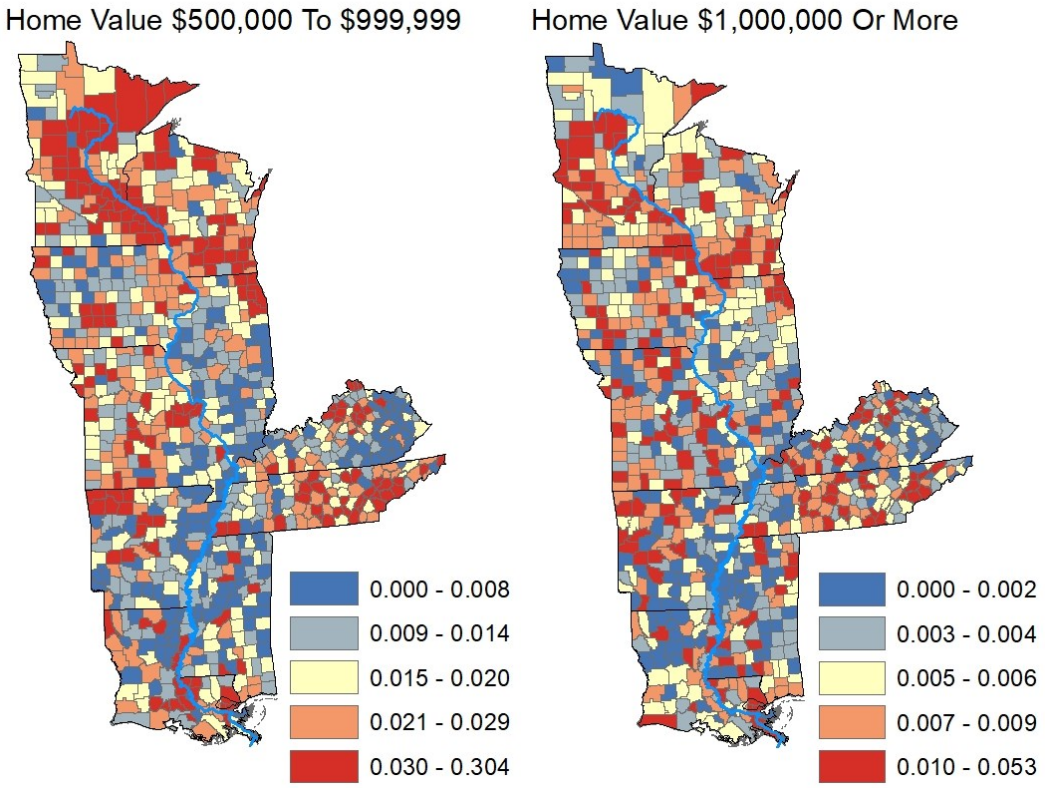

Figure 132: Quantile representations of home value including $500,000 to $999,999.

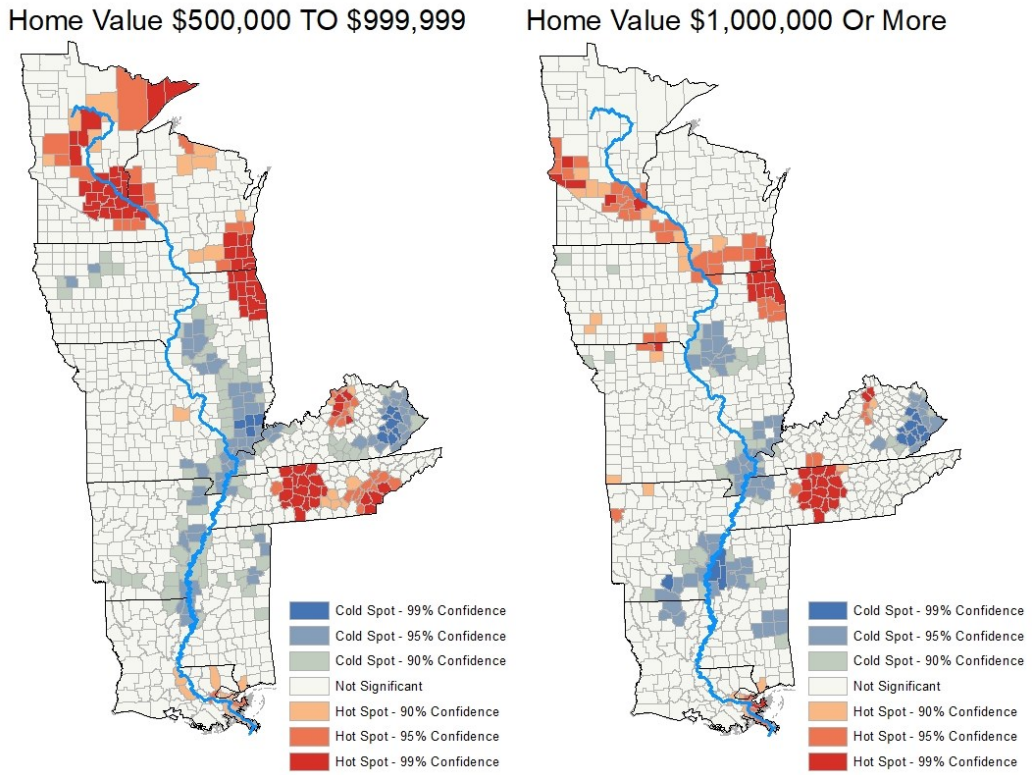

Figure 133: Getis-Ord GI representations of home value including $500,000 to $999,999.

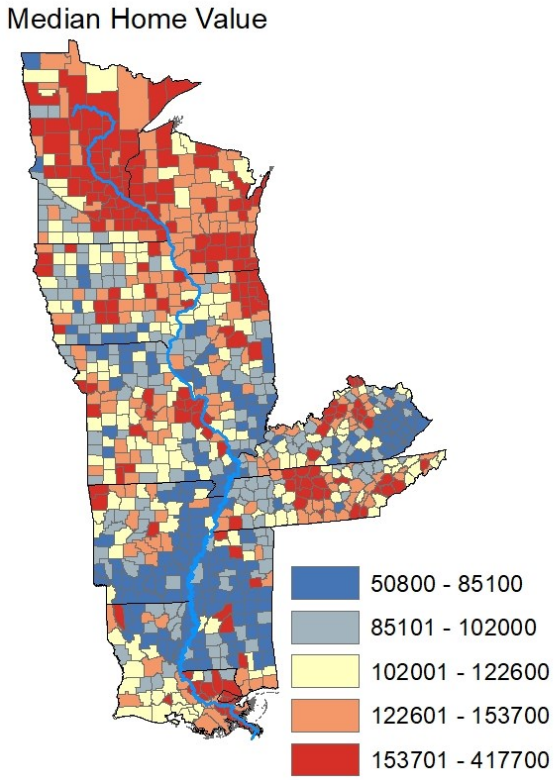

Figure 134: Quantile representations of home value including median home value.

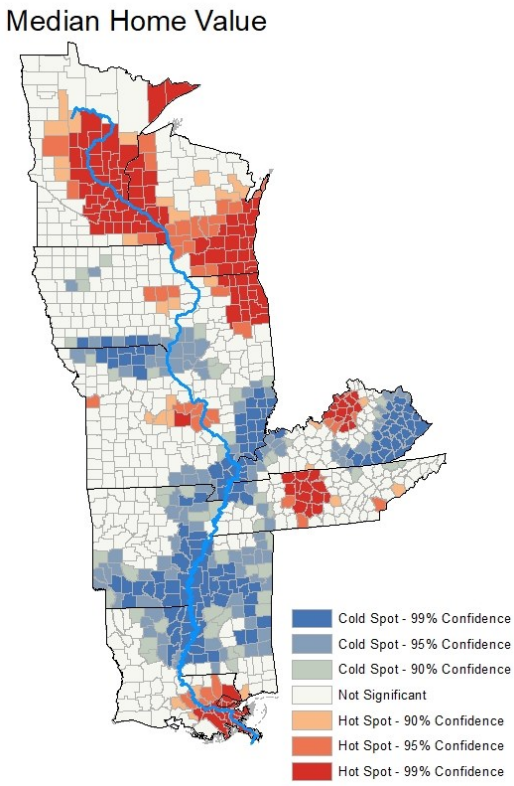

Figure 135: Getis-Ord GI representations of home value including median home value.

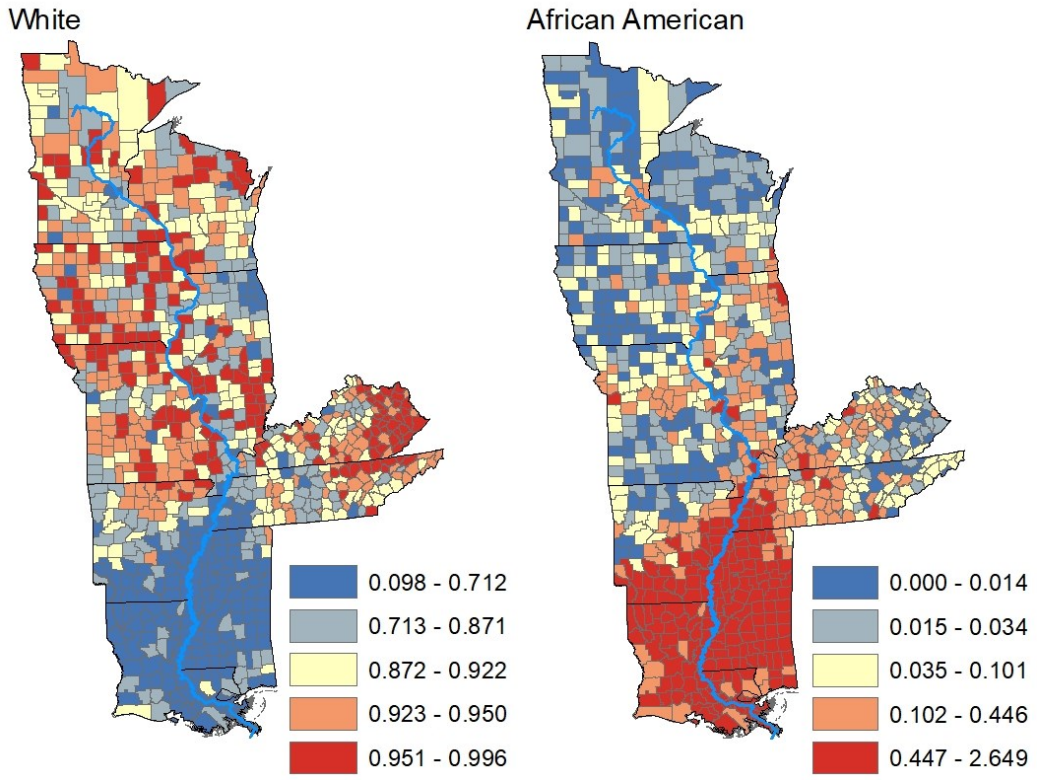

Figure 136: Quantile representations of race including White.

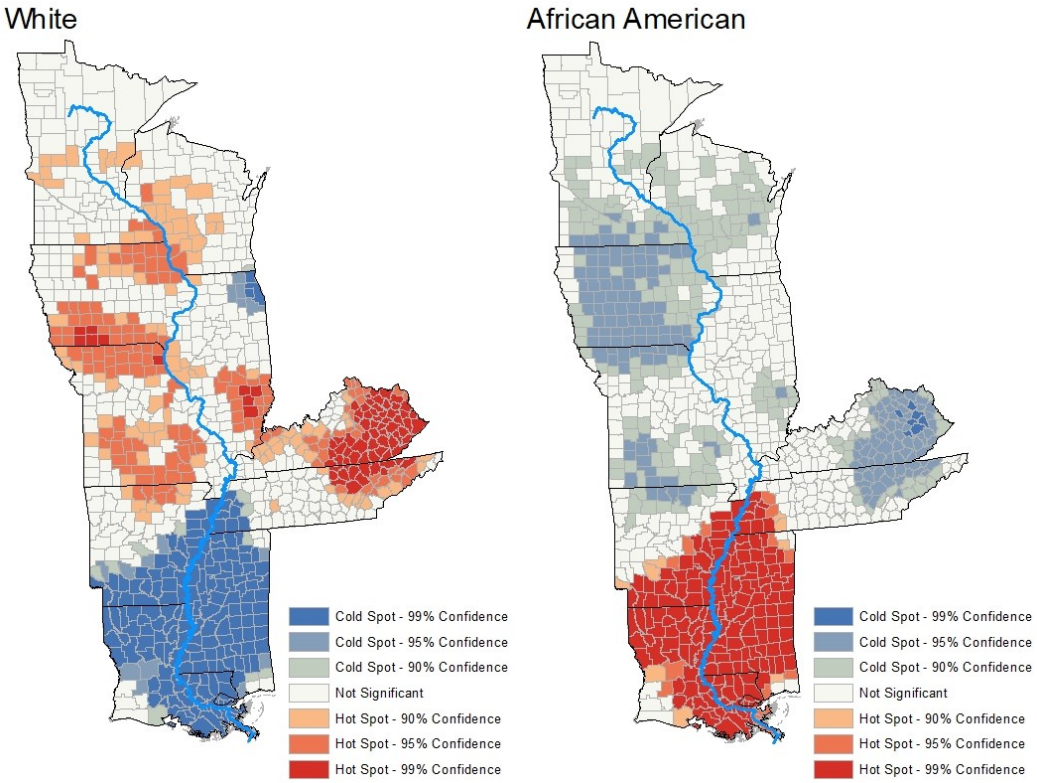

Figure 137: Getis-Ord GI representations of race including White.

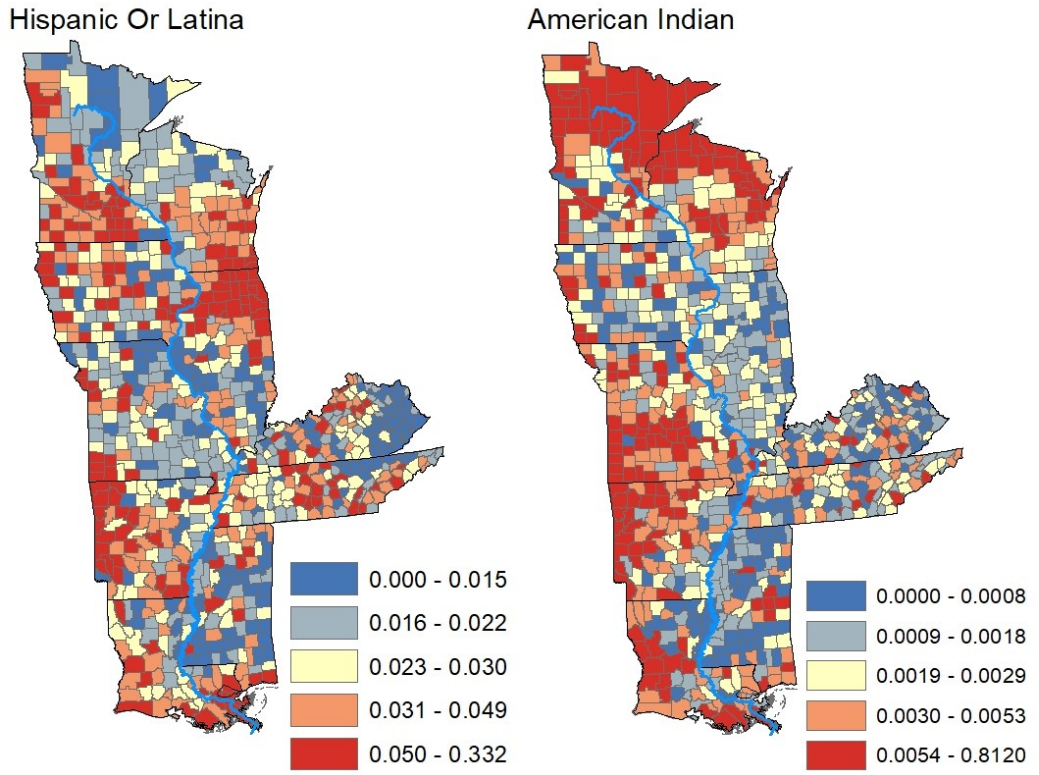

Figure 138: Quantile representations of race including Hispanic or Latina.

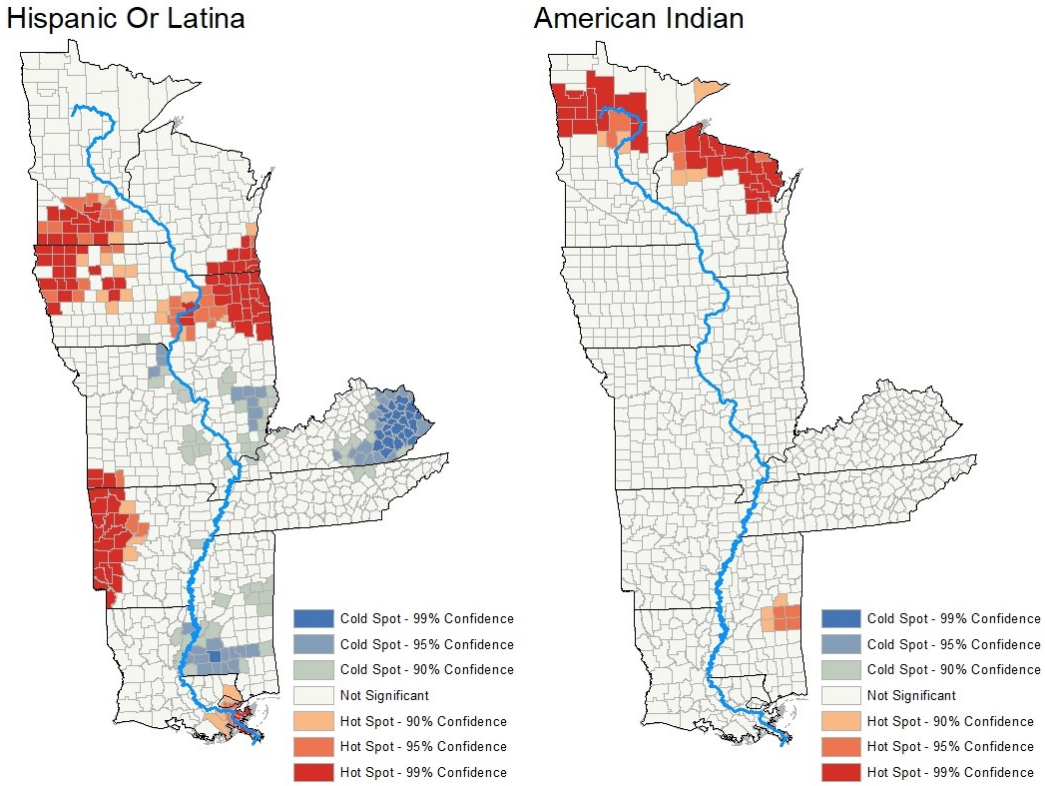

Figure 139: Getis-Ord GI representations of race including Hispanic or Latina.

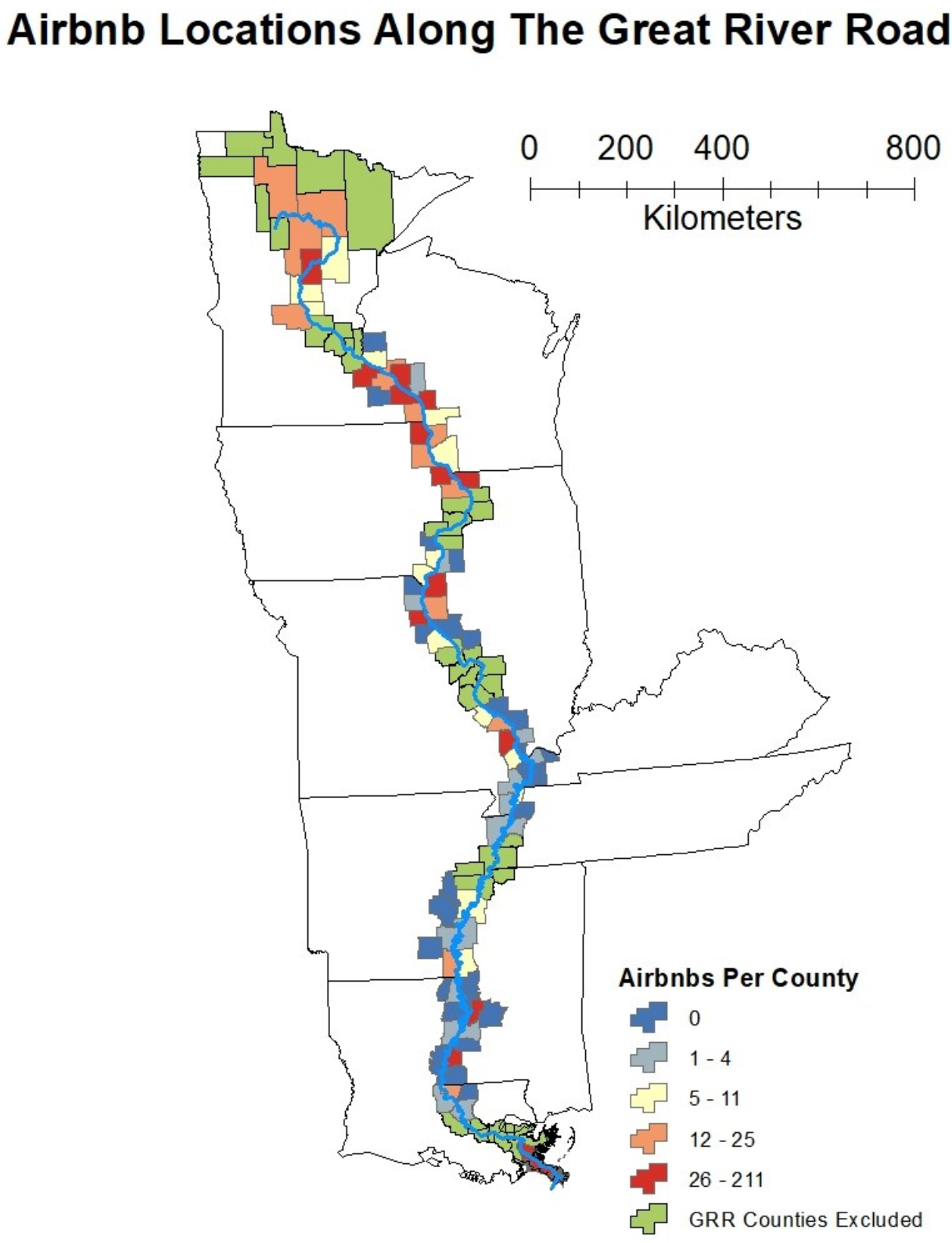

Figure 140: The number of Airbnbs in each county assessed in this study.

Conclusion

This study analyzed eleven variables based on social, economic, housing, and demographic characteristics along the entire extent of the Mississippi River. These variables were chosen based on the previous work of Telle (2021). The study yielded valuable information on a GRR region and raised questions concerning larger multi-state regional patterns. Using state boundaries to set a political extent for the study, nine-hundred and eleven counties were analyzed. With the GRR region being initially set at one-hundred and thirty-five counties, this study worked to create a more accurate border based on census five-year estimate data from 2014-2018 and Airbnb location data. The results of this analysis are somewhat mixed.

The defining of a GRR region was inconclusive based on the data analyzed, with some variables showing regional patterns. However, a majority of the variables failed to identify socio-economic boundaries, and the differences between the northern and southern portions of the Mississippi River proved to be more significant. The question of where the divide between the upper and lower Mississippi River is located, either near St. Louis, Missouri or Cairo, Illinois, showed mixed results. Variables including "9^{th} to 12^{th} grade no diploma", "high school diploma", "unemployment", "African American", household income, and variables pertaining to the year structures were built show Cairo, Illinois, located at the joining point of the Ohio River, as a more suitable dividing line between the northern and southern Mississippi River regions. Variables centered around St. Louis, Missouri generally served as urban and rural distinctions rather than larger regional variations. Such variables, including "bachelors degree or higher", "civilians in labor force", "median home values", "median household income", "households with a computer", "with broadband internet", and occupation and industry sector jobs, are impacted by the urban population of St. Louis. Similar variable values can also be seen in and around the

Memphis metropolitan area; however, southern GRR patterns persist north of these urban counties. The exact social and economic boundary between north and south is still somewhat in dispute based on the data analyzed. That said, Cairo, Illinois fits as a more accurate socio-economic divide between the North and South GRR, as the area is generally rural compared to St. Louis, Missouri and therefore follows regional patterns in the study area. St. Louis is often associated with the primary characteristics of urban areas, regardless of geographic location along the Mississippi River. Cairo, Illinois, on the other hand, is associated with regional household income, home value, educational attainment, occupation, and industry sector norms present in the study area. Because of this, Cairo, Illinois, is a more accurate divide between the North and South GRR when compared to St. Louis, Missouri.

This urban and rural county distinction was particularly observable when noting the general increase in household income and home values in urban areas compared to rural counties. This may be caused by the differences in the number of workers in each occupation and industry, which were often based on urban and rural county distinctions. Overall, urban counties along the GRR, regardless of geographic location along the Mississippi River, generally have similar social and economic characteristics based on the variables such as higher internet use and availability, higher household income, higher home values, higher level of educational attainment, occupational jobs, and industry jobs in the tec and information sectors. The rural areas along the GRR, however, vary dramatically depending on their geographic location along the Mississippi River.

The defining of a GRR region was inconclusive, but the unique social, and economic characteristics in the North vs. South and urban vs. rural areas along the Mississippi are quite prevalent. Further analysis over census data and other source material will be needed to define

the presence and extent of a Great River Road region with greater certainty. Such research can cast further light on the impacts the GRR has in local and regional economies. The GRR is a byway that links north to south and urban to rural places. Such an asset is not only worth understanding, but may prove beneficial not only for the Mississippi River region, but for regions across the United States and around the world. The research completed over the Mississippi River states can be refined and improved to guide future work over the river system and other regional reviews. For this reason, the information collected, analyzed, and interpreted can help further interest in the GRR and regional reviews as a valid form of geographic economic study.

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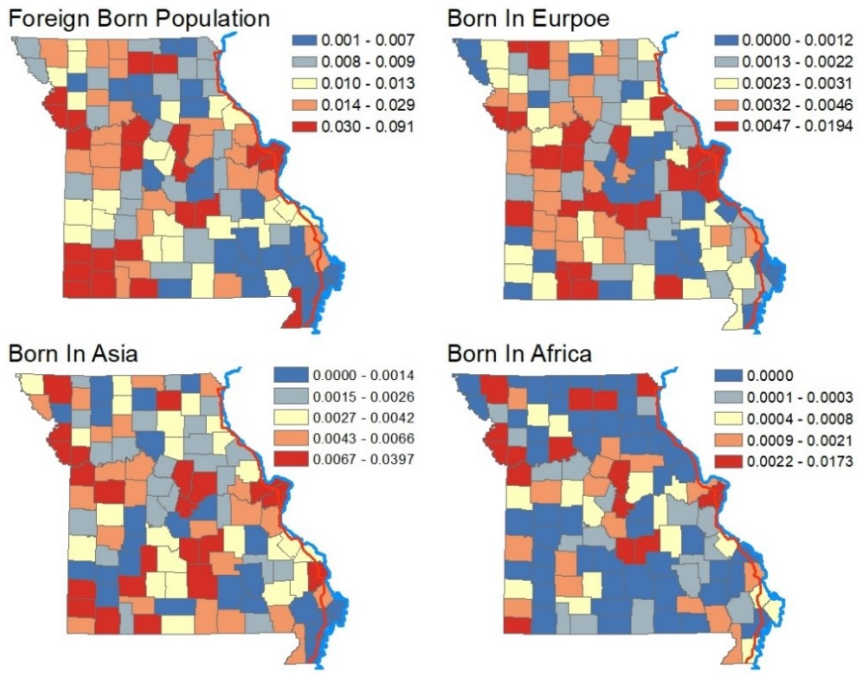
APPENDICES

Appendix A



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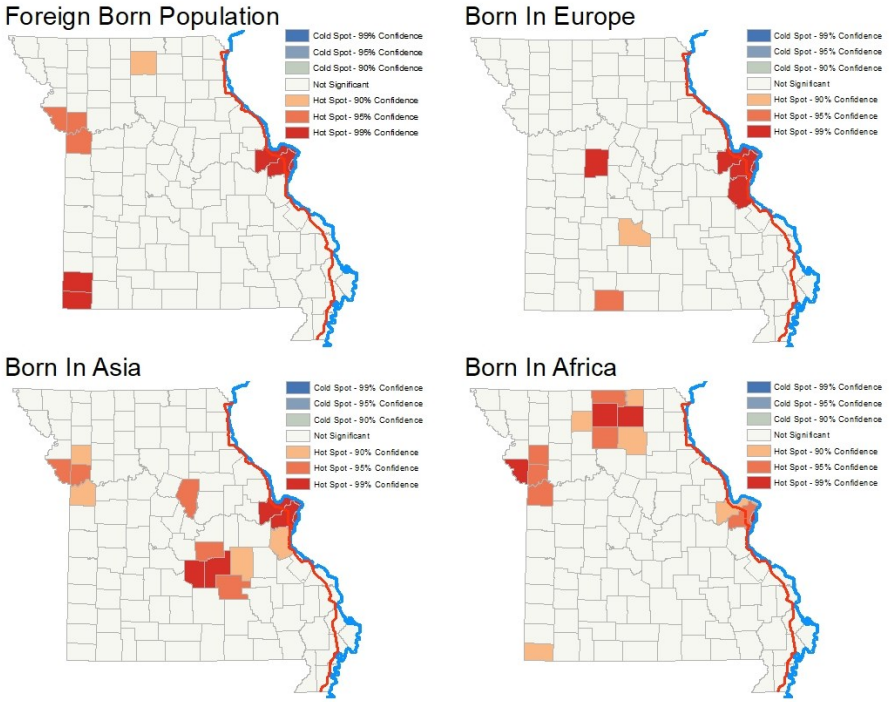

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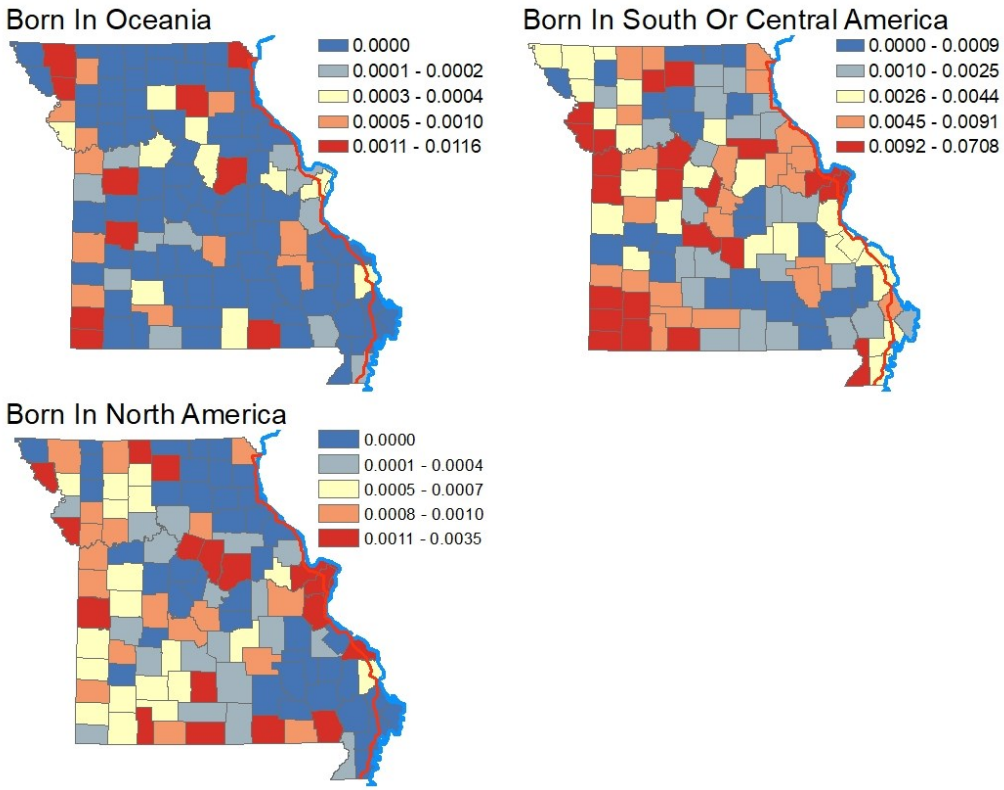

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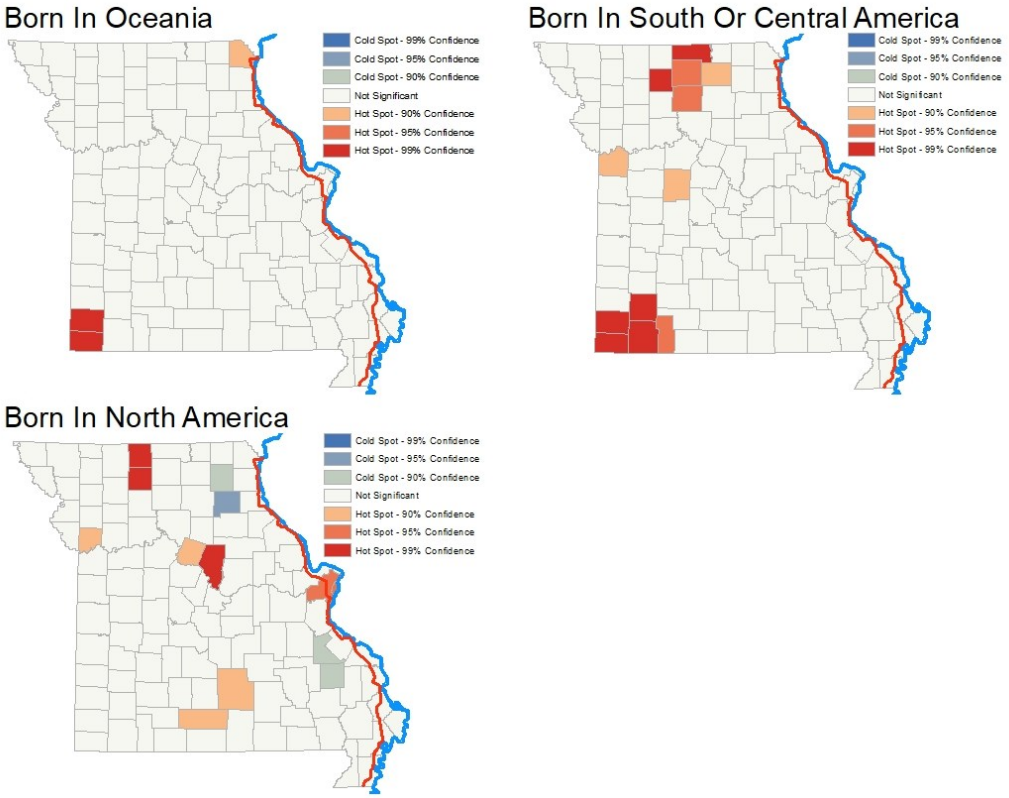

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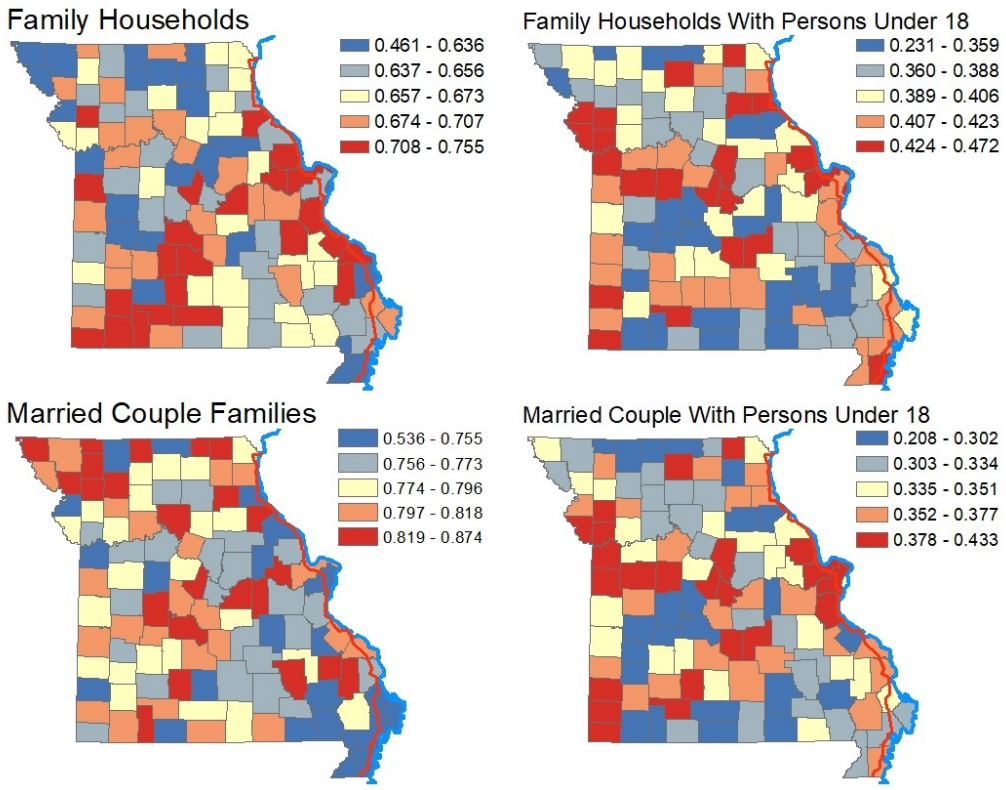

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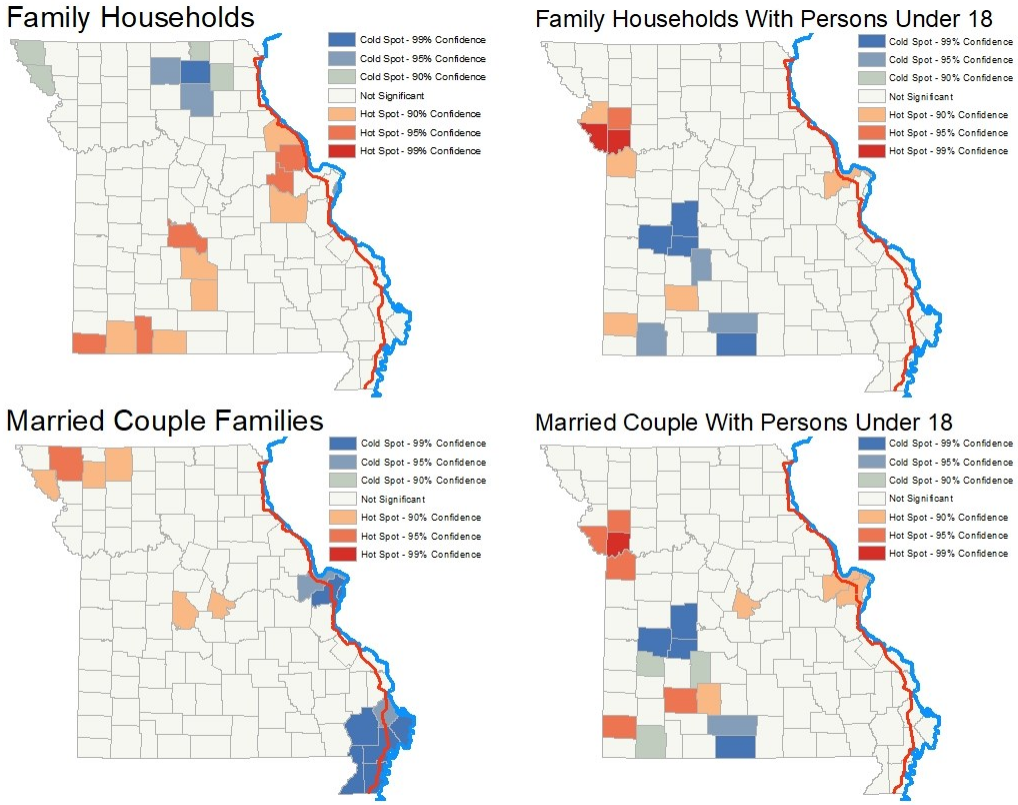

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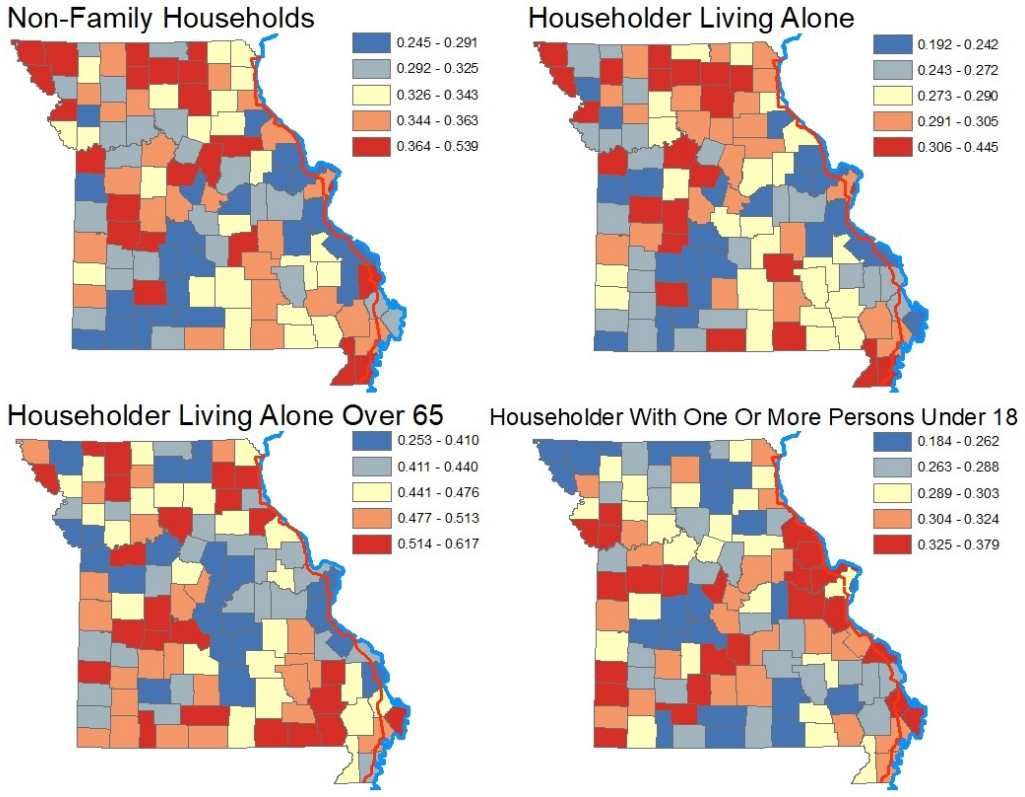

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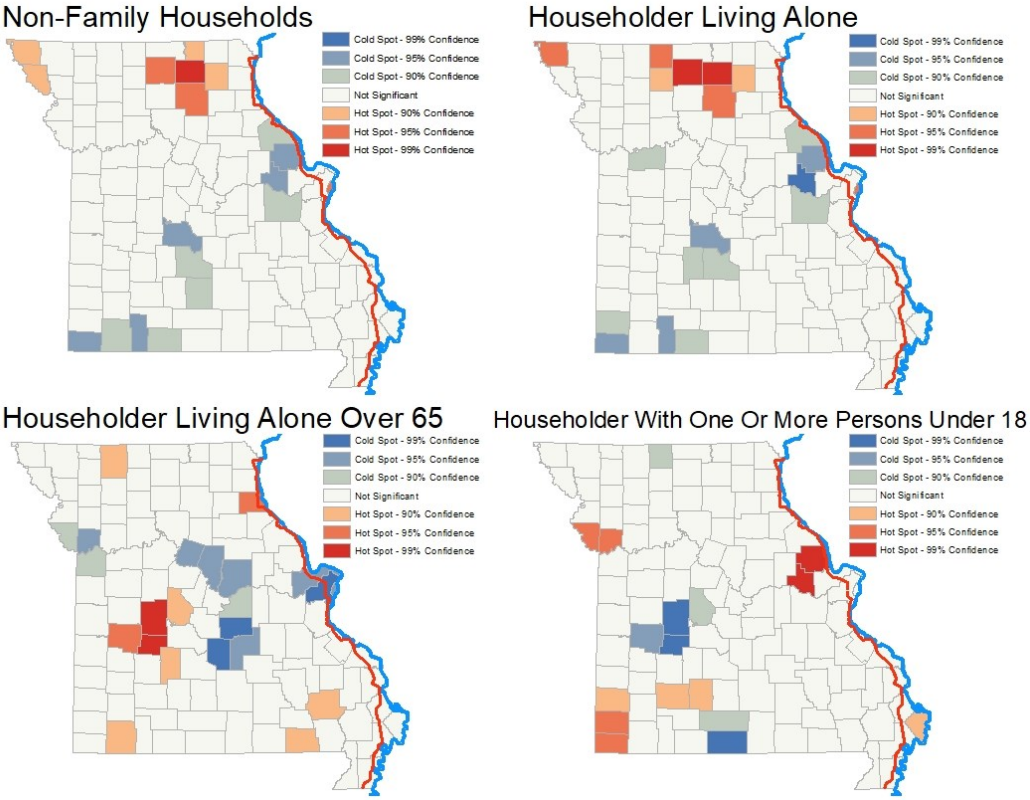

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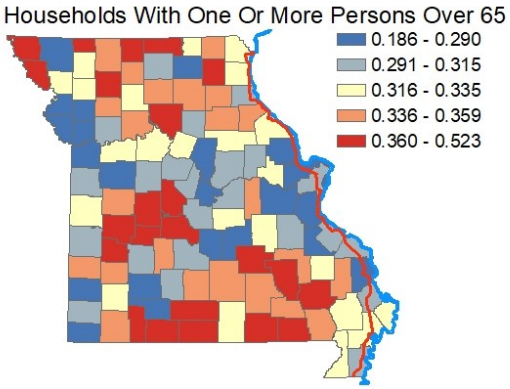

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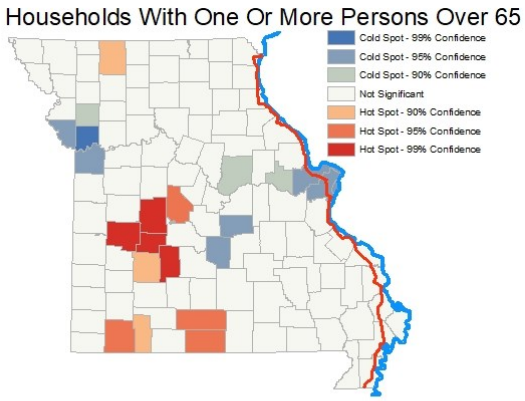

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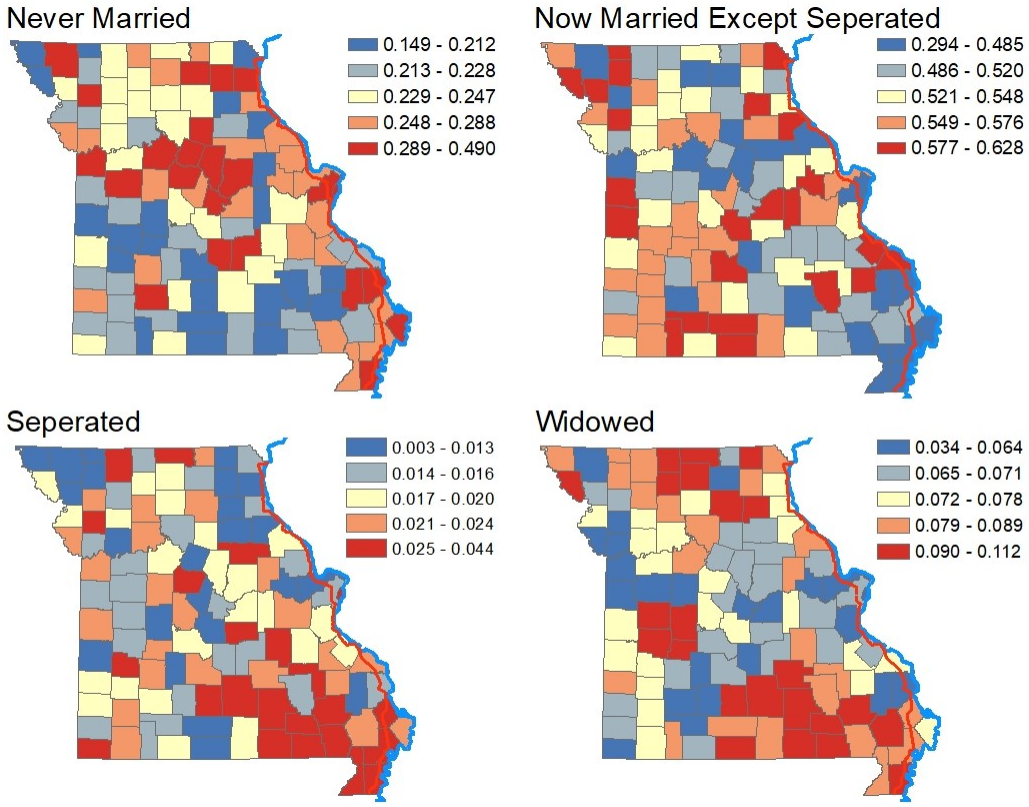

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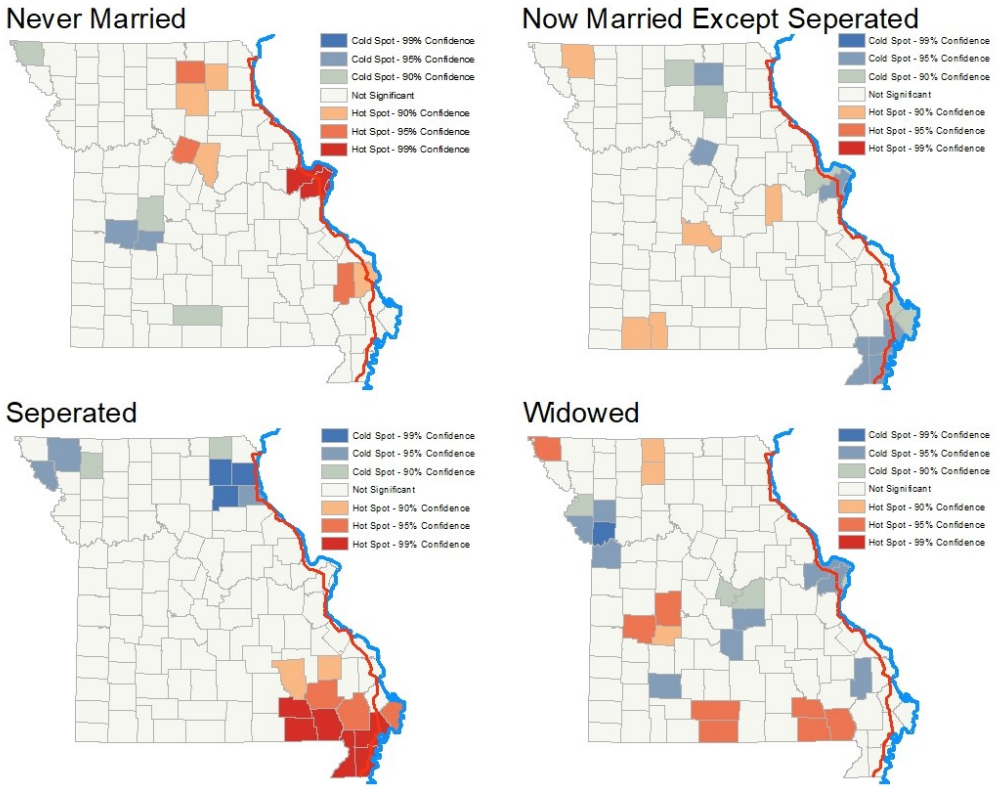

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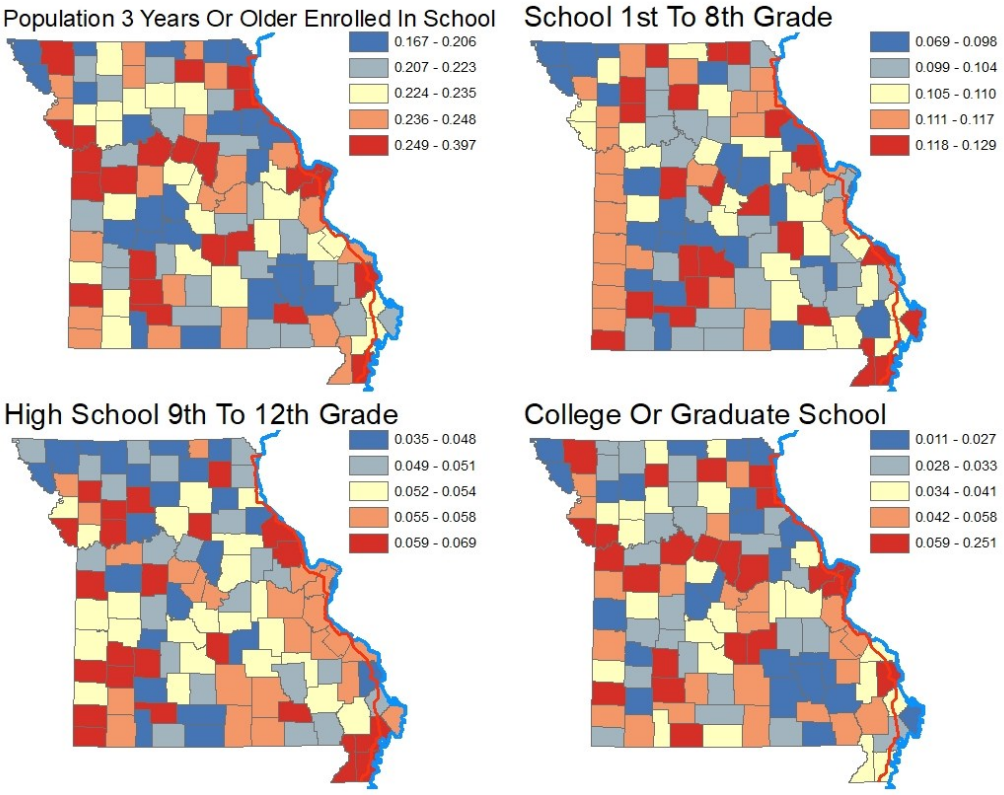

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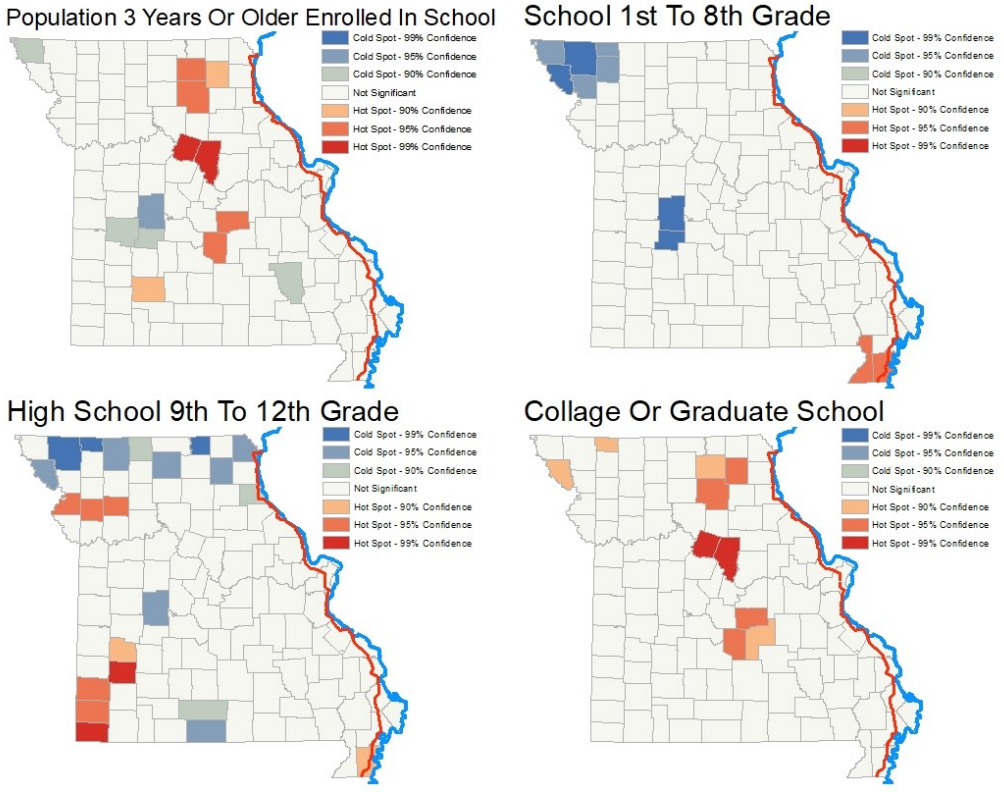

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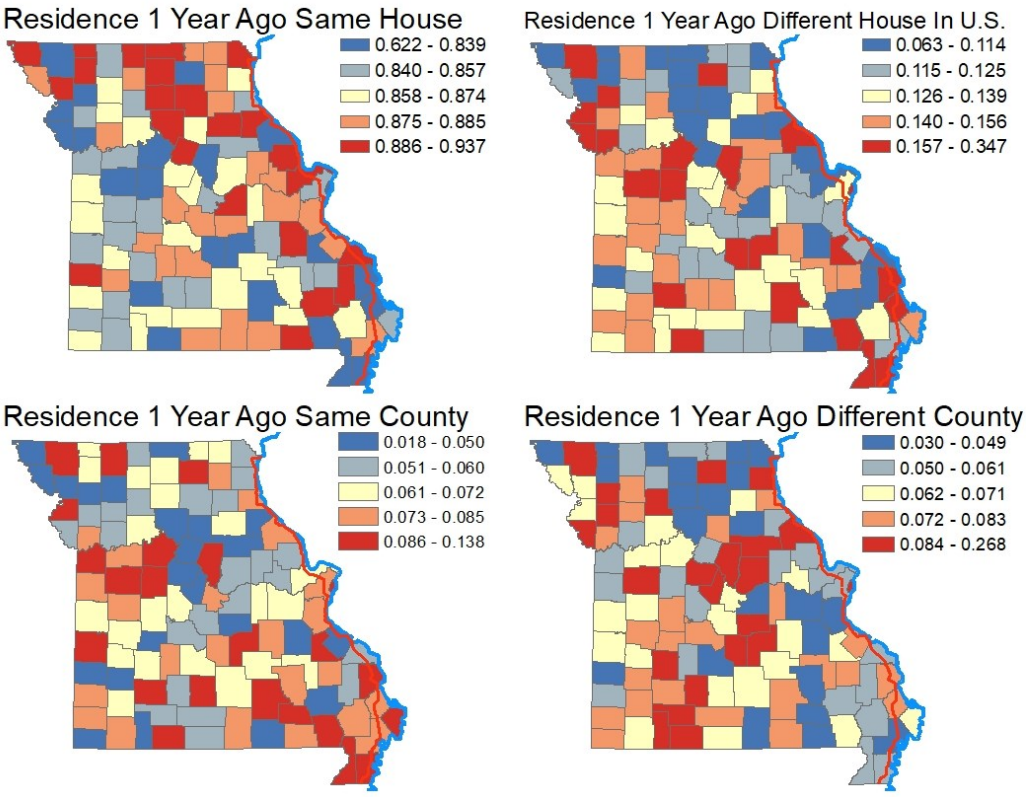

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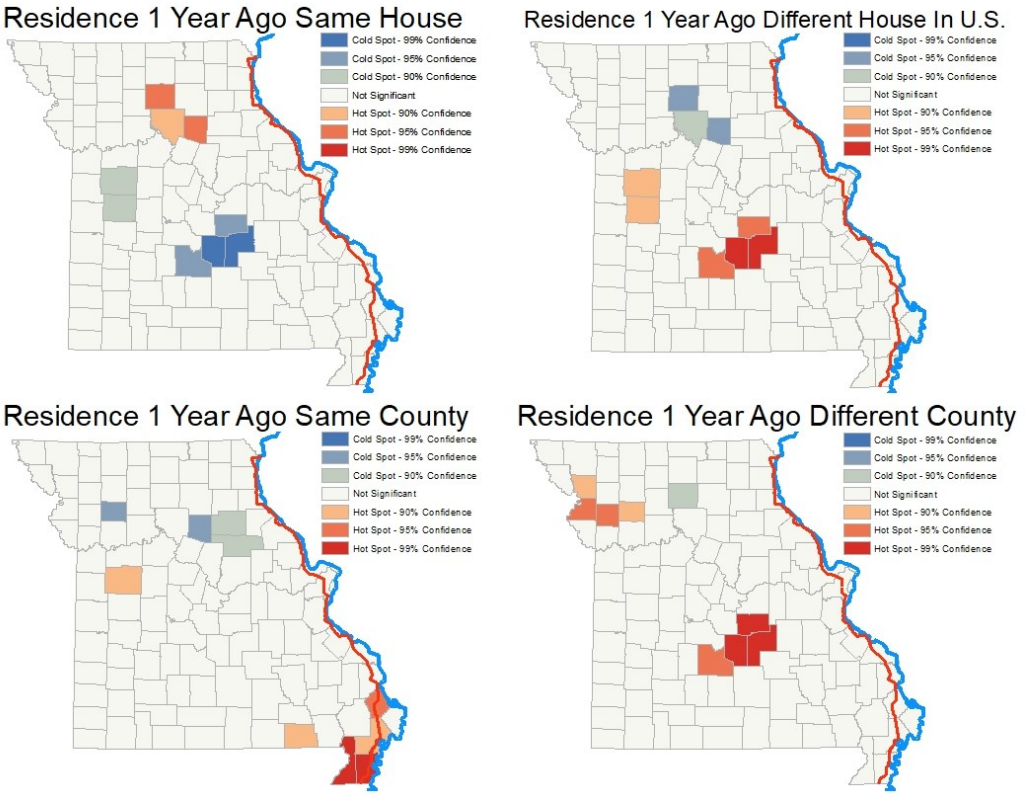

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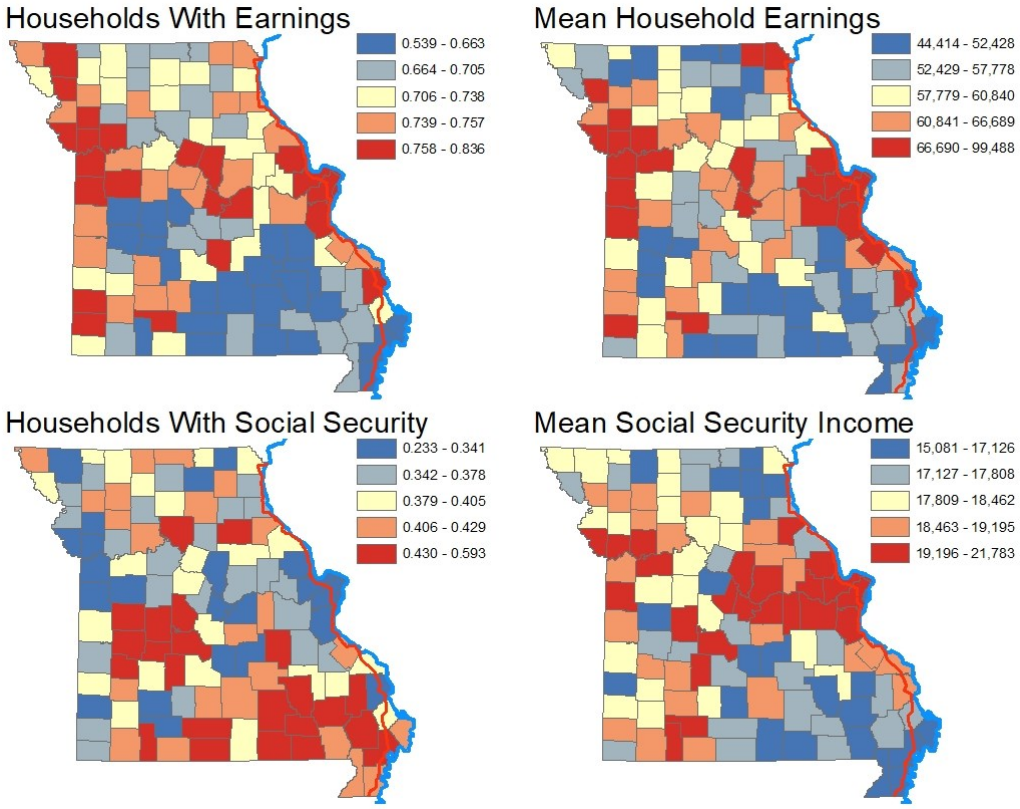

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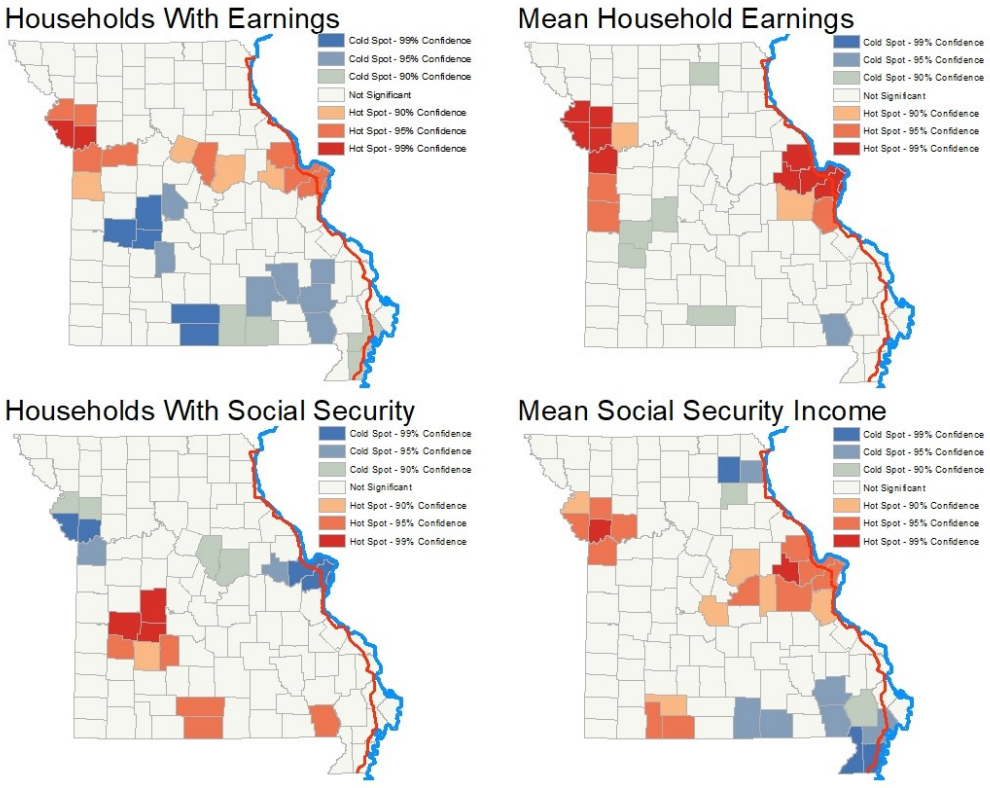

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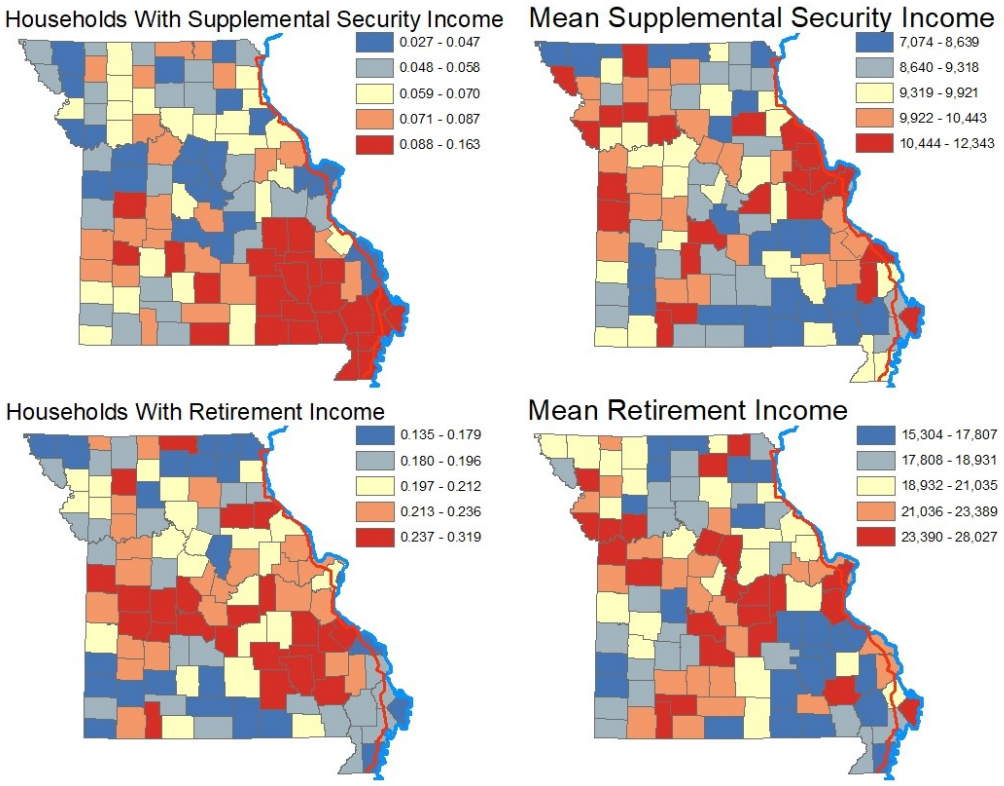

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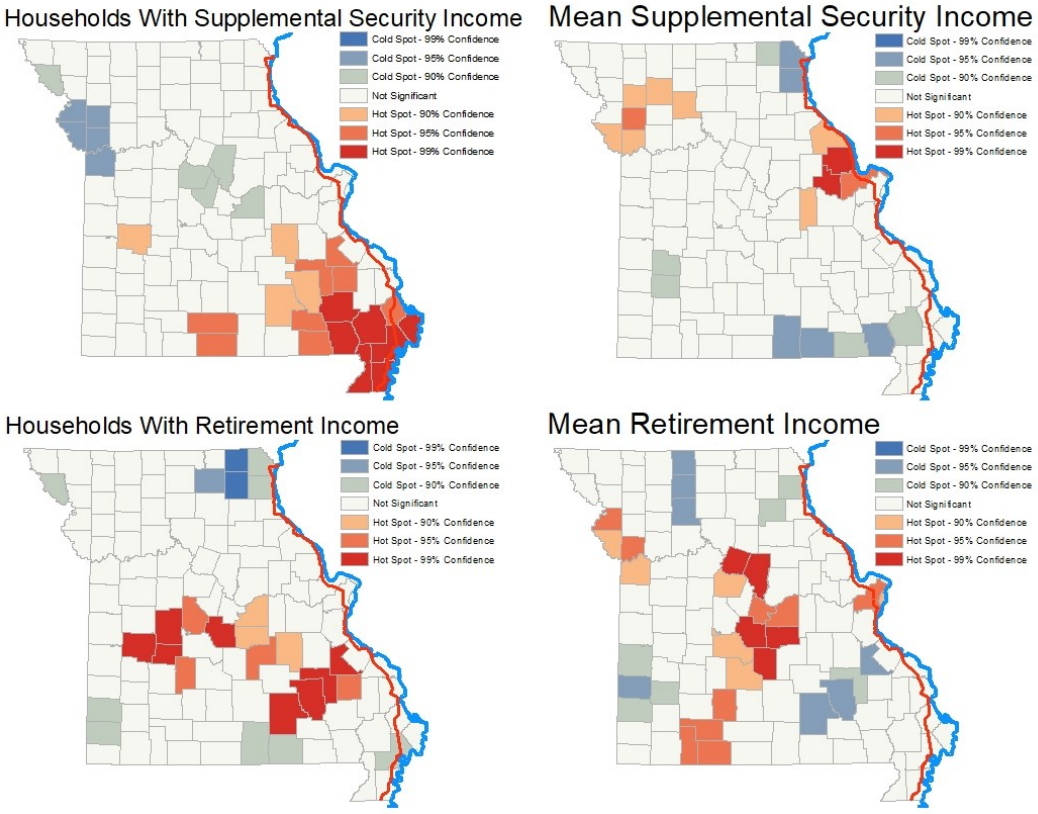

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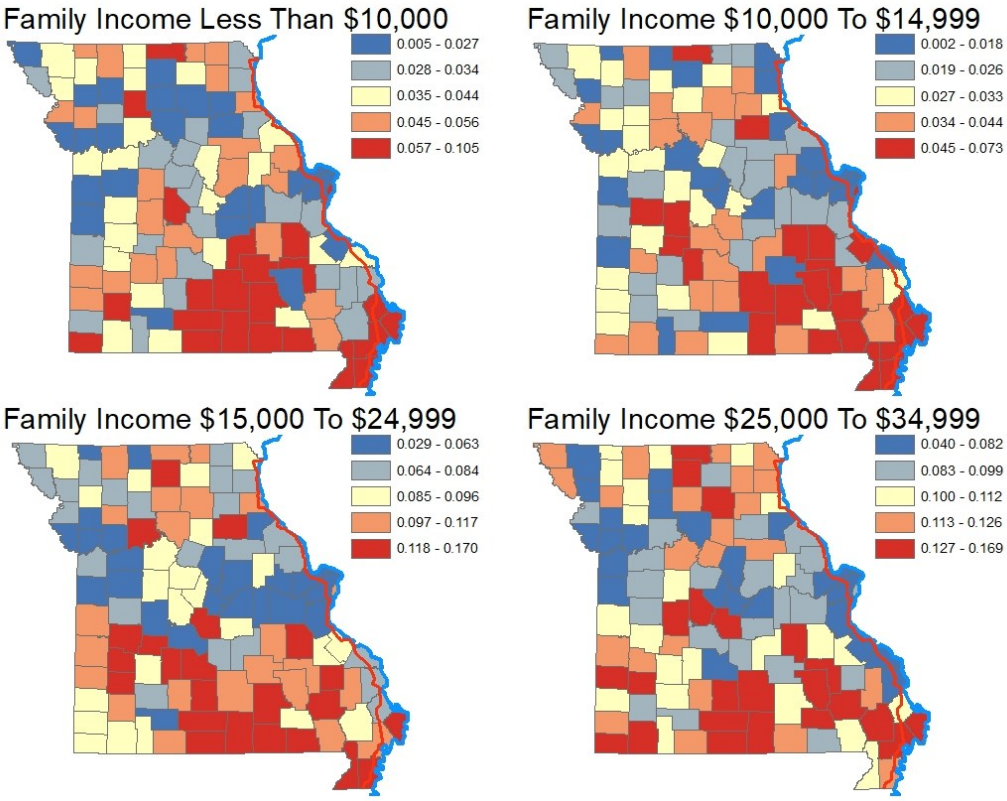

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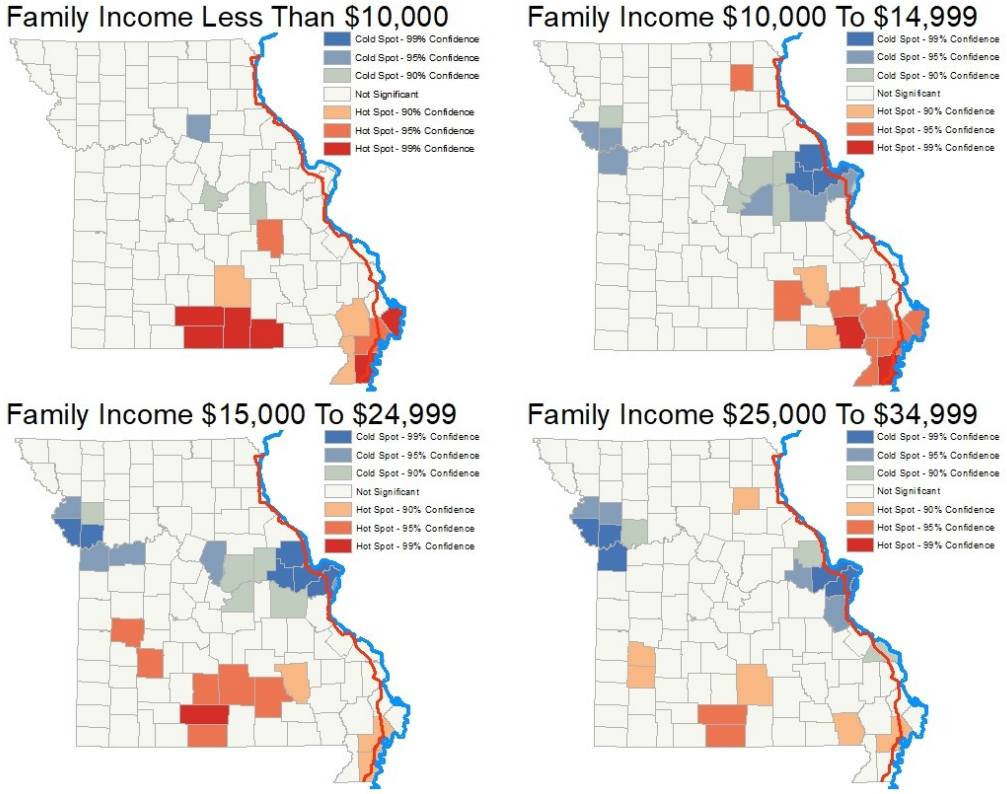

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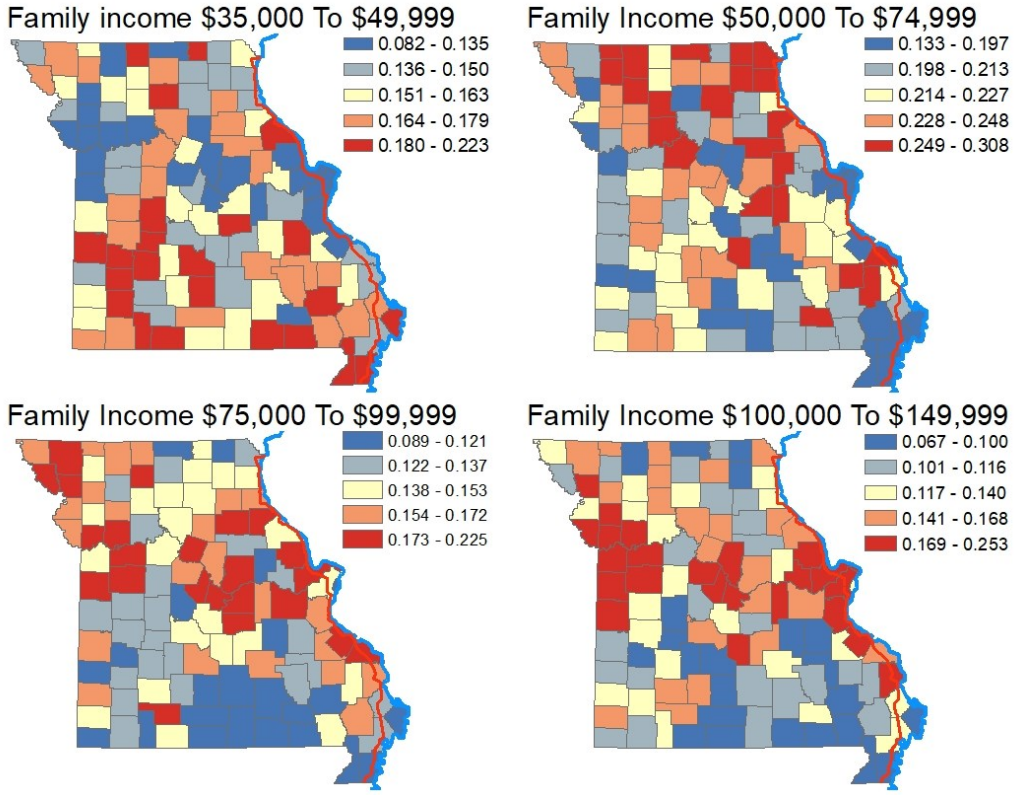

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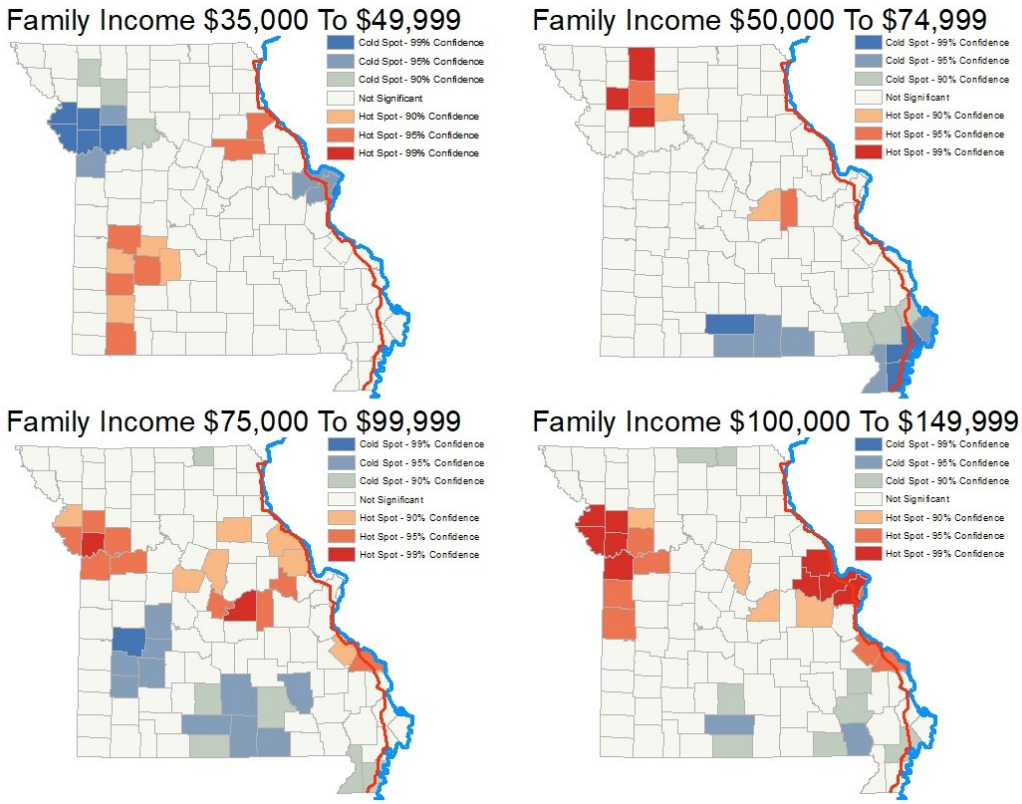

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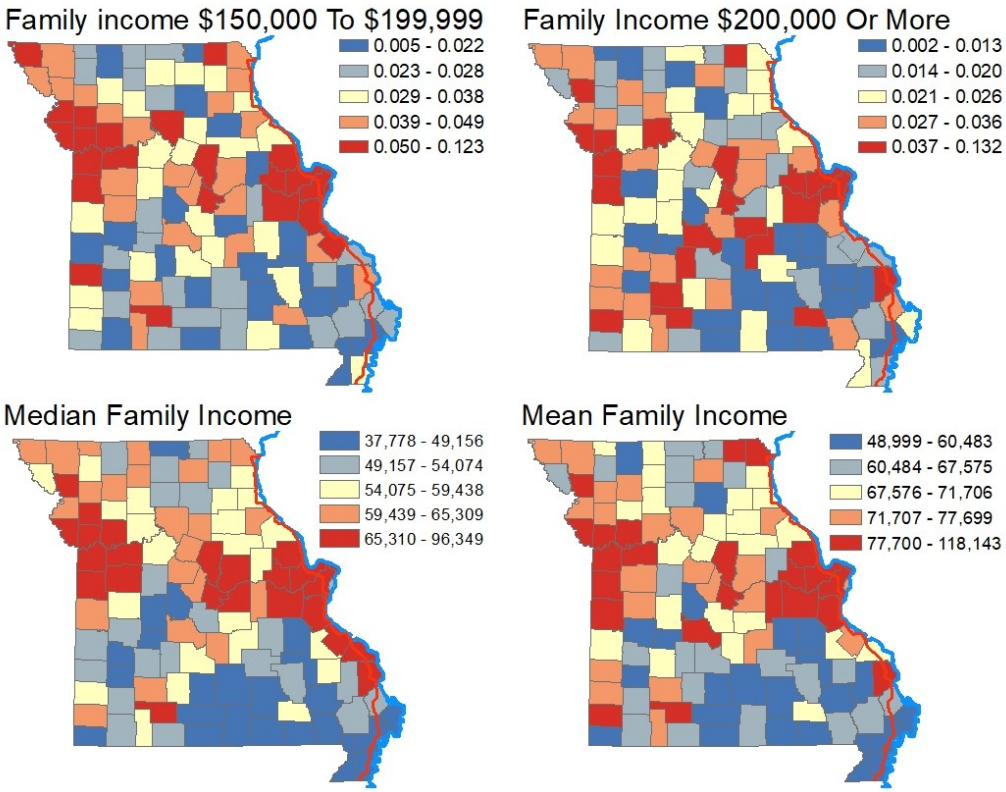

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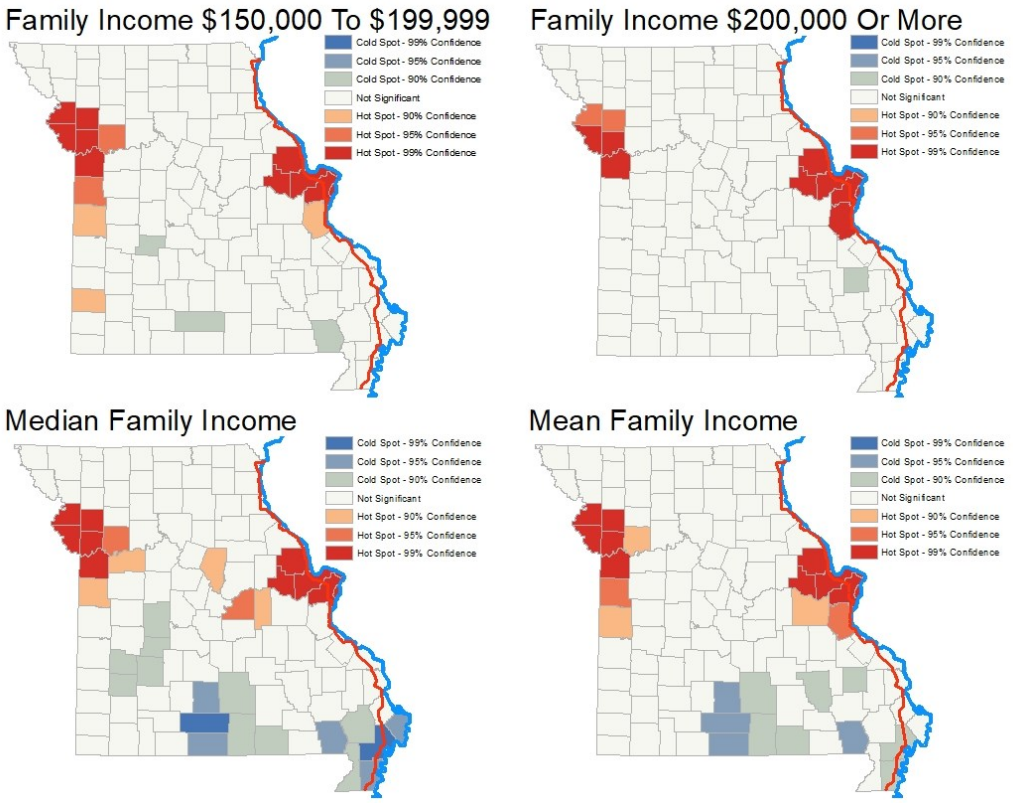

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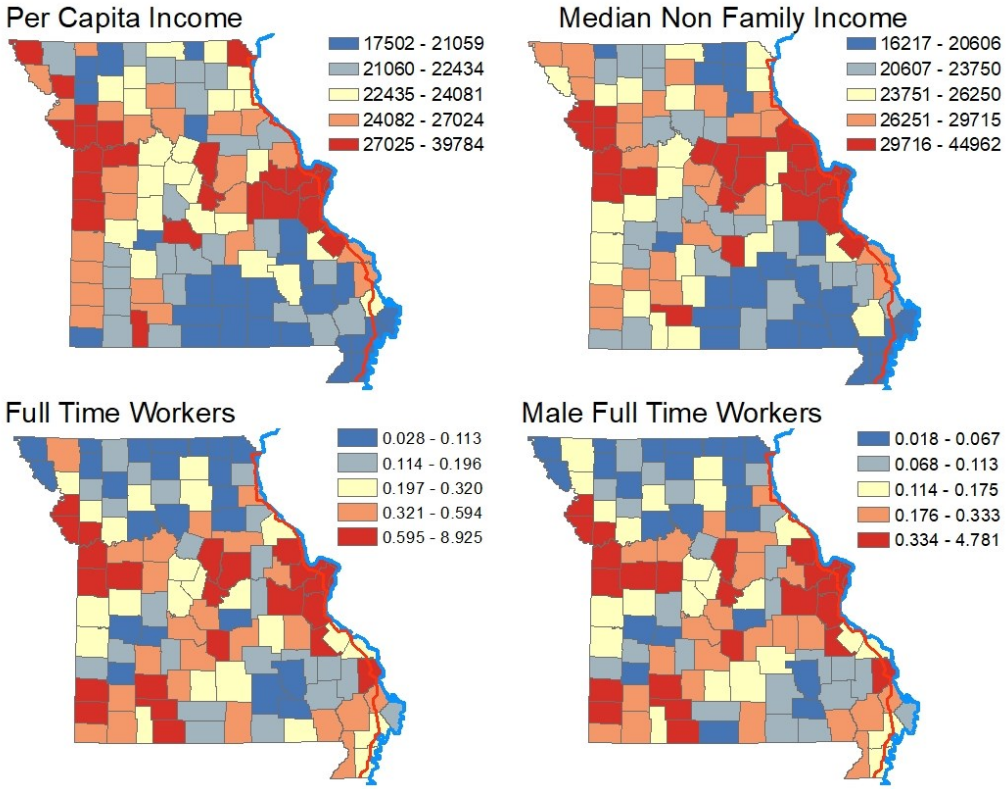

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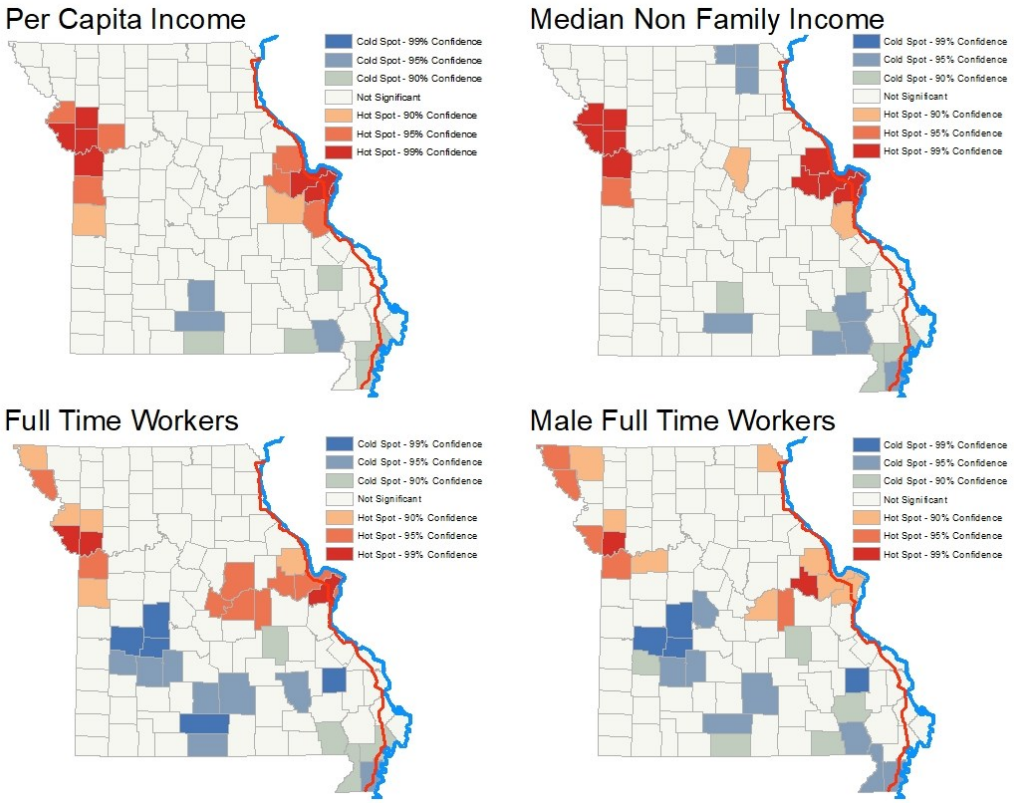

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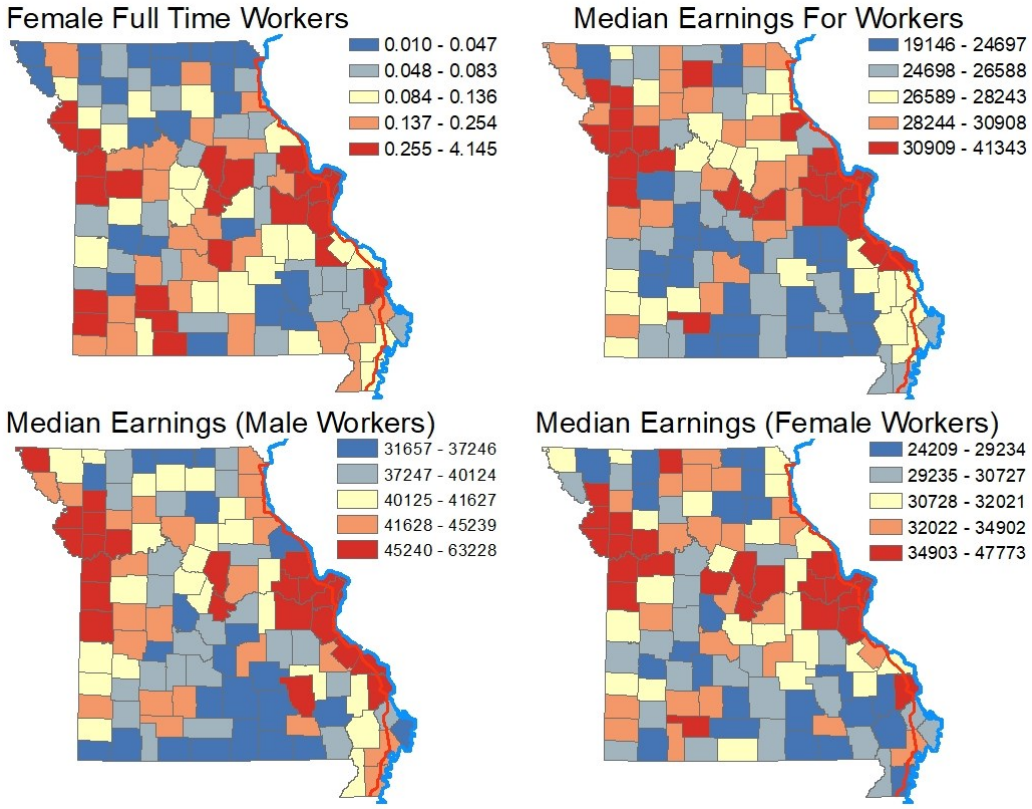

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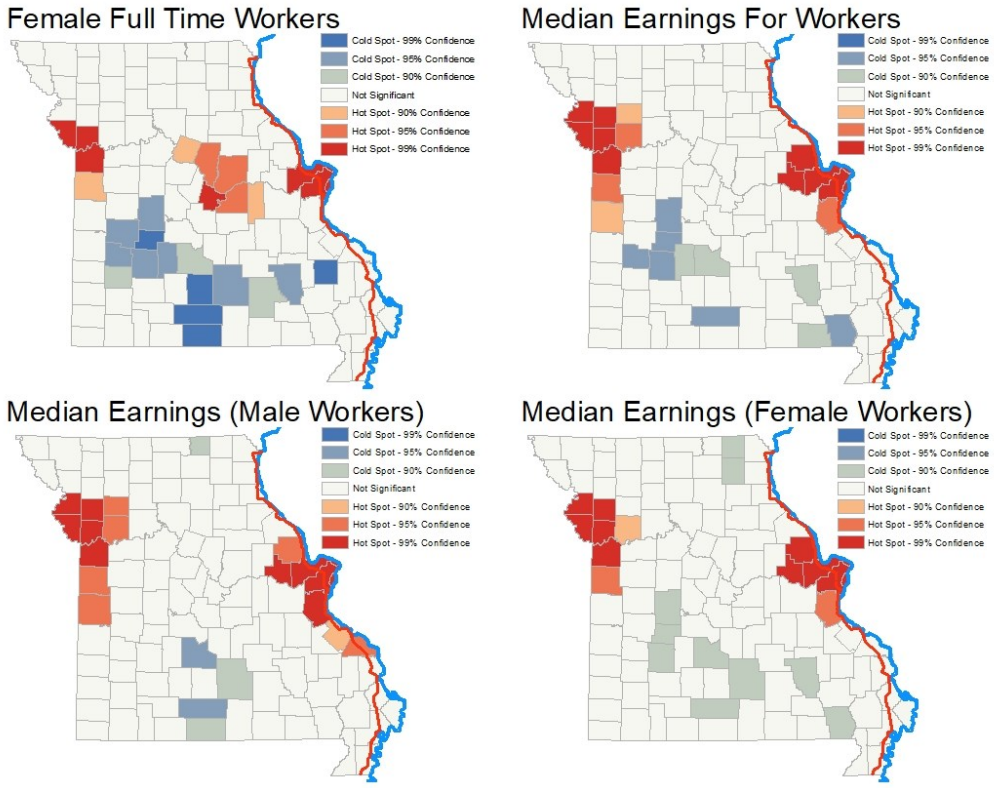

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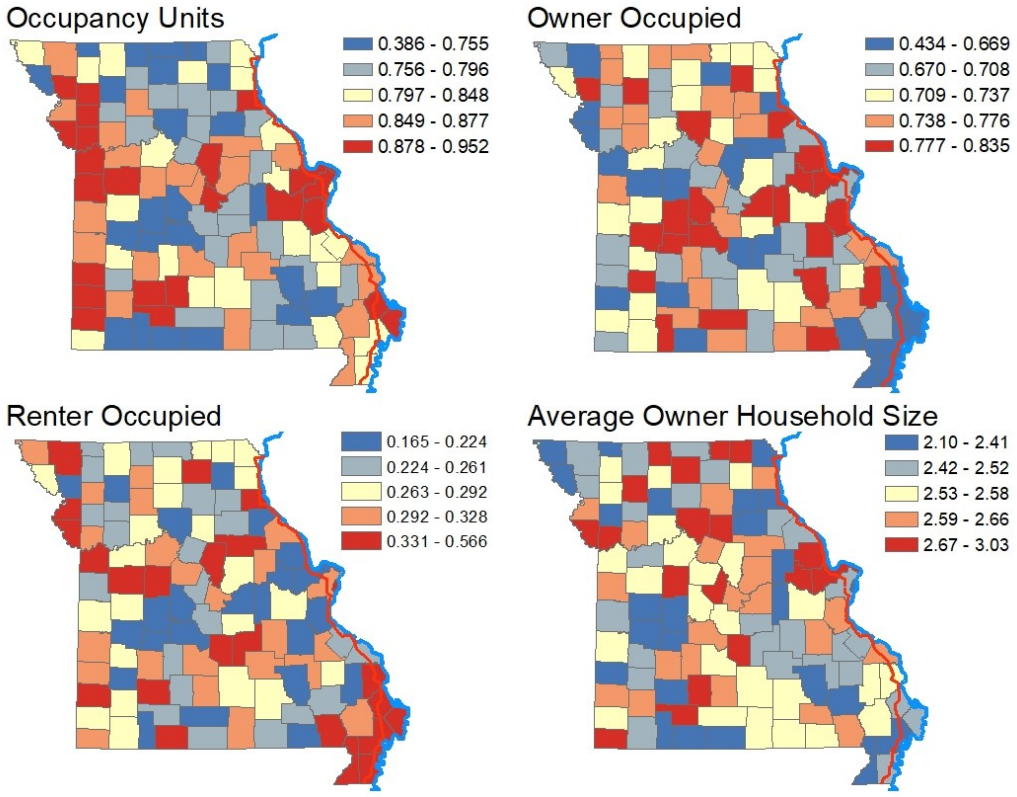

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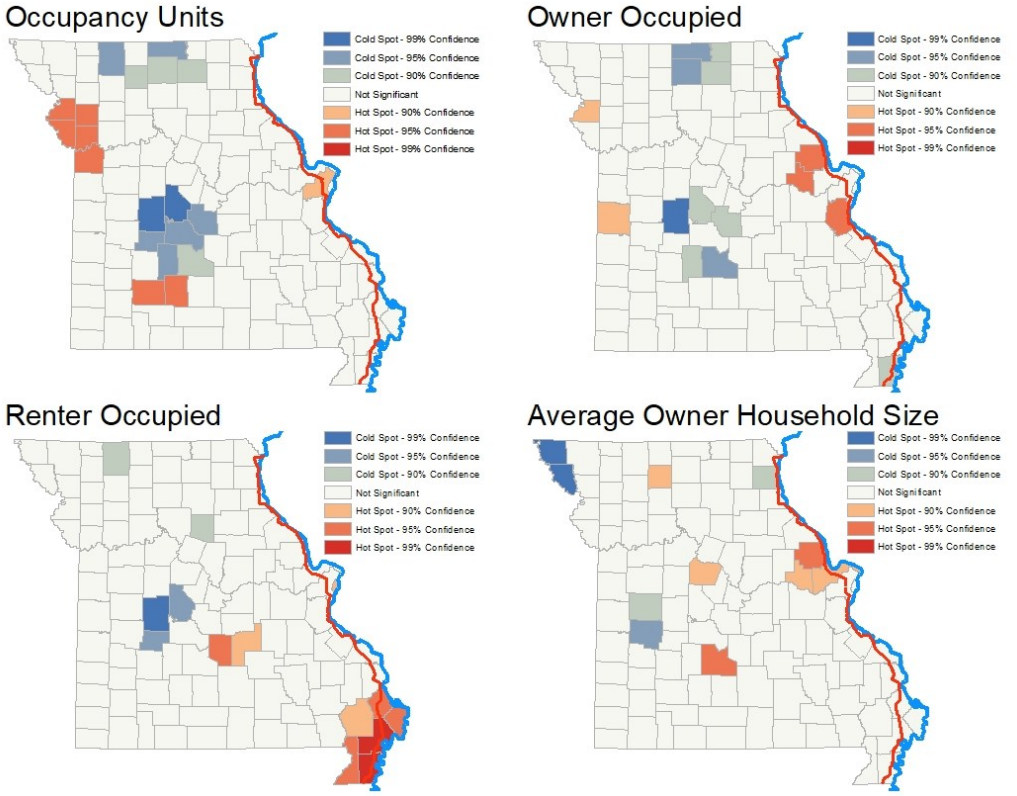

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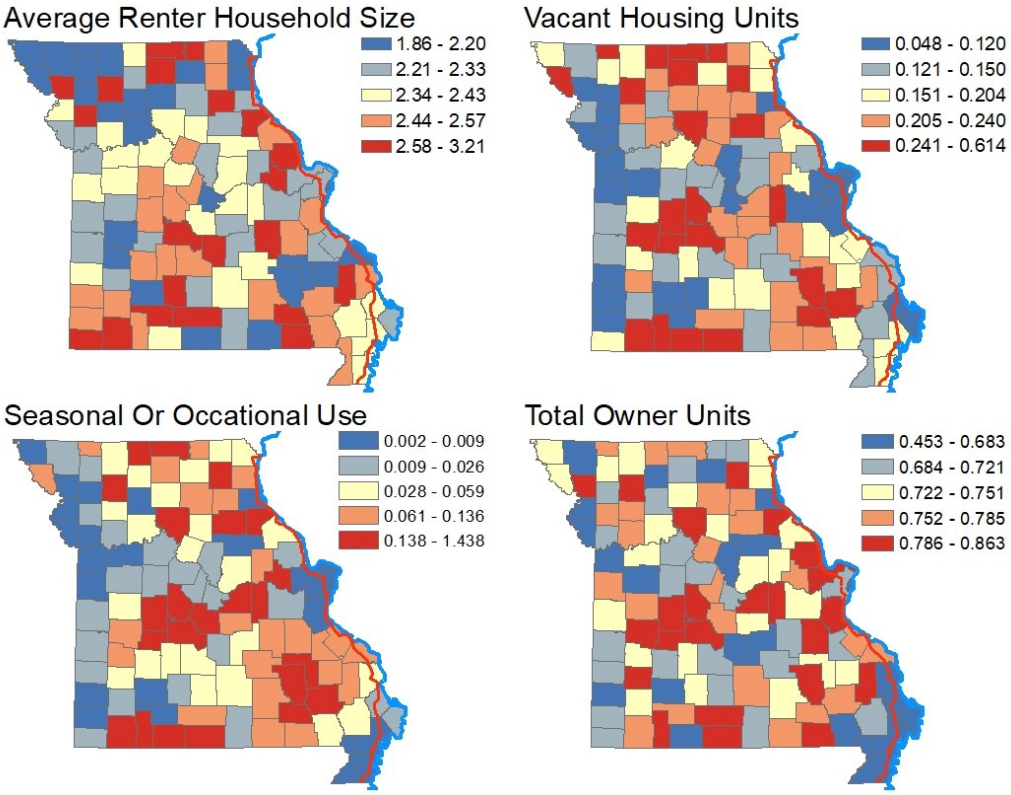

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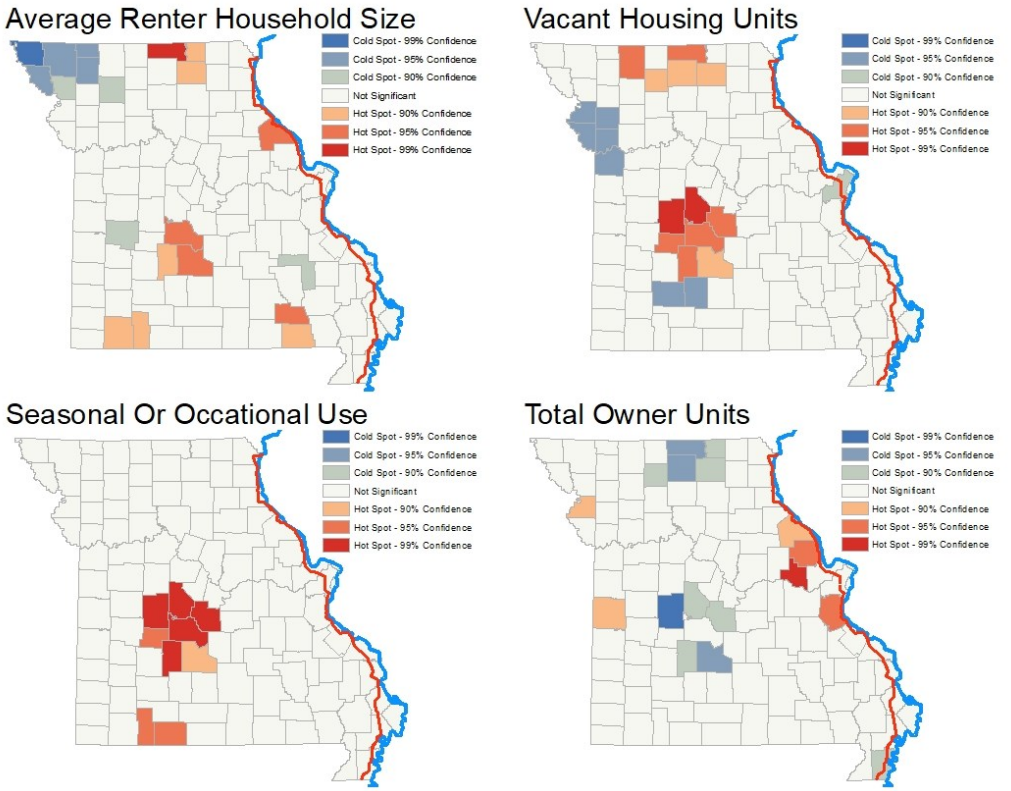

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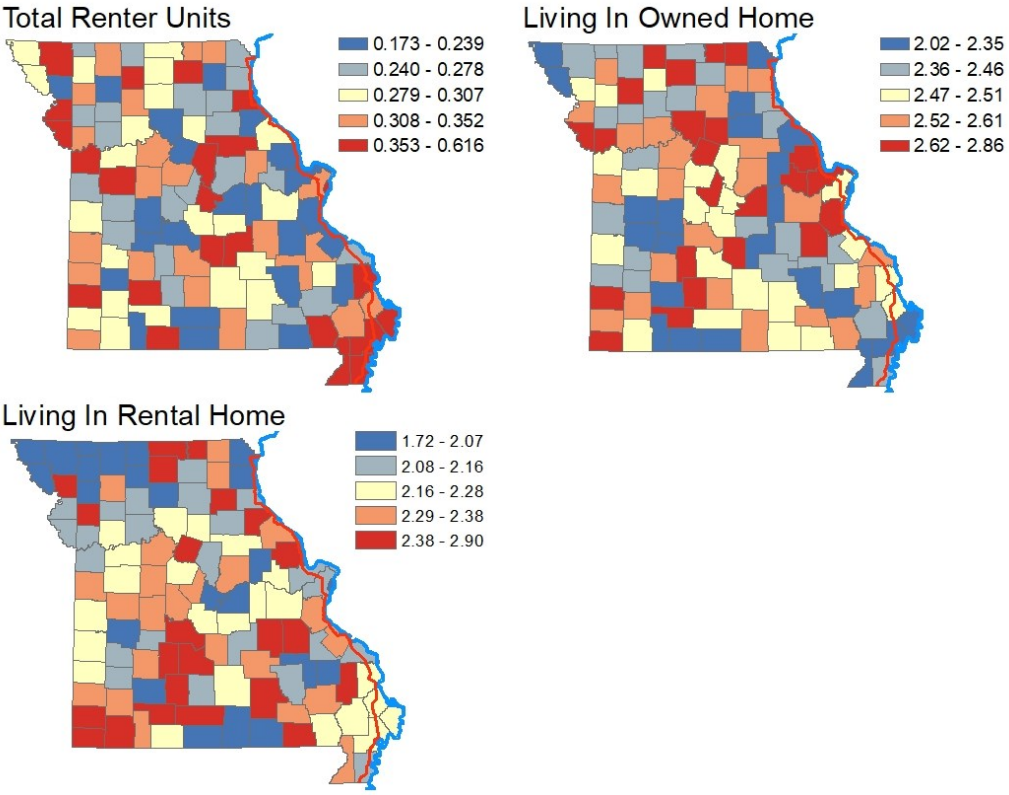

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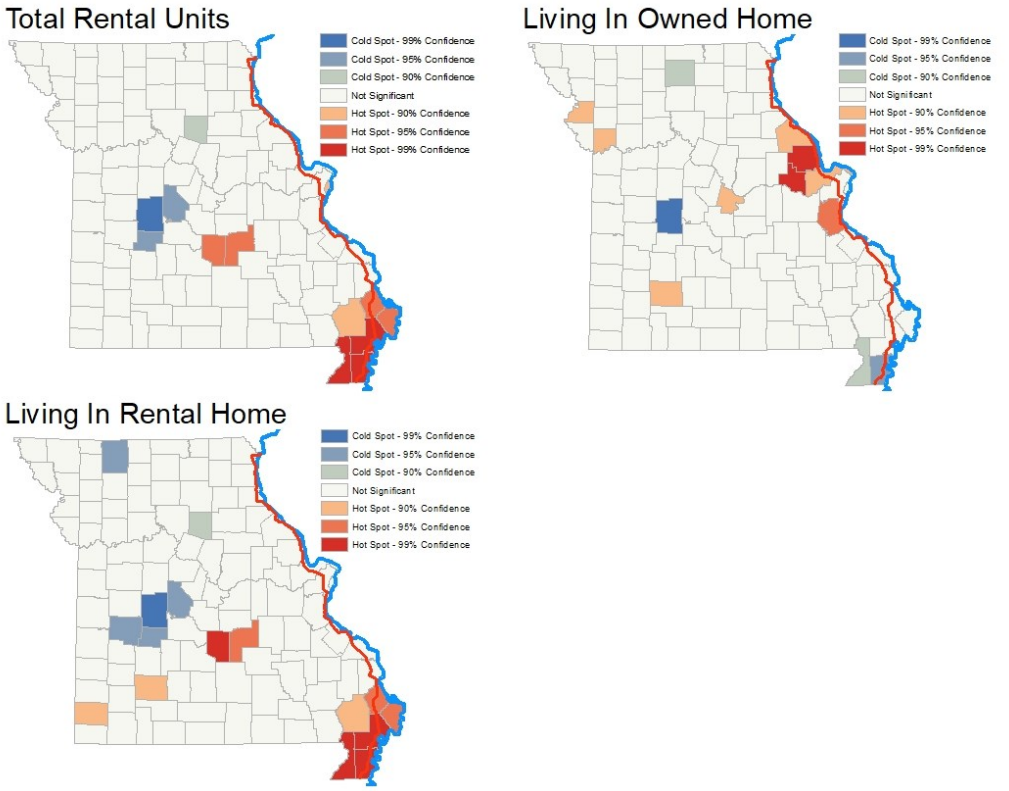

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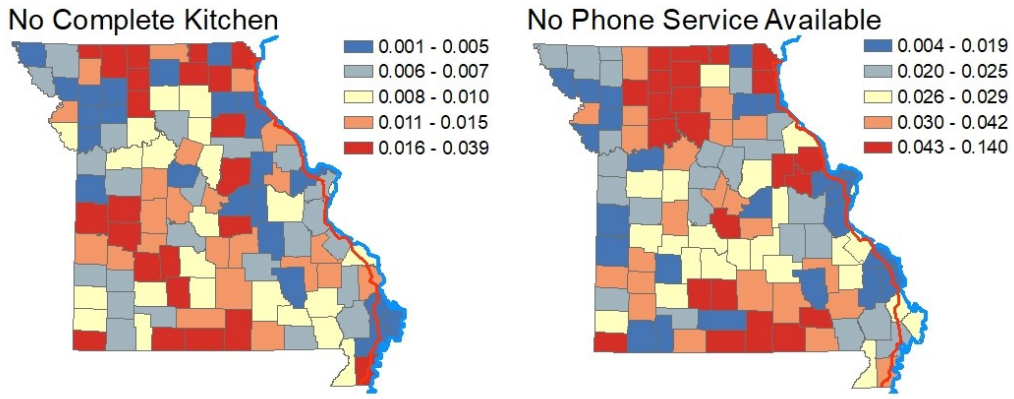

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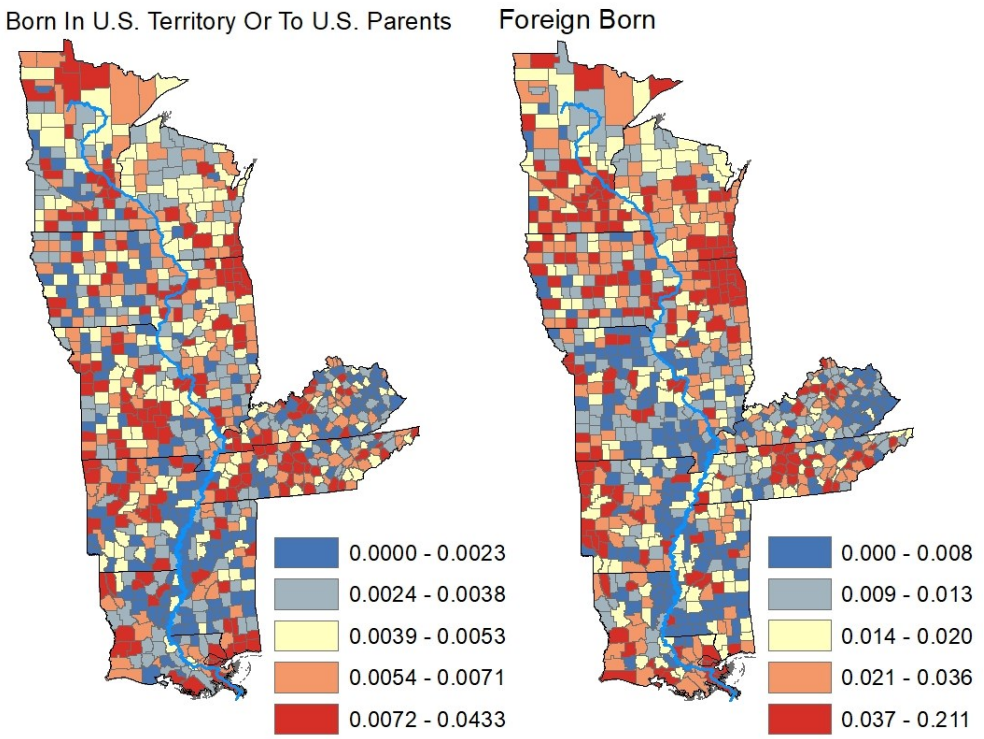

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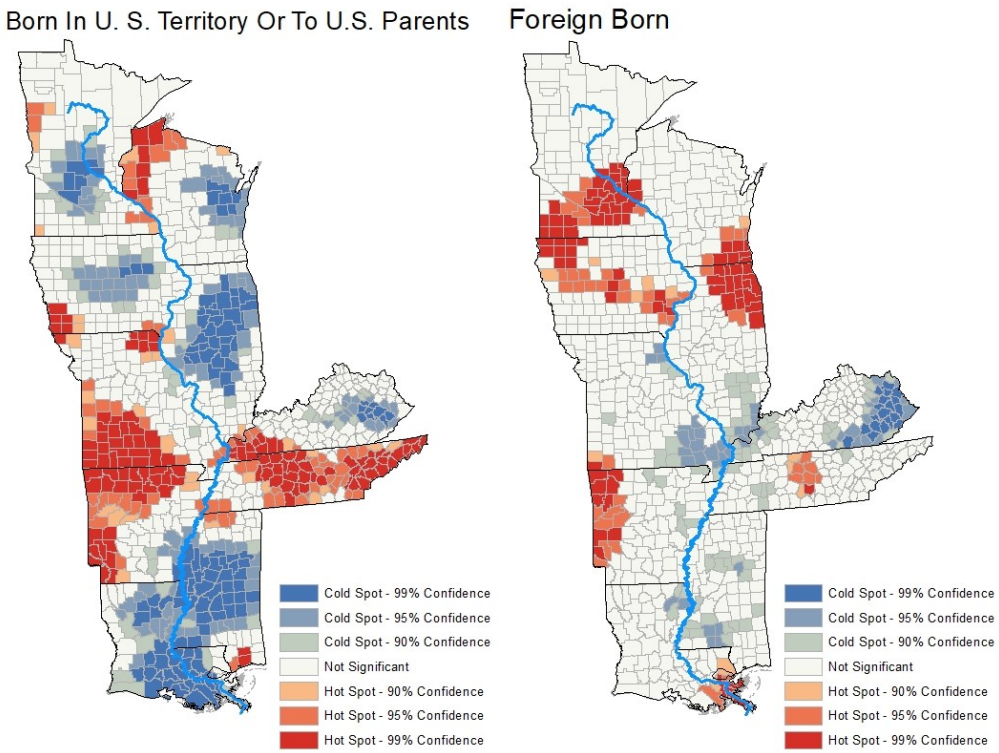

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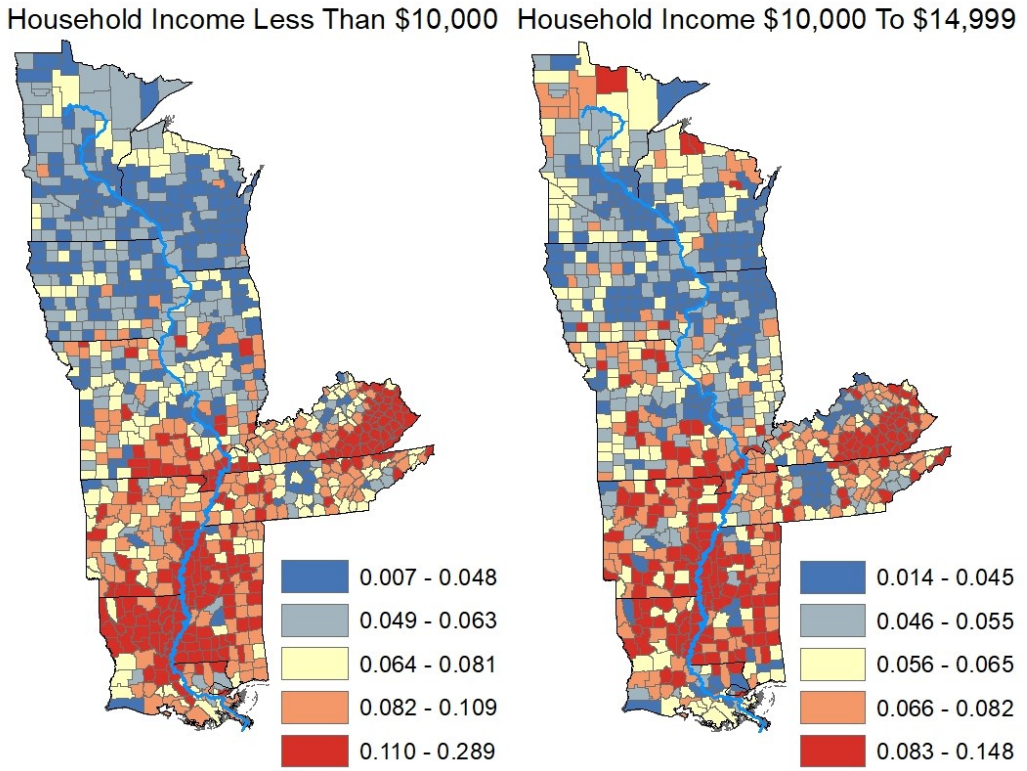
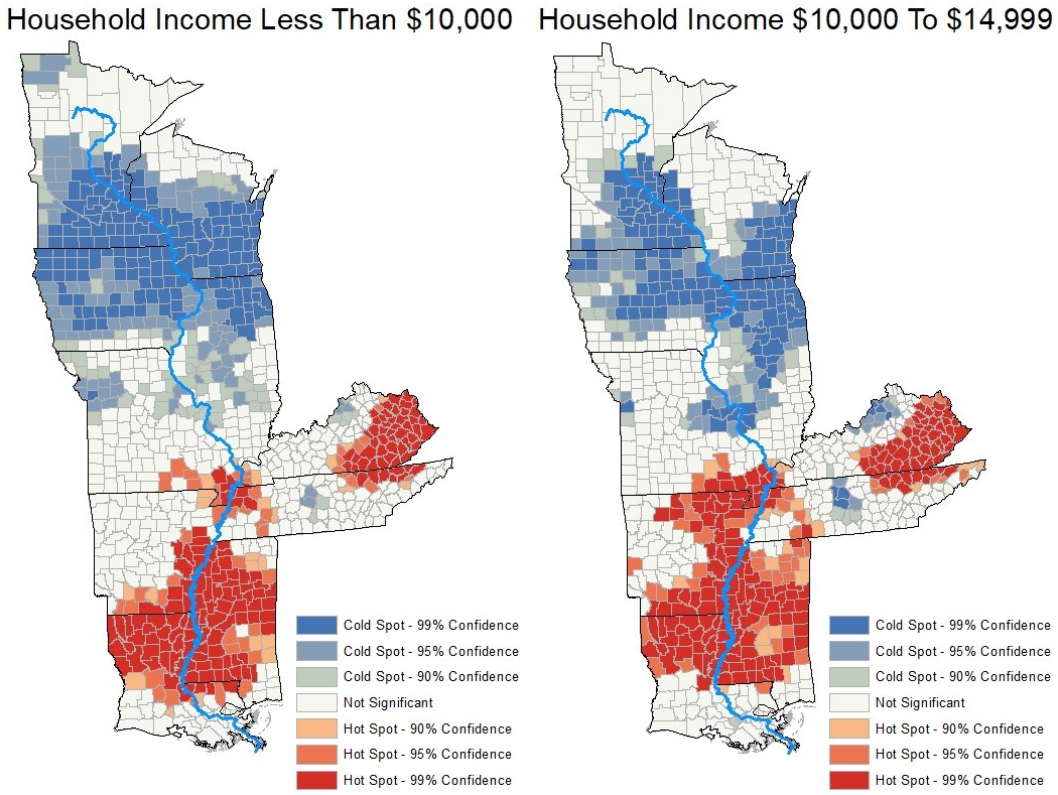


Appendix B-3



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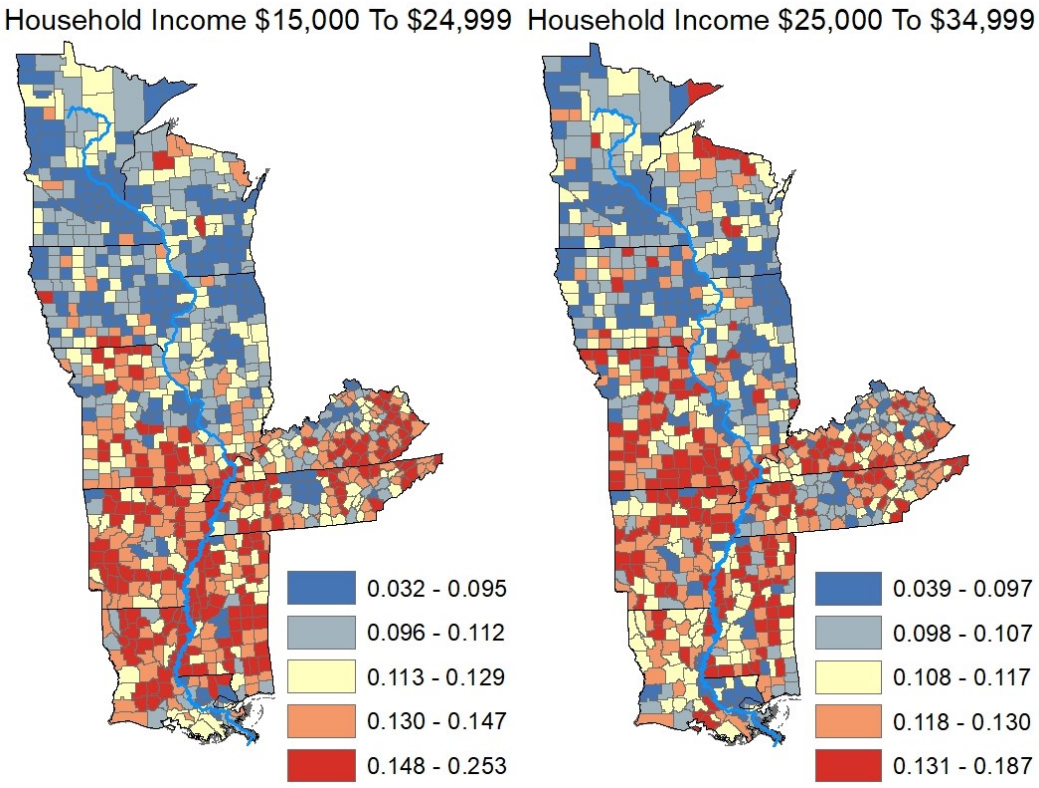
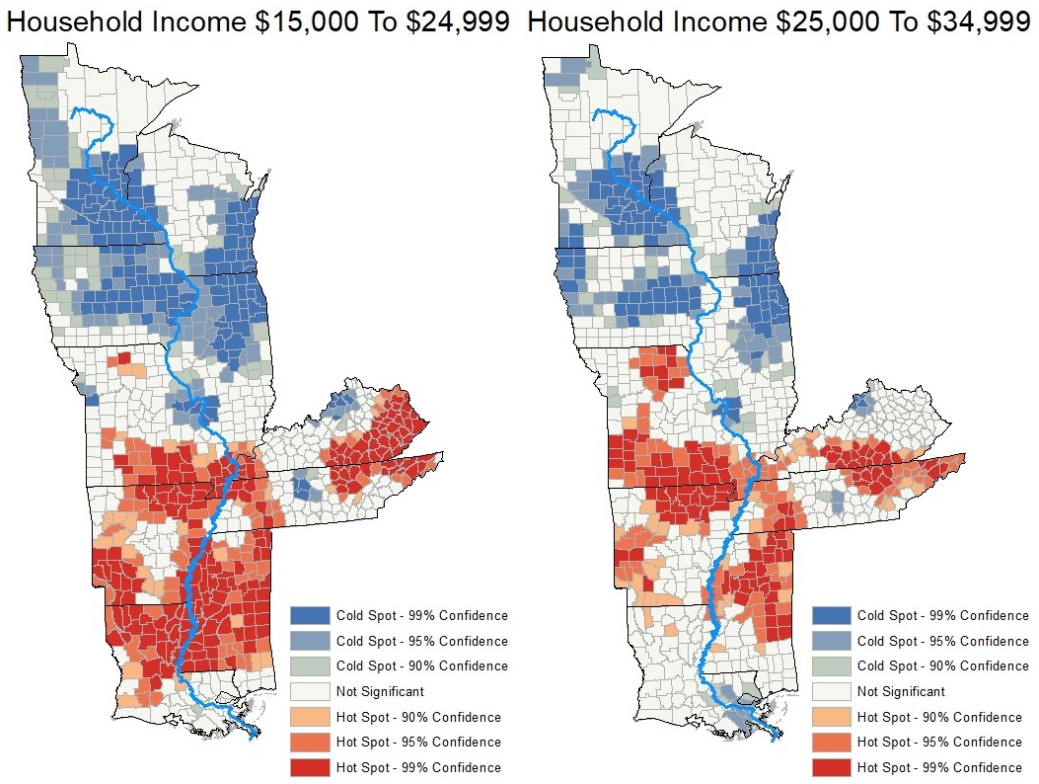


Appendix B-5



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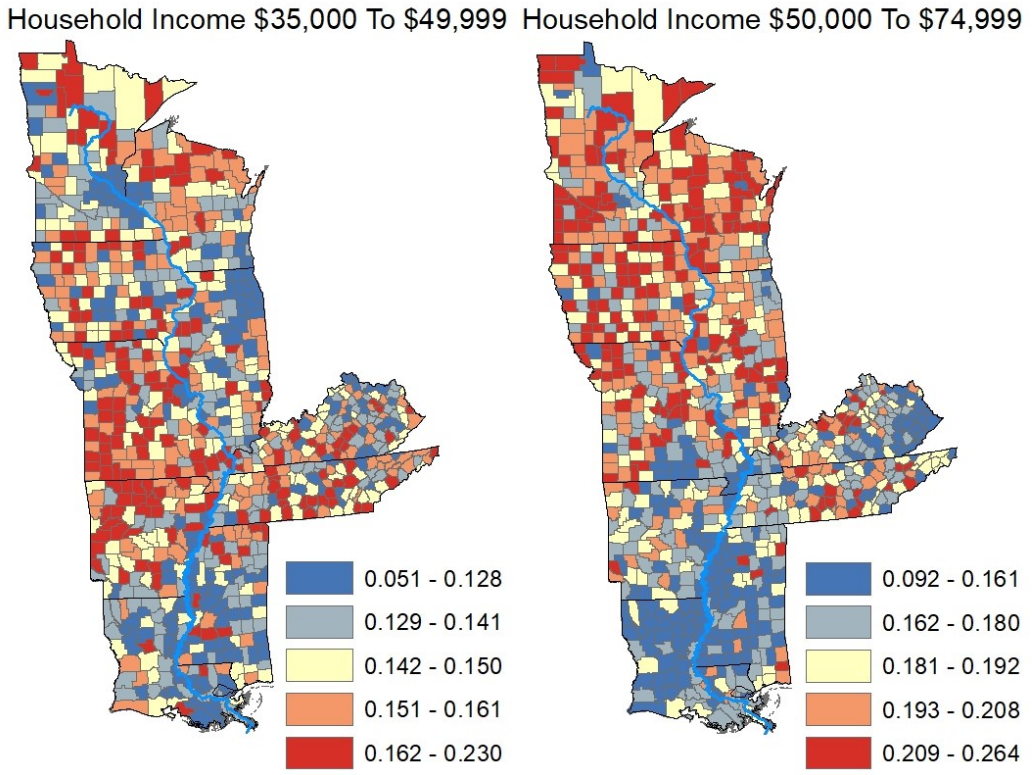

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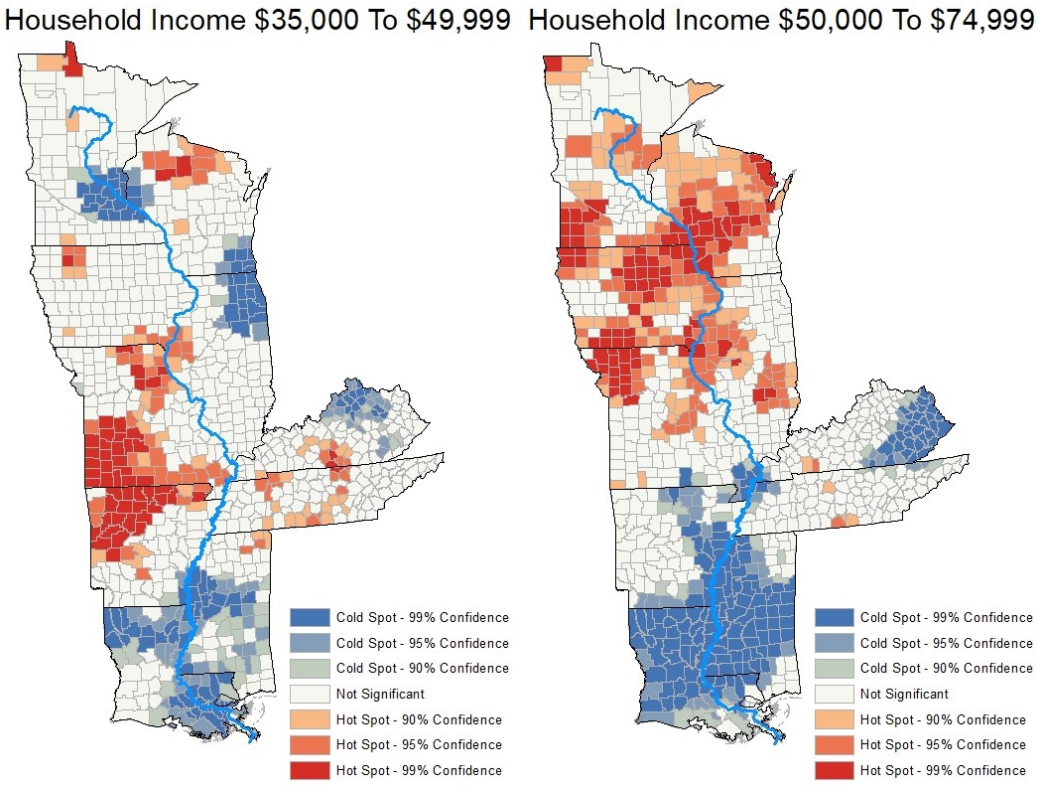

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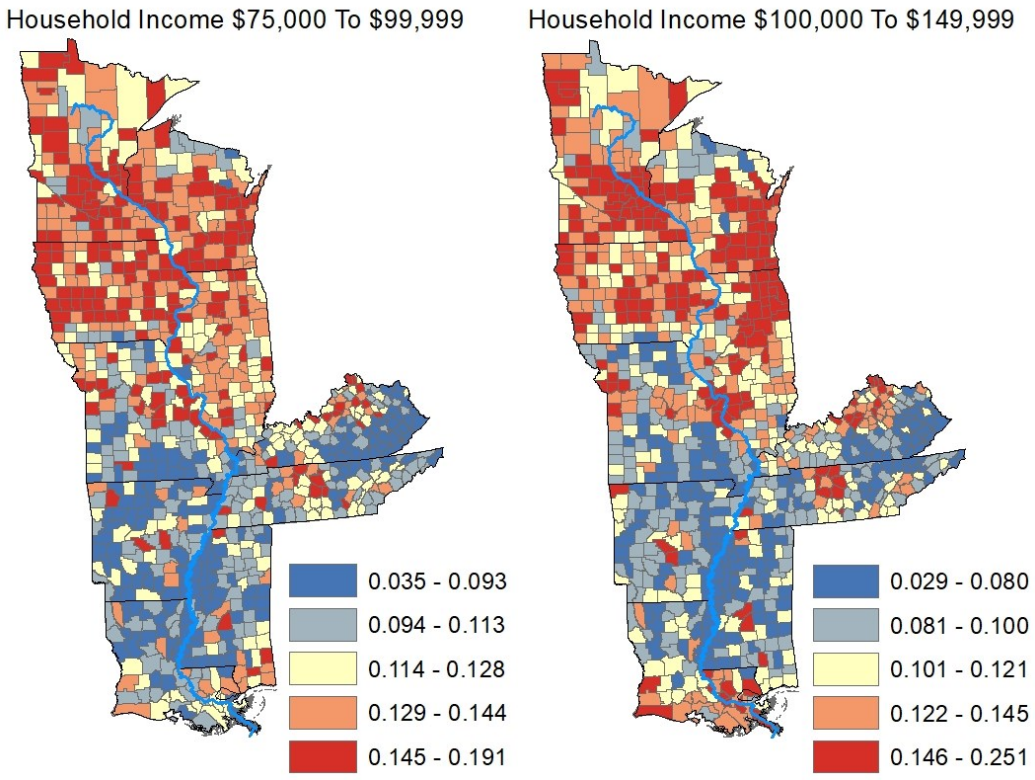

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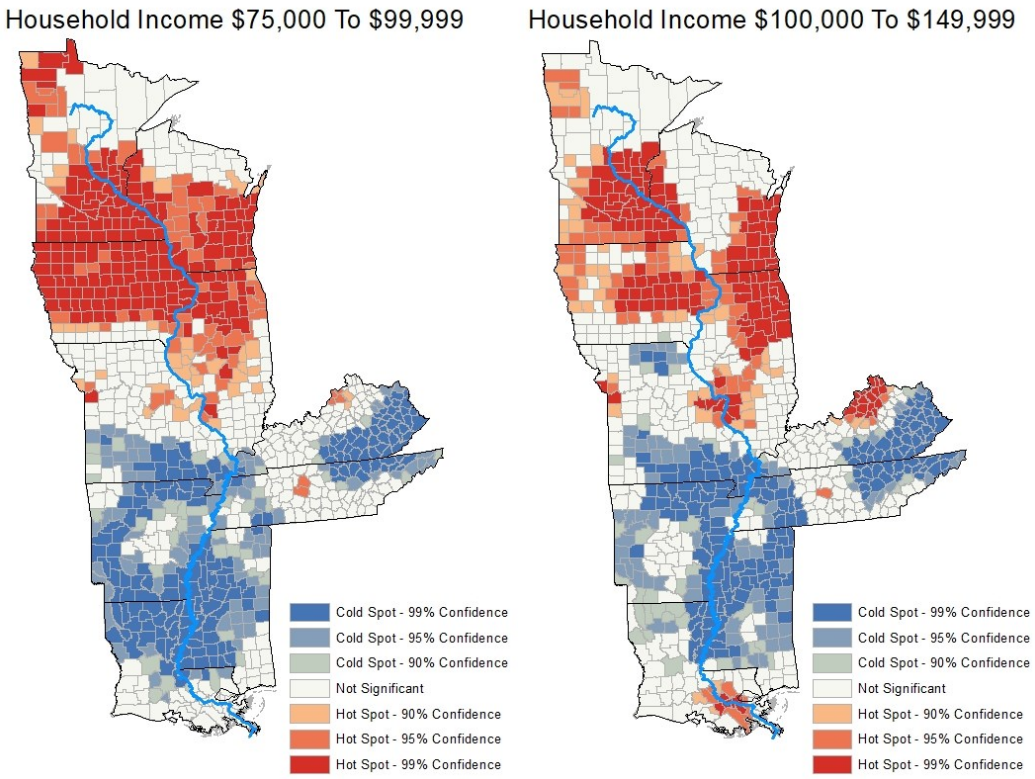

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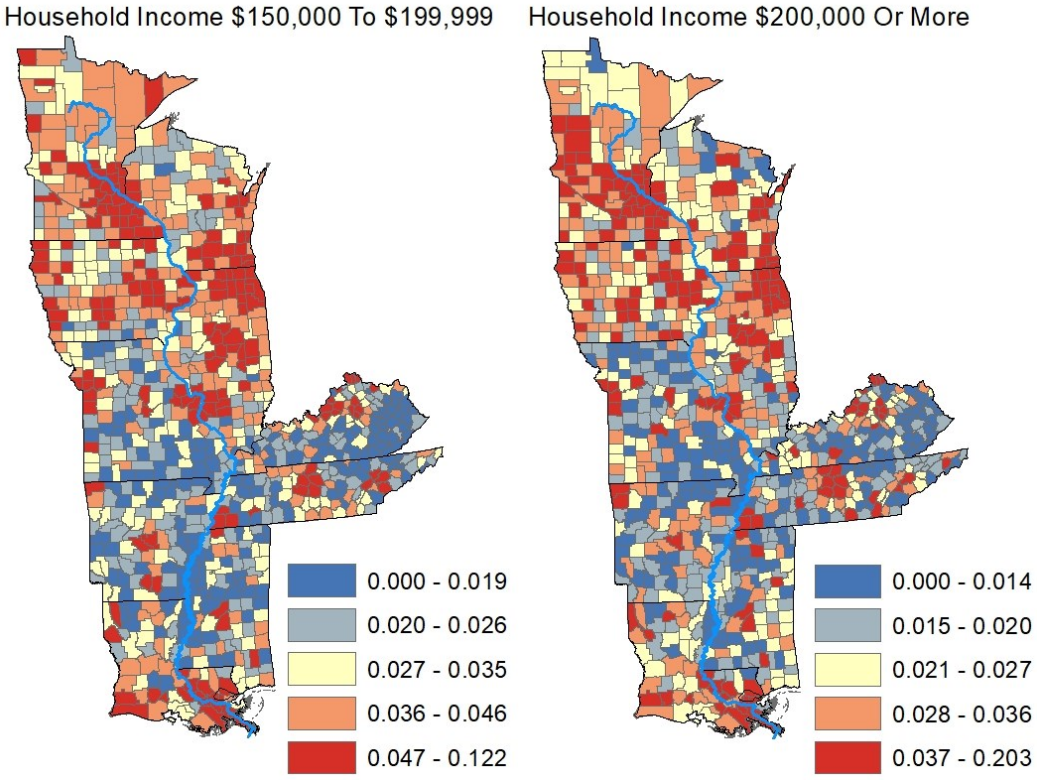
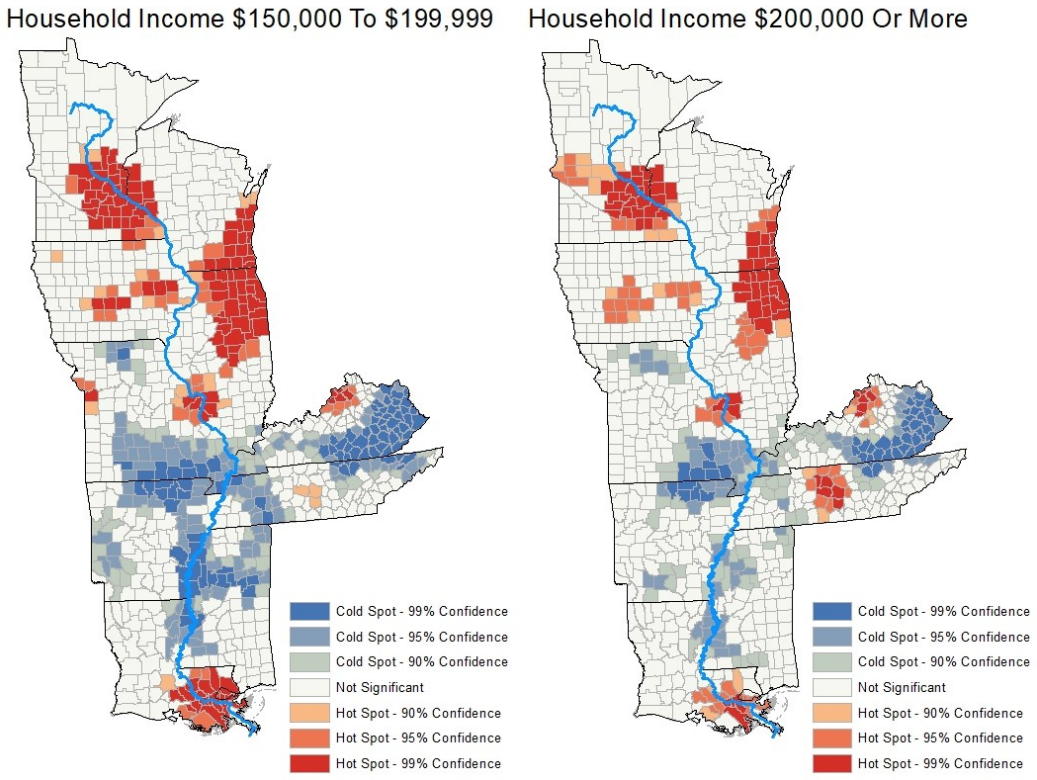
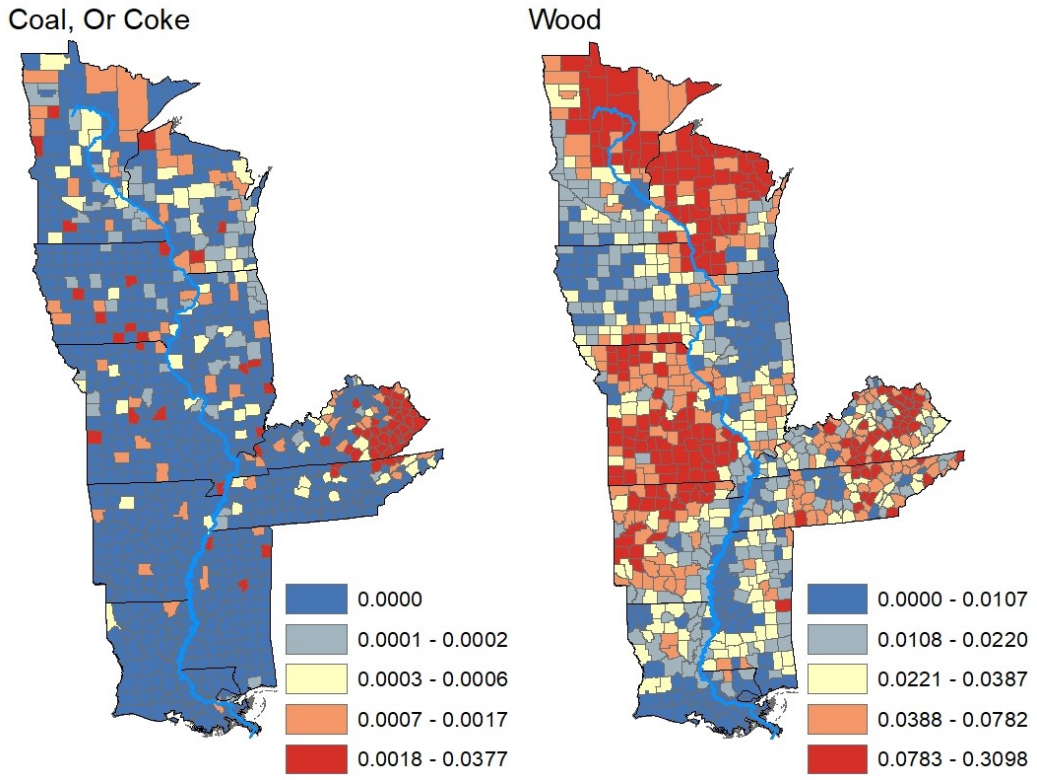


Appendix B-11



Appendix B-12



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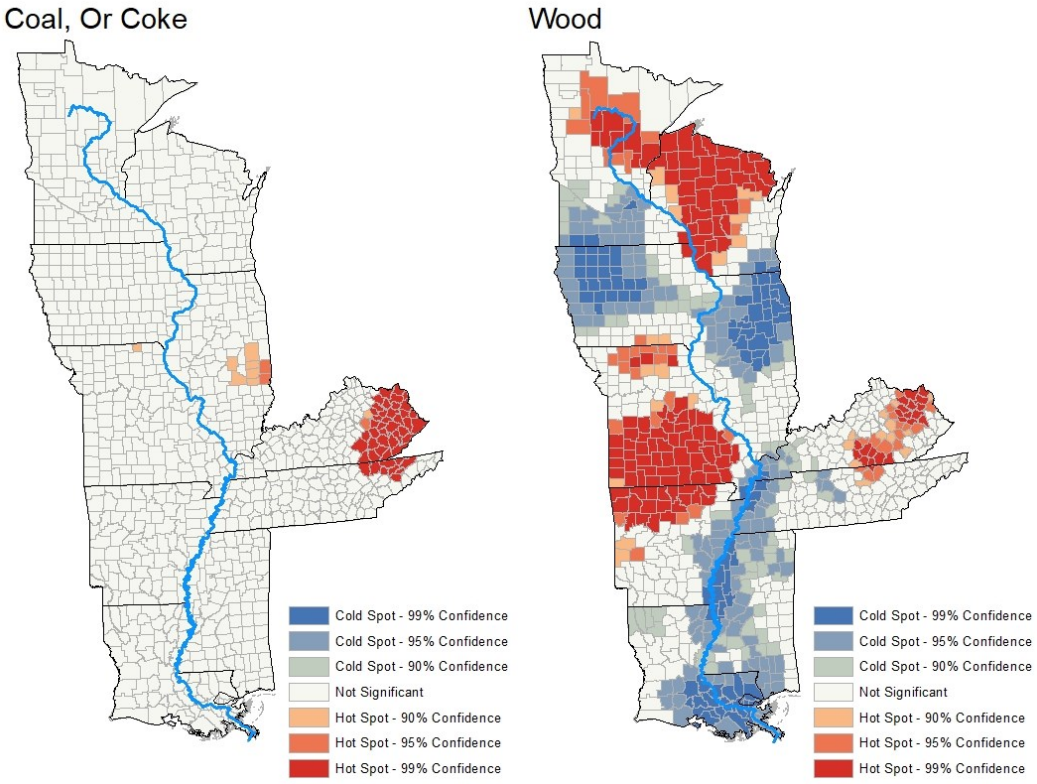
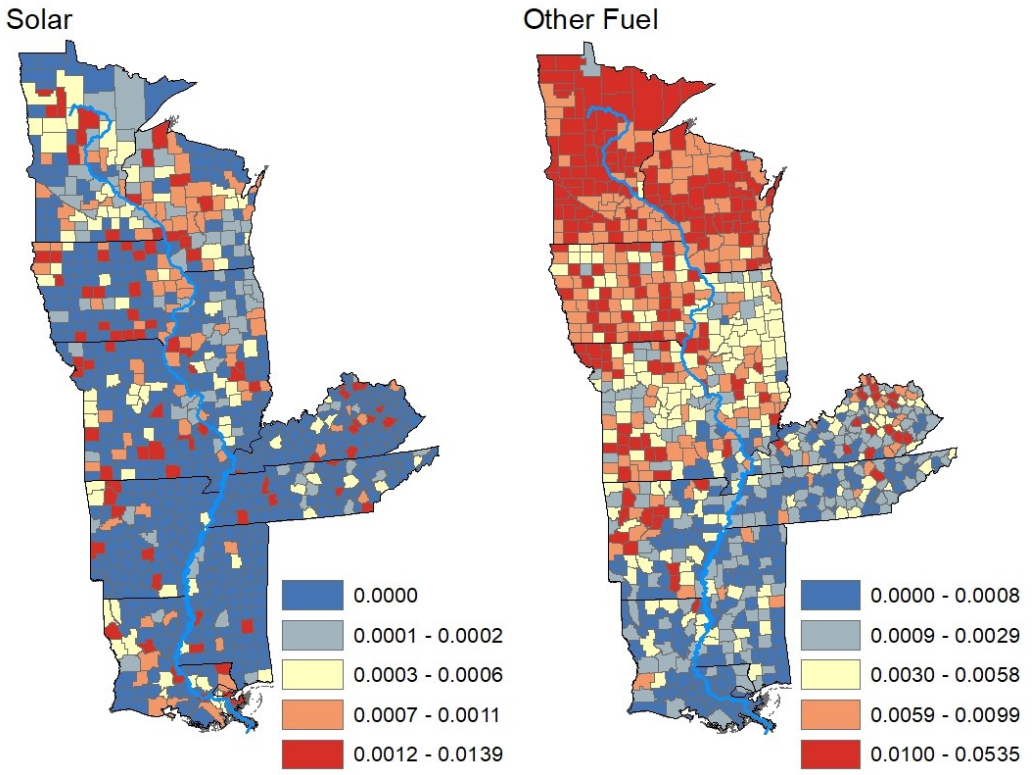
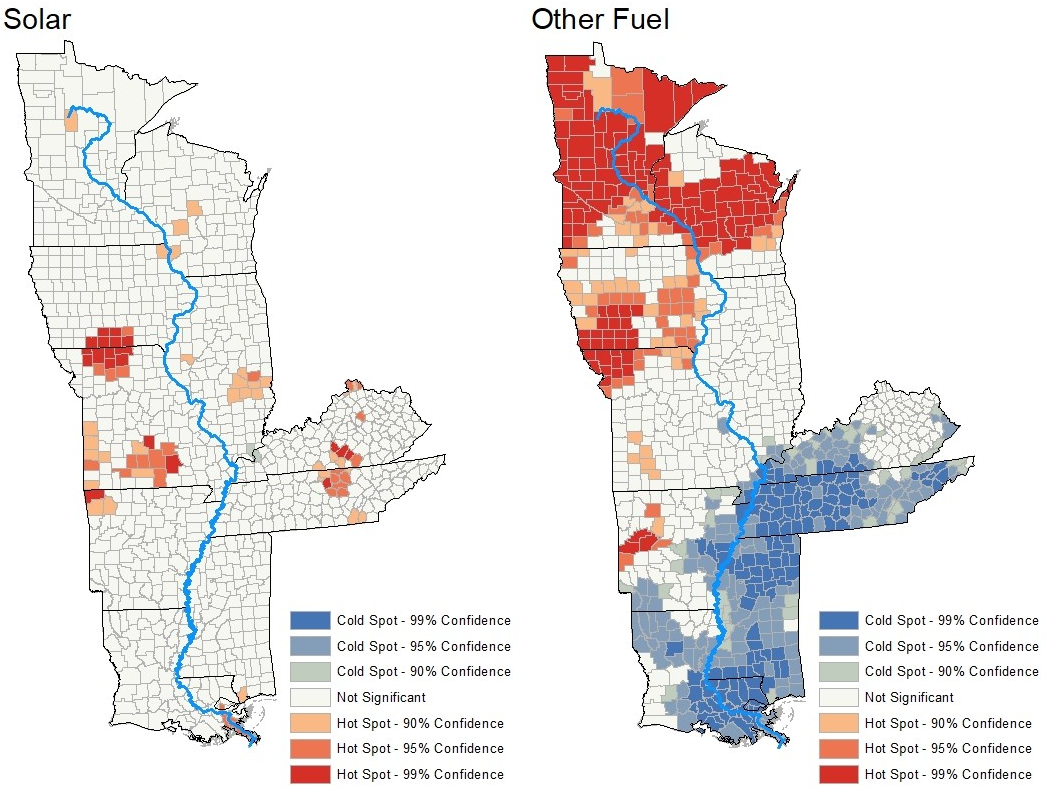


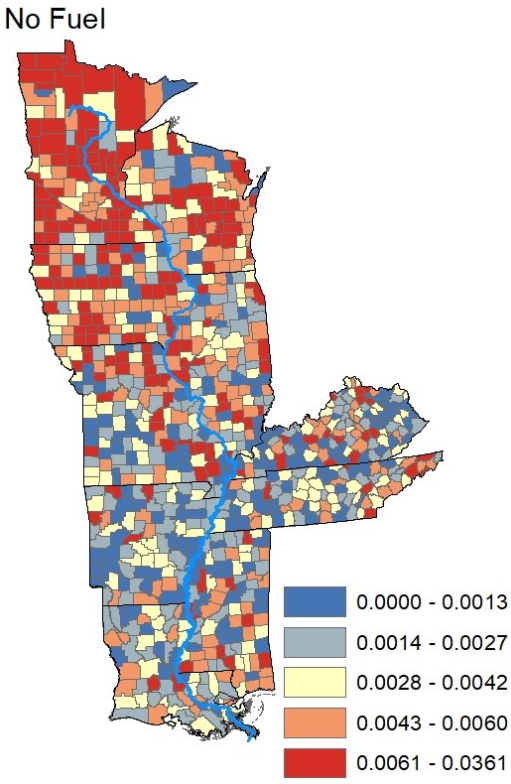
Appendix B-14



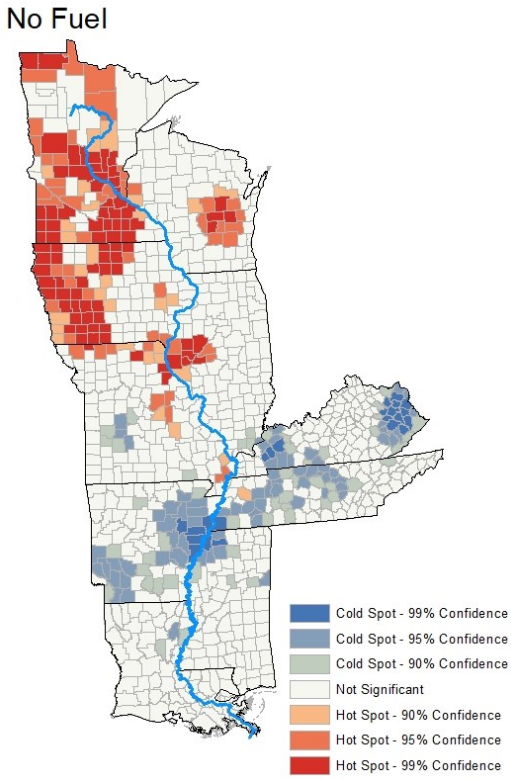
Appendix B-15



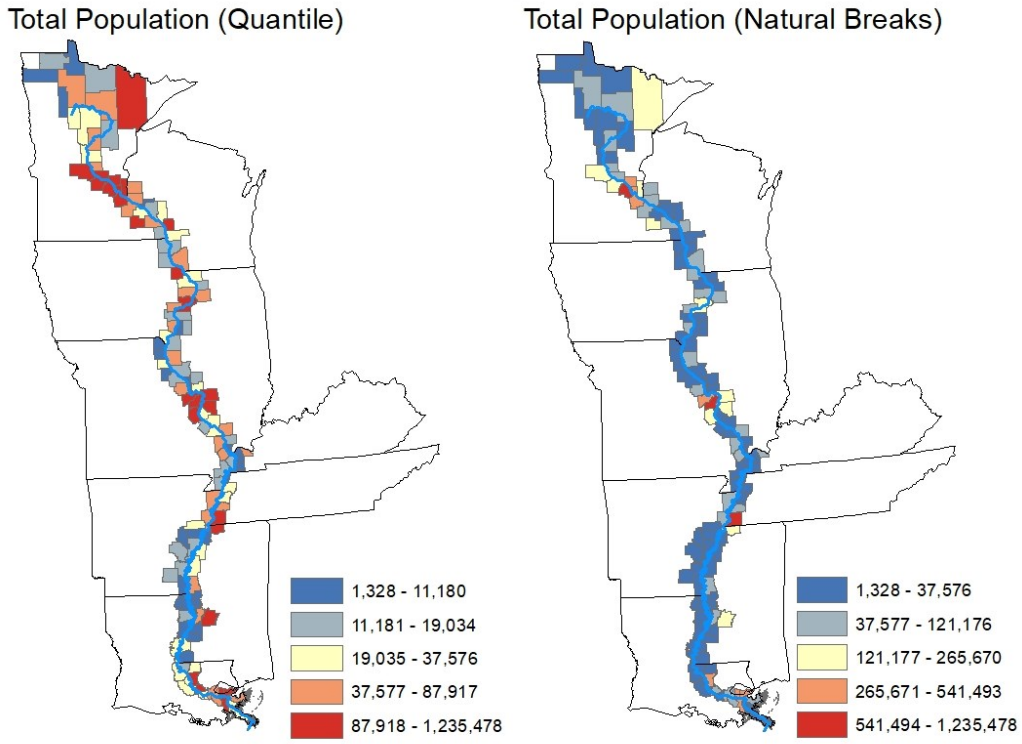
Appendix B-16



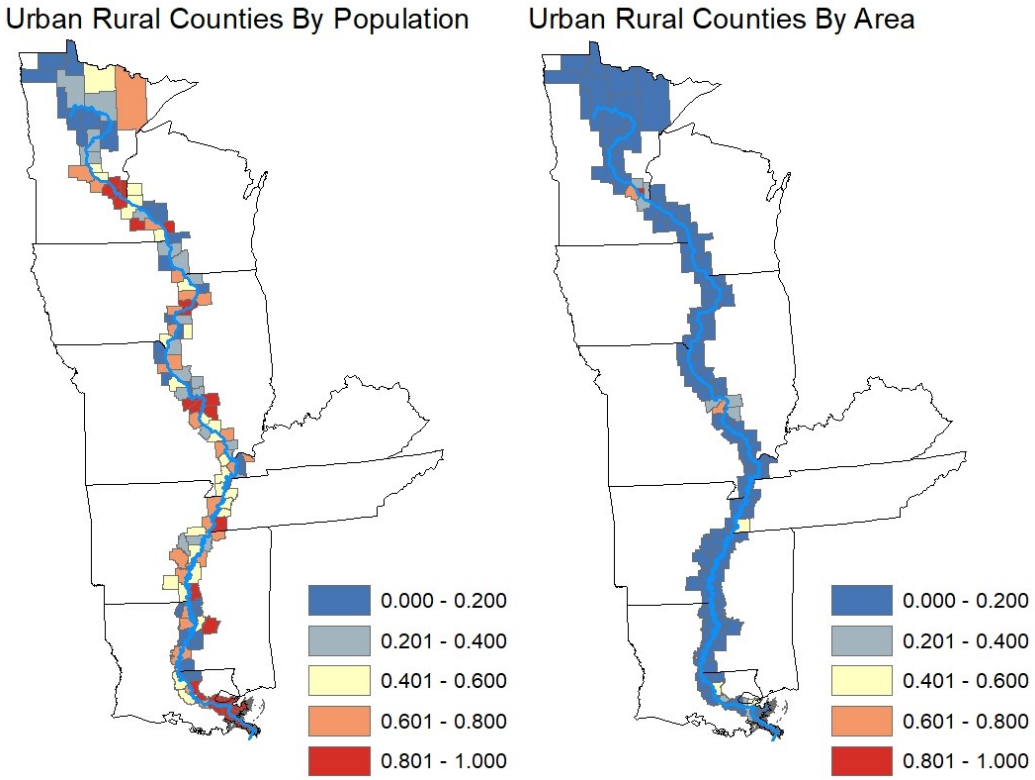
Appendix B-17



Appendix B-18

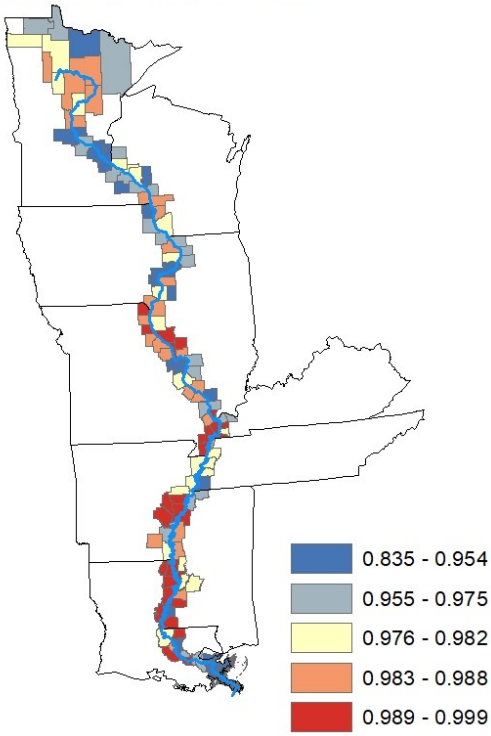


Appendix B-19

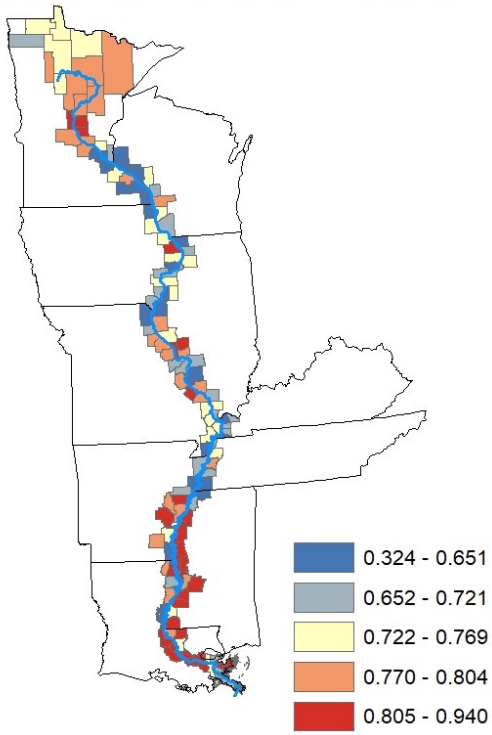


Appendix B-20

Born In The United States

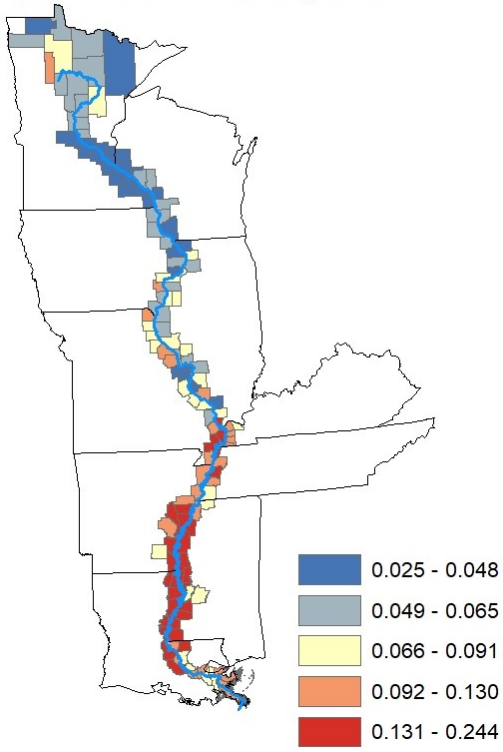


Born In State Of Current Residence

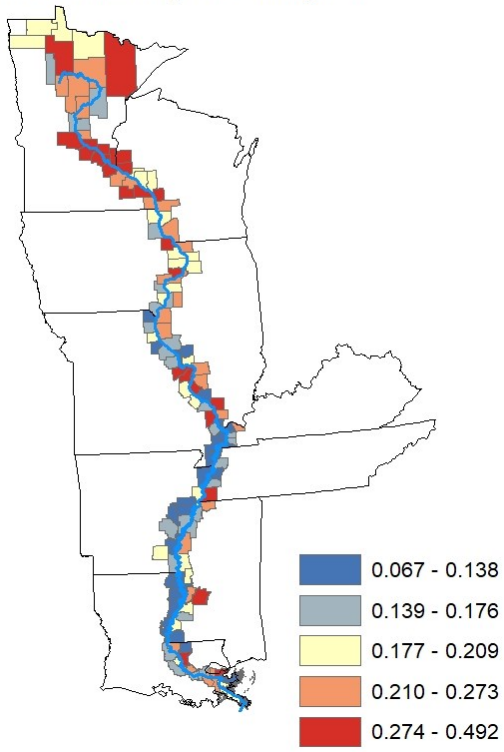


Appendix B-21

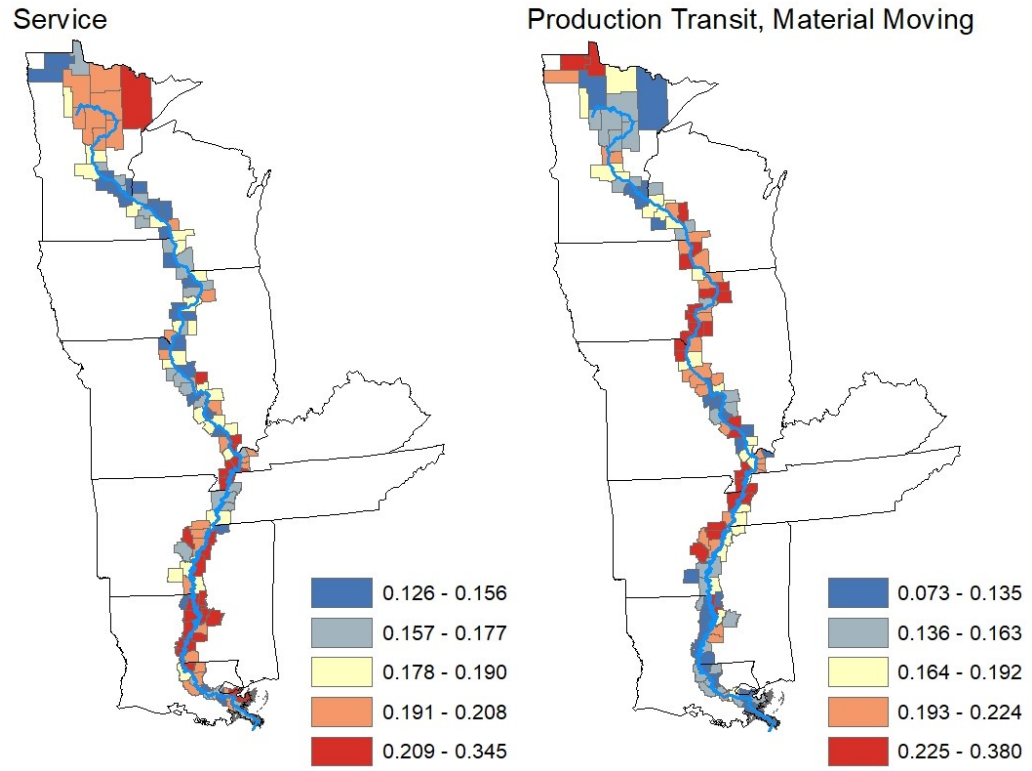
9th To 12th Grade No Diploma



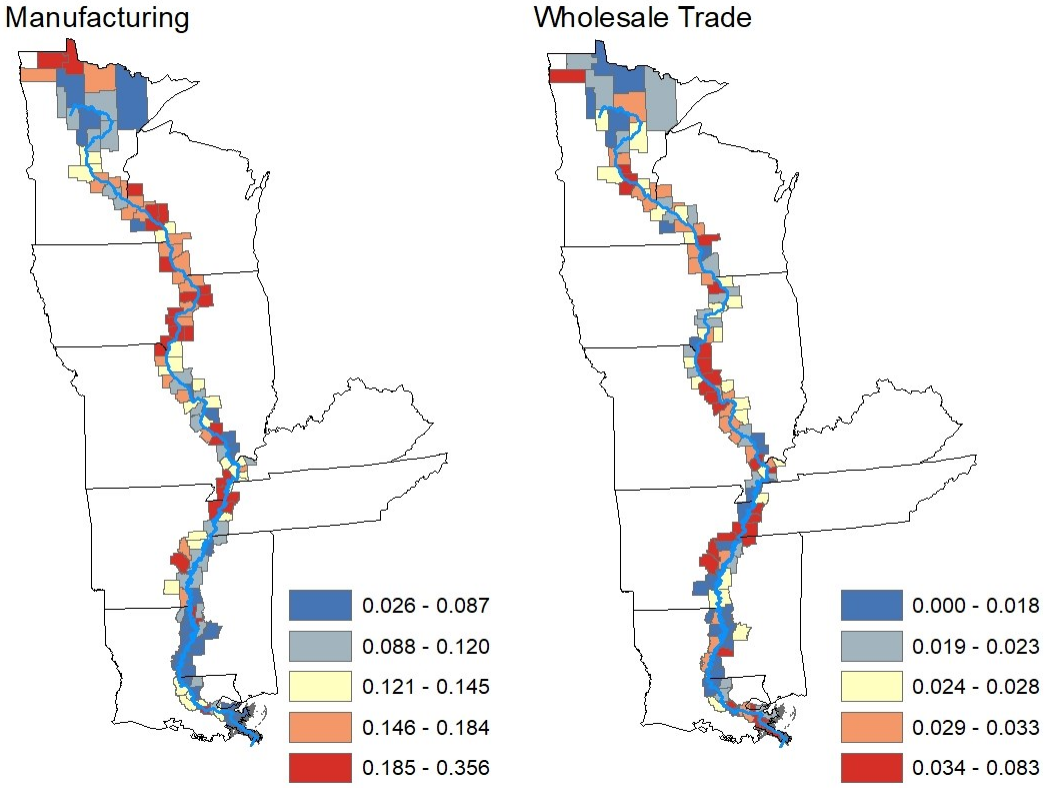
Bachelors Degree Or Higher



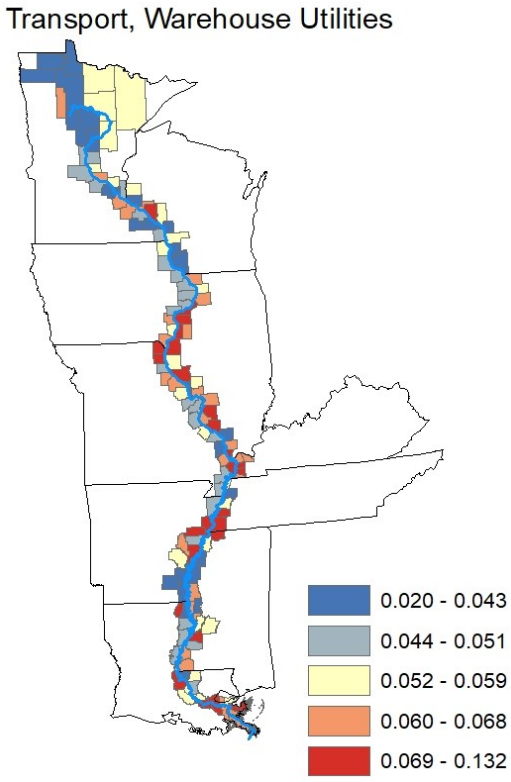
Appendix B-22



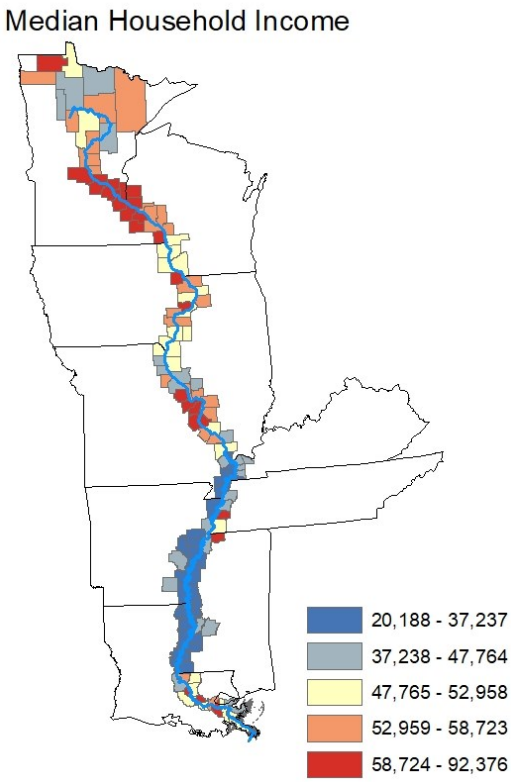
Appendix B-23

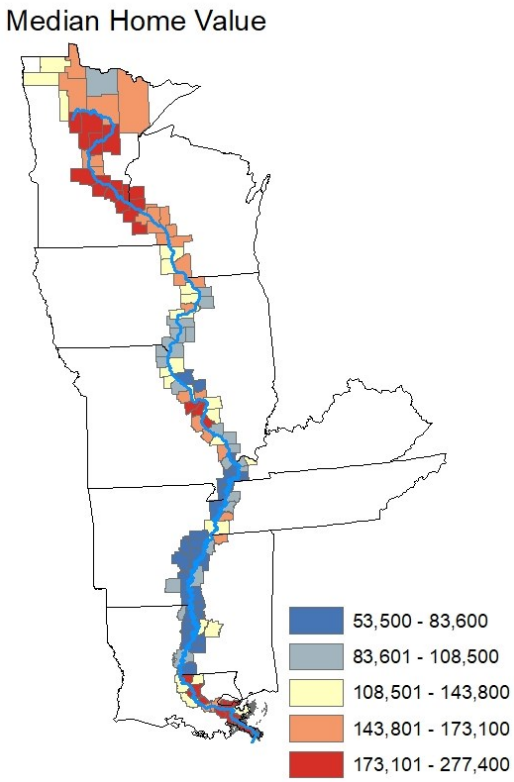


Appendix B-24

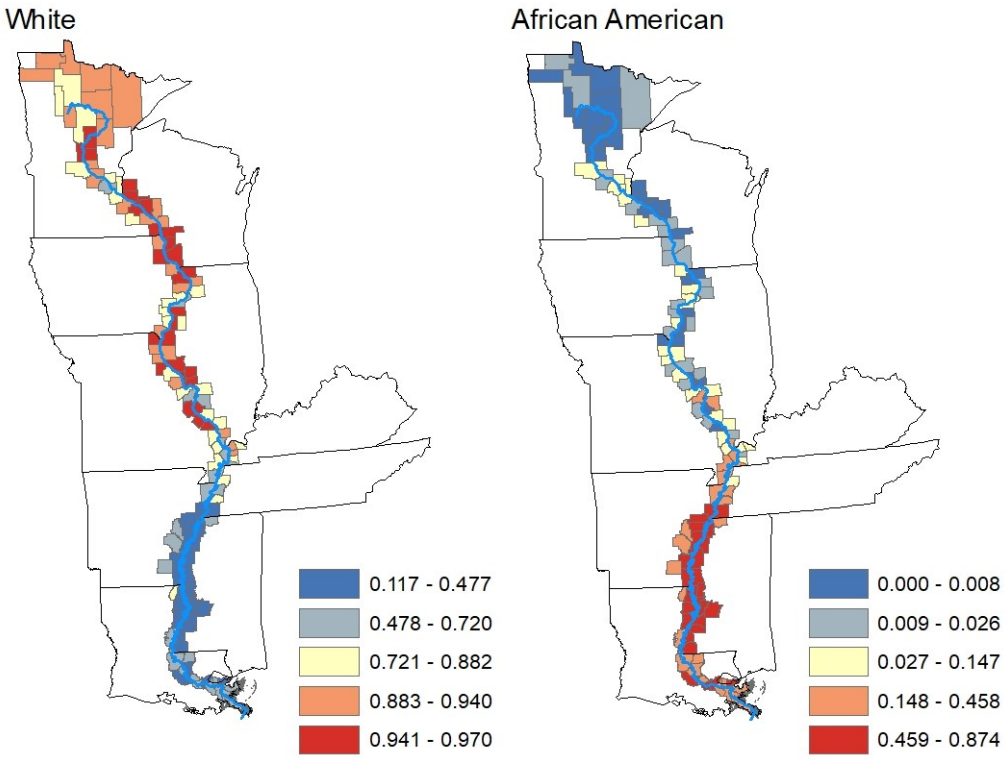


Appendix B-25





Appendix B-26



Appendix B-27