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Defining a Region: The Great River Road in Missouri*

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ABSTRACT
The Great River Road (GRR) is an established roadway along both the east and west banks of the Mississippi River that serves to connect people to the geography of this area. In this study, the socioeconomic characteristics present in Missouri are analyzed to determine if a more formal GRR region exists in Missouri. County-level data from a five-year estimate (2014–2018) conducted by the United States Census Bureau are used to give greater insight on any unifying characteristics the GRR may have in Missouri. Social, economic, housing, and demographic information combined with spatial pattern analysis help identify evidence of a “region” based around the GRR in Missouri. This spatial data analysis provides information to confirm the presence of a more accurate GRR regional border with a subsequent proposal of subregions.

KEY WORDS  Great River Road; Missouri; Mississippi River; Getis-Ord; Region

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 (Disque 1967). This set of roads would become known as the Great River Road (GRR), and the Mississippi River Parkway Commission (MRPC) was tasked with overseeing this network of roads. The GRR follows the Mississippi River on both east and west banks from Minnesota to Louisiana. The state of Missouri maintains 395 miles of the GRR along the western bank of the Mississippi River.

The GRR was intended to encourage and promote the movement of motor vehicles through the ten states along the Mississippi River by showcasing the natural, historical, and cultural characteristics therein (Miller 1987). In Missouri, a state statute sets an arbitrary border of the GRR based solely on proximity, including all counties contiguous to the

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Mississippi River (“Missouri State Statutes” 1979) but lacks a regional designation based on social, economic, housing, or demographic characteristics. Overall, the GRR’s impacts on states along the Mississippi River are generally understudied. This study explores those counties in Missouri currently included in the GRR designation, to determine whether they are uniquely “regional.” Spatial analysis of county-level census data is conducted to determine if sociodemographic variables within the counties adjacent to the Mississippi River are unique in defining a GRR region. Through this exploration, the study also examines whether defining characteristics exist that would expand the GRR region to counties beyond those adjacent to the river or whether “subregional” characteristics exist within the current GRR designation.

**LITERATURE REVIEW**

*History of the Great River Road*

The headwaters of the Mississippi River begin in Lake Itasca (central Minnesota). The river then crosses the central United States, moving south before emptying into the Gulf of Mexico. The Mississippi–Missouri River drainage basin is the fourth largest in the world among river systems. Historically, this waterway has been used for the transportation of goods and people throughout the midwestern United States. The unique culture of this region inspired Mark Twain to write his novel *The Adventures of Huckleberry Finn*. The Mississippi River’s economic and cultural identity also inspired the creation of the GRR as a means to preserve and promote this historic waterway and its surrounding areas. The GRR’s history begins in 1936, when the Missouri Planning Board proposed a river road along the full extent of the Mississippi River (Smith 1998). This plan eventually connected ten states and two Canadian provinces, spanning nearly three thousand miles. The MRPC, founded in 1939, adopted many of the same ideas for the river road put forth by the Missouri Planning Board. In the same year, the river road concept gained popularity, and talk began of authorizing studies on the logistics of creating such a road (Smith 1998). Discussion of the river road project ceased until the conclusion of World War II, but in 1951, an official report by the Bureau of Public Roads (BPR) was presented to Congress, outlining the plausibility of a river road (Smith 1998). The recommendation by the BPR favored repairing, widening, and connecting existing road along the Mississippi River as an alternative to new construction projects along the entire extent of the Mississippi River (Smith 1998).

With a clear goal set for the scenic route along the Mississippi River, federal funds were set aside for the river road in the Federal Highway Act of 1954. Over the next two decades, state agencies worked on finding suitable routes for the scenic drive. Even though federal funds were allocated for the GRR, no federal aid was provided; states allocated funding for the project in these early years. In 1976, the Federal Highway Administration finally distributed federal funding to states that followed federal guidelines for the scenic road (Smith 1998).

Since the 1970s, the Great River Road has experienced dwindling federal interest and development. Most travel articles give details for only small sections of the GRR.
Berlin and Chu (2006) photographed locks and dams, barges, homes, watersports, boating, and more along the upper Mississippi River. In 2008, Bures documented several music studios and art museums from Minneapolis, Minnesota, to Davenport, Iowa, insisting that these showed the possible start of a “Midwestern Renaissance.” Measells and Grado (2008) researched the economic impacts of two birding festivals in the state of Mississippi, looking at visitor spending habits at these festivals, as well as general travel expenses. One of these festivals is located along the Great River Birding Trail, which coincided with the GRR’s path within Mississippi.

Despite a change in the nature of visitation along the GRR, Mueller (1998) emphasized the unique opportunity that the entire GRR provides: the ability to see a major world river from headwaters to mouth. The only three river systems in the world that are larger—Amazon, Congo, and Nile—are unable to boast such experiences because of lack of infrastructure. The Mississippi River dominates North America, and any individual with a vehicle can experience it in its geographic entirety. From these examples, it appears that although there is a desire to continue a unifying coherency across the GRR in its entirety, most tourism-related uses of the GRR entail emphases at narrower geographical scales. This lends itself to the postulation that, at least today, the GRR might not necessarily possess unifying and unique socioeconomic characteristics to give it a “marketable” geographic coherency as initially intended. Indeed, using regional taxonomies referenced by Noronha and Goodchild (1992), it appears that the original GRR designation might be better described as “descriptive,” as its definition was founded in cultural and economic heritage.

**Regional Approaches**

Using Missouri as a baseline, this research attempts to determine if the current GRR designation as defined by Congress (proximity to the Mississippi River) resembles a coherent region based on an evaluation with sociodemographic variables. Regions are defined as areas with similar characteristics that set places apart from neighboring locations based on a high level of functional integration. Criteria used to determine a region can vary widely, using multiple variables or a single variable covering geographic, social, economic, and/or historic aspects of a space (Castree, Kitchin, and Rogers 2013). The purpose of creating a region can ultimately affect how that region’s boundaries are set and interpreted, as well as the allocation of federal funds or forms of policy.

Formal and functional classifications can serve as the foundations for creating specific regions. These regional designations can create significantly different outcomes in the overall purpose or practical outcomes that a region may experience. These “regional taxonomies” (Noronha and Goodchild 1992) can begin to tie measurable variables to regions for better assessment of needs. For example, utilizing variables of poverty to create a coherent region may allow economic policy to specifically address areas that adhere to such criteria, thereby geographically targeting areas in need. Kasala and Šifta (2017) discuss in more detail the nature of creating and defining regions as they explore the historical progression of formal and functional regions, noting the complexities ruminated on by others, such as Sauer (1925) and Hartshorne (1939), as regional definitions are,
invariably, products of both natural and cultural landscapes. These authors also discuss the historical progression of formal and functional regional analysis.

A *formal* region is generally defined by measurable characteristics (e.g., political, economic, or climate regions). Noronha and Goodchild (1992) discuss the formal region by citing Minshull (1967), who describes a formal region as “the largest area over which a generalization remains valid.” Formal regions can allow for decision-makers to benchmark based on specific sociodemographic or physical variables and for regional boundaries to be defined by a more quantitative spatial variable. Outcomes defining regions as such can fall short, as they might be based on “individual expertise” opinions (Noronha and Goodchild 1992) or rely heavily on too few variables. Kasala and Šifta (2017) explore the notion that formal regional definitions in more recent times have yielded to more functional definitions such as those of Paasi (2010) and Nir (1990), who base their theory on social constructs and systems theory.

*Functional* regions differ from formal regions in that they are often seen as derivations arising from human activity and cannot be bounded by a “uniformity of characteristics, but a network of social and economic” characteristics (Noronha and Goodchild 1992). In this sense, “internal diversity” exists within such regions, juxtaposing them against the intended goals of formal regions. The authors go on to note that although bonds within a functional region may derive from shared attributes, in this case, such attributes are not directly relevant to the functionality or existence of the region. The strength of this regional designation is based on networks, interactions, and end-outcome goals of those defining the regional boundaries. While Kasala and Šifta (2017) emphasize that functional regions tend to be viewed as a “new regional geography,” they also underscore both advantages and weaknesses to this functional approach. The notion of a functional region taps into processes and political and social themes, increasing the potential practicality of such a definition; however, issues such as complexity and “transferability” often render functional regions isolated, hindering comparability and practicality beyond their own boundaries.

*Regional Overviews*

Regions are important in identifying and addressing problems affecting large areas (Coanen, Hanson, and Rekers 2015). The Appalachian Regional Commission (ARC) and the Lower Mississippi Delta Development Commission (LMDDC) are congressional commissions and federally funded organizations focused on functional regions. These regions are functional in the sense that they are created by formal governing bodies based on perceived networks, not on a set of clearly defined criteria. Often, this focus includes studies to identify problems (usually concerning economic development) and resultingly encourage economic growth. As this research seeks to determine if the GRR can be defined as a formal region with coherent socioeconomic foundations, it is important to analyze other regions with similar attributes.

The Appalachian region is a good example of a functional sociocultural region with economic development underpinnings. The ARC was established by Congress to help identify and address slow economic growth in the geographic highlands of the eastern
United States, including more than four hundred counties in thirteen states. Joshi and Gebremedhin (2012) conducted a study using the regional boundaries set by the ARC to explain poverty rates and wealth disparities in the Appalachian region using variables such as education rates, minority populations, urban/rural distinctions, and workers in industries. Gerbremarian, Gebremedhin, and Schaeffer (2011) also conducted an economic review of the ARC, demonstrating correlations between employment and poverty through variables of employment, migration patterns, and median household income.

The Mississippi River Delta is another functional region in the United States with economic development underpinnings. Like the ARC, the LMDDC focuses on identifying and addressing a lack of regional economic growth. Latanich (2001) assesses the LMDDC region, identifying education rates, lack of infrastructure, poor incentives for outside investment, and a lack of new industries as some of the reasons for stagnant economic growth. Reeder and Calhoun (2002) review the Delta Regional Authority (DRA), which identifies 219 counties in the lower delta region in need of economic stimulation. Of these counties, 188 are identified as rural. Reeder and Calhoun (2002) find that, based on unemployment and household income data, urban counties benefit more through federal funding and programs than do the region’s rural counties.

It must be noted that the current delineation of the GRR appears to align with the definition of a functional region, in which the initial function was to promote tourism and economic activity through ties to cultural and economic heritage. Two key elements underscore this connection:

1. congressional designation without a strictly defined formal data basis and
2. a focus on human networks based on cultural ties and economic uses of the Mississippi River.

In many ways, this region is formalized with physiographic (Mississippi River and its alluvial plain), cultural (historical tourism), and economic-development (“westward expansion” and barge commerce) underpinnings, further stressing the network of dynamic variables (both human and physical) that interplay with its boundaries. Such a designation grounded in tourism and economic development is not unique, as areas such as the Tennessee River Valley, Lakes to Locks Passage, Columbia River Gorge, and Route 66 National Scenic Byway are all bases for comparison.

Areas identified above have served as coherent regions for applying economic development through tourism or other means, although they generally appear to be without strict formal designations. It is important to review beyond such functional regions to determine if key socioeconomic variables might also define a region based on those variables observed in spatial coherency such as within formal regions. Because of the complexities involved in crafting regions (Kasala and Šifta 2017), experts functionally or perceptually grouping a region for larger purposes can unintentionally obscure subregional needs, thereby hampering more efficient economic development. Additionally, regions such as the GRR, with economies shifting because of globalization, may over time become
out of sync with present needs. It should be noted that the GRR initially was promoted via economic and cultural coherencies that have changed significantly over the past 50 years.

In review, we observe the GRR to be a functional region based on historical networks and bounded by geographic proximity. The observed outcomes of waning interest in the GRR might be a result of a misalignment from the initial criteria to define the GRR and the historical evolution of the sociodemographic situation throughout the GRR region. Knowing this, we seek to determine if any underlying sociodemographic variables exist that would lend a potential to craft the GRR in Missouri as a formally defined region based on characteristics existing today. In doing so, we look to identify the potential for expansion of the region based on a formal variable or whether formal subregions exist within the larger mystique of Missouri’s GRR as it exists today.

The Great River Road in Missouri

Missouri was chosen for this study as a microcosm of the Mississippi River for several reasons. Missouri’s Mississippi riverfront represents both urban (St. Louis) and rural populations. The geographic distinction between the upper and lower Mississippi River is normally based in the state of Missouri. This location is often designated at either the confluence of the Mississippi and Ohio Rivers (southeastern Missouri) or the confluence of the Mississippi and Missouri Rivers (east-central Missouri). Regardless of the chosen inflection point, Missouri is situated in both the upper and lower portions of the Mississippi River, which is a significant guiding factor in economic development. For example, two federally funded commissions—the DRA and LMDDC—both set the boundaries of the delta south of St. Louis, encompassing most of southeastern Missouri (Latanich 2001; Reeder and Calhoun 2002).

METHODOLOGY

Study Area

The geographic limits for this study are established by the political boundaries for the state of Missouri. Missouri contains 114 counties and one independent city, the City of St. Louis. For this study, the City of St. Louis is treated as another county within Missouri. Emphasis is placed on the 17 eastern counties encompassing the GRR (“Missouri State Statutes” 1979). Table 1 lists these counties from north to south along the Mississippi River in three economic regions based on designations given by the Missouri Economic Research and Information Center (MERIC).

Figure 1 highlights the 17 GRR counties on the eastern side of Missouri determined by the Missouri state statute (“Missouri State Statutes” 1979). These counties act as a border for Missouri’s GRR region as defined by the MRPC. The distinction between GRR counties and non-GRR counties is based on founding MRPC article 226.455, section 3, which 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).

Table 1. Missouri Counties Located along the Mississippi River, North to South

<table>
<thead>
<tr>
<th>Northeast Region</th>
<th>St. Louis Region</th>
<th>Southeast Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark County</td>
<td>St. Charles County</td>
<td>Ste. Genevieve County</td>
</tr>
<tr>
<td>Lewis County</td>
<td>St. Louis County</td>
<td>Perry County</td>
</tr>
<tr>
<td>Marian County</td>
<td>City of St. Louis</td>
<td>Cape Girardeau County</td>
</tr>
<tr>
<td>Ralls County</td>
<td>Jefferson County</td>
<td>Scott County</td>
</tr>
<tr>
<td>Pike County</td>
<td></td>
<td>Mississippi County</td>
</tr>
<tr>
<td>Lincoln County</td>
<td></td>
<td>New Madrid County</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pemiscot County</td>
</tr>
</tbody>
</table>

Figure 1. Map of Missouri Counties and the GRR
Missouri categorizes counties into ten regions based on the categorization of the MERIC, which distinguishes ten regions, with each border based on general labor needs and dominant industries for local economies in each county (Figure 2). These economic regions are defined based on labor demands, coupled with unemployment and prevalent industries in each county. Data are centralized geographically to create contiguous regions of similar labor and economic makeup to better assess and assist economic growth within the state (MERIC 2020). The GRR crosses three MERIC economic regions in eastern Missouri: the Northeast, St. Louis, and Southeast regions. None of these regions exists exclusively within the GRR designation. The three easternmost 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 a GRR region.

Figure 2. The Ten Regions of Missouri as Defined by MERIC

Data Collection and Analysis

U.S. counties are used in many regional studies and are an appropriate level of analysis for determining the socioeconomic characteristics along the Mississippi River. Previous
reviews have focused on regions with boundaries based upon political, economic, or geographic indicators, or a combination of the three. Using county boundaries to delineate regional borders gives regions a better ability to handle environmental, social, and economic issues facing those areas (Coanen et al. 2015). Regional incorporation can prove to be invaluable in assessment of future problems such as climate change, aging populations, and economic stagnation, among other concerns.

This research is exploratory in that it seeks to determine if a spatial set of socioeconomic variables applies to the current GRR area within Missouri. Previous studies mentioned (Gerbremarian et al. 2011; Joshi and Gebremedhin 2012; Latanich 2001; Reeder and Calhoun 2002) review socioeconomic variables such as education, labor, unemployment, race, income, and home value to determine the economic condition within an existing formally defined region. This study has no luxury of a clearly defined border other than a state statute based on proximity to the Mississippi River. Such an arbitrary border does not adhere to economic or historical aspects and only broadly adheres to a single geographic characteristic: proximity to the Mississippi River. In the absence of a well-studied and -understood border, it is necessary to collect, review, and analyze a wide range of available data pertaining to social, economic, housing, and demographic characteristics to determine if any unknown regional patterns are present. Because of this, we analyzed 24 variables to provide a more comprehensive overview of potential socioeconomic patterns within the GRR area.

County-level census data for the state of Missouri were obtained 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 (ACS) (overseen by the U.S. Census Bureau), specifically the five-year estimates from 2014 through 2018. The 2014–2018 data collected by the ACS was the most current five-year estimate available at the start of this study. Of 41 variables in the data set, only 24 variables were identified for further analysis. These 24 variables cover social, economic, housing, and demographic data to determine which variable characteristics are most appropriate when defining a GRR region (Table 2).

**Table 2. ACS Variables Analyzed in This Study (Alphabetical)**

<table>
<thead>
<tr>
<th>Age</th>
<th>Home Value</th>
<th>Origin of Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizenship Status</td>
<td>Household by Type</td>
<td>Other Income</td>
</tr>
<tr>
<td>Class Worker</td>
<td>Household Income</td>
<td>Race</td>
</tr>
<tr>
<td>Disability by Age</td>
<td>Housing Characteristics</td>
<td>Residence 1 Year Ago</td>
</tr>
<tr>
<td>Education</td>
<td>Housing Occupancy</td>
<td>School Enrollment</td>
</tr>
<tr>
<td>Employment Status</td>
<td>Insurance Coverage</td>
<td>Workers by Industry</td>
</tr>
<tr>
<td>Family Income</td>
<td>Internet Use</td>
<td>Workers by Occupation</td>
</tr>
<tr>
<td>Heating Fuel</td>
<td>Marital Status</td>
<td>Year Structure Built</td>
</tr>
</tbody>
</table>

Using census data for economic reviews of specified regions is established in previous research (Brasington, Hite, and Jauregui 2015; Daly, Jackson, and Valletta 2007;
Vinje 1977). Daly, Jackson, and Valletta (2007) study the income gap in the United States based on education attainment and age compared to unemployment. A study of “Indian reservations” by Vinje (1977) analyzes per capita income as it relates to labor in manufacturing, agriculture or government industries, unemployment, labor participation, and geographic characteristics. Brasington, Hite, and Jauregui (2015) study housing prices based on race and education attainment of homeowners to correlate which individuals and neighborhoods have higher-valued homes.

The primary method for analyzing the data is spatial analysis software. Quantile classification is utilized for data representation to account for the broad variety of variables in this study (Brewer and Pickle 2002). Quantile classification places the same number of samples (counties) in each category, which allows for a more accurate comparison between variables that do not share the same scaling method (e.g., USD, population, number of households). For this study, 115 counties are divided into five groups, placing 23 counties in each sample group.

Additional spatial analysis is 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 (Songchitruksa and Zeng 2010). “Hot spots” represent sections of the study area that have higher values in the data set. For example, the total population data hot spot represents a spatially significant area with higher populations, compared to the rest of the study area, centered around urban counties (St. Louis and Kansas City). “Cold spots” represent sections of the study area with lower values based on the data set. A “cold spot” concerning total population represents a spatially significant area with low populations compared to other parts of the study area (northern Missouri). This analysis considers not only the cell (county) value being analyzed but also the neighboring cells’ values. Using this method of analysis, Getis-Ord GI finds spatially significant hot and cold spots within a data set. It calculates the numerical value of the variable with 90%, 95%, and 99% confidence for both spatially hot and cold value points in the study area.

Although the GRR is designated as a national scenic byway and possesses certain unique characteristics pertaining to its history, culture, and relevance to the Mississippi River, its ability to be classified as a formal region based on socioeconomic standards is unknown. In this study, we asked if the GRR in Missouri has distinctive socioeconomics that allow it to be defined as a coherent region. Additionally, we analyzed this further to determine if there existed socioeconomic-based subregions within the Missouri GRR in its current extent. We further analyzed whether any coherent area(s) should extend beyond the immediate counties adjacent to the river. In answering these questions, we used three basic reviews to act as guides while analyzing the data:

1. Is the data category representing a product of a GRR distinction or an urban/rural dichotomy? This distinction is made by looking at the percentage of a county’s population living in urban areas in addition to the percentage of the county’s land area classified as urban (Figure 3).
2. Is the data category representing a GRR region or another Missouri subregion such as those defined by MERIC (Figure 2)?
3. Is the data category predictive of national-level regionalization beyond Missouri, such as that of a lower/upper Mississippi River distinction? Geographically, the upper-lower Mississippi River divide is close to the Missouri border. Socially and economically, several federal commissions include southern Missouri in studies and programs to help the Mississippi Delta region.

Figure 3. Percent Urban Area and Population by County

RESULTS AND DISCUSSION
Data are segmented into four categories: social, economic, housing, and demographic. This grouping system is taken from the U.S. Census Bureau’s classifications of the data.
Each variable is assessed based on urban and rural counties, Missouri subregions, and a north/south Missouri distinction outlined in the methodology section. Quantile representations and hot spot representations are analyzed simultaneously to reduce visual errors when identifying spatial patterns. Every variable mentioned in this study is assessed; however, only variables deemed spatially significant for the development of a regional analysis are listed in this section. Within figures representing quantile categories, the legend is displayed in decimal percent to the thousandths (one tenth of one percent); within figures representing the GI statistic, all red and blue shades represent spatially significant outcomes, with the gradation of color indicating 90%, 95%, or 99% confidence in data results.

Social Characteristics

Figure 4 shows the quantile representations and Getis-Ord GI hot spot analysis representations for educational attainment. The first variable pertains to the percentage of the population without a high school diploma, which is much higher in southern Missouri.

Figure 4. Quantile and Getis-Ord GI Representations of Education Attainment

![Quantile and Getis-Ord GI Representations of Education Attainment](https://scholar.valpo.edu/mssj/vol25/iss1/10)

**Note:** Quantile categories are displayed in decimal percent to the thousandths (one tenth of one percent).

The hot spot analysis confirms a spatially significant hot spot in the Southeast and South Central regions of the state. Also a part of this hot spot is the “boothel” region,
including three GRR counties adjacent to the Mississippi River. Other areas, including urban centers (St. Louis and Kansas City) and the Northwest region of Missouri, indicate a higher percentage of the population with at least a high school diploma, evident by the cold spots shown in these counties. The second variable, “bachelor’s degree or higher,” indicates that more of the population in urban areas and in counties with educational state institutions (Greene County’s Missouri State University, Cape Girardeau County’s Southeast Missouri State University, Boone County’s University of Missouri, and Nodaway County’s Northwestern Missouri University) has obtained college degrees, although only three spatially significant hot spots are identified: St. Louis, Kansas City, and Cape Girardeau County.

Internet use variables are normalized by the total number of households in each county. Figure 5 shows the quantile representations and Getis-Ord GI hot spot analysis representations for Internet usage. Higher percentages of households in urban areas have access to broadband Internet. These same areas show a lower percentage of households without Internet access. The South Central and Southwest regions in particular have higher percentages of households with no Internet access, compared to other regions in Missouri. These trends and hot spots are centered on the borders of Missouri with Arkansas and Oklahoma; further study over these border counties may show that this trend crosses state lines. These variables are predominately an urban/rural distinction while also showing some regional variations.

**Figure 5. Quantile and Getis-Ord GI Representations of Internet Use**

*Note:* Quantile categories are displayed in decimal percent to the thousandths (one tenth of one percent).
Economic Characteristics

Figure 6 shows the quantile representations and Getis-Ord GI hot spot analysis representations for employment status. Higher percentages of “females in labor force” are located in urban areas and in the Northwest region. This is in contrast to the South Central and Southeast regions representing lower percentages of female workers. GRR counties in the Southeast region are outside of this trend with higher percentages seen in other regions. This can be disputed, however, when looking at the spatial analysis detecting hot spots in St. Louis, Kansas City, the Jefferson City area, and Perry County.

Unemployment in the state is more prevalent in the South Central and Southeast regions. St. Louis has higher unemployment compared to other urban counties. The spatial analysis shows a trend of hot spots in the bootheel and St. Louis areas, as well as the southern portion of the state crossing into both the Central and South Central regions. The Northwest region exhibits a large cold spot, indicating lower percentages of unemployed individuals.

Figure 6. Quantile and Getis-Ord GI Representations of Employment Status

Note: Quantile categories are displayed in decimal percent to the thousandths (one tenth of one percent).

Workers-by-occupation variables examine the number of workers in varying occupations and are normalized by the population over the age of 16 in each county. Figures 7 and 8 show the quantile representations and Getis-Ord GI hot spot analysis representations for workers by occupation. Farming, fishing, and forestry occupations...
are prevalent along the northern border counties as well as in the South Central and Southeast regions. Hot spots indicate a pattern of rural counties having a higher percentage of the workforce in these occupations. Service jobs are again prevalent in the South Central and Southeast regions. The bootheel counties are especially high in service jobs; hot spots appear in the bootheel and other counties in the Southeast region. Management, business, science, and arts occupations are centered around urban areas, with spatially significant hot spots centered on St. Louis and Kansas City. Construction and extraction occupations are more prevalent in rural areas surrounding urban centers. There is a drop in the percentage of workers in this occupation in bootheel counties, including the three most southern GRR counties. This may be evidence of lack of new development within this area of the GGR region.

**Figure 7. Quantile Representations of Workers by Occupation**

![Quantile Representations of Workers by Occupation](image)

*Note: Quantile categories are displayed in decimal percent to the thousandths (one tenth of one percent).*

Workers-by-industry variables reflect the number of workers in each industry and are normalized by the population over the age of 16 in each county. Figures 9 and 10 show the quantile representations and Getis-Ord GI hot spot analysis representations. Agriculture, forestry, fishing, and mining industries have similar patterns with farm, fishing, and forestry occupations. “Agriculture, forestry, fishing, mining” represents hot spots in rural counties in the South Central region and in northern border counties. Wholesale trade shows an interesting pattern of higher
percentages of workers in the labor force along the GRR, with the exception of Clark County in the north and several counties in the bootheel. Hot spots are present along the Mississippi River north of St. Louis and in the Ozark and Southwest regions. Finance, insurance, and real estate industries are prevalent in the urban areas of St. Louis, Kansas City, and Springfield. Hot spots are centered around St. Louis and Kansas City, with a large cold spot in the southern portion of the Central region and parts of the South Central region. Finally, construction industry jobs, similar to construction and extraction occupations, are centered in counties close to urban centers, including St. Louis and Kansas City. A larger cold spot can be seen in the bootheel, again indicating a lack of development in this area of the state.

**Figure 8. Getis-Ord GI Representations of Workers by Occupation**

Household income consists of many variables covering income and is normalized by the total number of households in each county. Figures 11 and 12 show the quantile representations and Getis-Ord GI hot spot analysis representations. Households making less than $10,000 are more prevalent in the south, particularly the South Central and Southeast regions. Hot spot analysis confirms a spatially significant hot spot along the southern border of the state.
Figure 9. Quantile Representations of Workers by Industry

Note: Quantile categories are displayed in decimal percent to the thousandths (one tenth of one percent).

Figure 10. Getis-Ord GI Representations of Workers by Industry
Figure 11. Quantile Representations of Household Income

Note: Decimal percentages are shown to the thousandths (one tenth of one percent).

Figure 12. Getis-Ord GI Representations of Household Income
“Household income $75,000 to $99,999” shows patterns of higher percentages in urban counties and in counties along the Mississippi and Missouri Rivers. Counties clustered around Kansas City also create a large hot spot in western Missouri. Households with income greater than $200,000 are clustered around urban counties and the Southwest and Ozark regions, although St. Louis and Kansas City and surrounding counties are the only spatially significant hot spots. Finally, “median household income” shows hot spots in the St. Louis and Kansas City areas. A significant cold spot can be seen along the southern border in both the South Central and Southeast regions. Counties along the GRR have higher median household incomes than do counties farther to the west. This trend stops in Scott County and south, into the bootheel. This area is a part of the cold spot mentioned previously, indicating lower average household income.

Housing Characteristics

“Year structure built” variables in this section cover the decades in which homes of each county were constructed. These variables were normalized by total housing units in each county. Figures 13 and 14 show the quantile representations and Getis-Ord GI hot spot analysis representations. Structures built before 1939 are clustered in the Northeast and Northwest regions as well as the City of St. Louis and the Kansas City area. Structures built in the 1950s show two hot spots, one of which is located in the Southeast region of the state. This may imply population shifts and a lack of new housing developments in the region. Structures built in the 1960s show a westward spread, away from the Mississippi River. The bootheel has spatially significant hot spots with higher percentages of structures built in this decade. Finally, a higher percentage of structures were built in the 2000s in the center of Missouri, including the Central, South Central, and Ozark regions. Counties outside of urban centers exhibit higher numbers of structures from that decade as well. Counties outside of St. Louis and the Ozark region are spatially significant hot spots. The bootheel is a large cold spot for the same decade, indicating a lack of new construction in the area during the period.

Home value is broken up into separate categories that represent the number of homes in that value bracket. The variables in this section were normalized by occupied housing units in each county. Figure 15 shows the quantile representations and Getis-Ord GI hot spot analysis representations. Home values less than $50,000 are found more in rural areas, in both the north and south. Urban areas, including St. Louis, Kansas City, Springfield, and Jefferson City, show separate cold spots throughout the state. The cold spot in eastern Missouri extends south of St. Louis along the Mississippi River. Median home value shows a similar distinction between urban and rural counties. Urban areas have higher home values, with hot spots in the St. Louis, Kansas City, Ozark, and Central regions. The trend of higher home values follows the Mississippi River south of St. Louis. This is not the case in the extreme northern GRR counties or the extreme southern GRR counties, with cold spots being present in both areas.
Figure 13. Quantile Representations of the Years Structures Were Built

Note: Decimal percentages are shown to the thousandths (one tenth of one percent).

Figure 14. Getis-Ord GI Representations of the Years Structures Were Built
Figure 15. Quantile and Getis-Ord GI Representations of Home Values

Note: Decimal percentages are shown to the thousandths (one tenth of one percent).

Demographic Characteristics
Race variables are normalized by total population in each county. Figure 16 shows the quantile representations and Getis-Ord GI hot spot analysis representations. The “female” variable appears to be somewhat random when looking at the quantile representation. Urban areas are often characterized by more than 50% of the population being female, but this is also true in many rural areas. There is some difference shown in the Northeast and Northwest regions, with lower percentages of female populations. This is contrasted with the generally higher values in the Southeast, South Central, and Ozark regions. The hot spot analysis shows two cold spots, one in the Northwest region and one in the Southeast region.

African American populations are similar to female populations, with no major urban or rural distinction shown in the quantile representation. Higher percentages of African American populations in the Southeast and Central regions are notable; however, hot spot analysis shows that only the counties in the bootheel along the GRR are spatially significant hot spot rural counties. The urban counties of St. Louis and Kansas City also show up as hot spots for African American populations.
CONCLUSION

The results of this study have brought to attention a significant number of patterns and spatially based trends that help with better defining and understanding the Missouri GRR area as it is today. The overall coherency of these variables seems to be observed, not at a spatial regional representation of the GRR, but at other geographic levels. Notably, distinct sociodemographic disparities exist between rural and urban (St. Louis) counties. Additionally, differences exist in the rural counties north of the St. Louis metropolitan area and those south, indicating more regional representation beyond an urban/rural dichotomy. Differences in sociodemographic variables within a grouping of rural counties north and south of St. Louis are prominent in terms of education (Figure 4), unemployment (Figure 6), household income (Figures 11 and 12), and gender and race (Figure 16).

Exploring our initial regional assessment of the GRR, however, leads us to conclude that no unifying sociodemographic characteristic, or apparent combination of characteristics, in the assessed data allow for a formal region to be established, though additional variables and analysis are needed to strengthen this assumption. That said, based on the variables used in this study, it appears that, structurally, the GRR area resembles a functional region based on its initial (Congress-approved) designations: proximity to the Mississippi River, with the theoretical foundation of establishing a coherent area based on social and cultural heritage, and economics. Looking more at formal designations requires

Note: Quantile categories are displayed in decimal percent to the thousandths (one tenth of one percent).
future research in spatial modeling and a factor-type analysis to determine if a coherent combination of socioeconomic variables might allow for a better designation as a formal region designation.

The presence of a single GRR region within the state of Missouri is difficult to determine. With that said, the spatial analysis in the research did lend credence to the ability to identify three subregions we feel are worth note. Based on visual patterns represented through quintile classification and confirmed as spatially significant through Getis-Ord GI hot spot analysis, we propose that the GRR region in Missouri be split into three subregions, two of which require adding breadth, by the inclusion of adjacent counties. We term these Missouri subregions the North GRR, the Greater St. Louis GRR, and the South GRR. Figure 17 shows each subregion, as well as original GRR region.

Figure 17. Proposed Missouri GRR Subregions

![Missouri Great River Road](image)

The North GRR subregion begins with Clark County, bordered by Iowa to the north and extending southward to Pike County’s southern border, approximately 60 miles north of St. Louis. Only the five counties adjacent to the Mississippi River are included in this subregion. With no spatially significant patterns, it is difficult to place additional counties west of the original GRR into this subregion. Counties in the Northeast region along the
Missouri–Iowa border appear to share more similarities than other GRR-based regions or subregions. Resultingly, counties west of the original GRR region in northern Missouri are not added as part of a GRR region or subregion. This new region’s southern extent, Pike County, is seen as separate from the Greater St. Louis GRR subregion using spatial representation and hot spot analysis of the variables “household with broadband Internet”; “females in labor force”; “fishing, farm, forestry”; “agr., fishing, mining”; “finance, insurance, real estate”; “household income $200,000 or more”; “median household income”; “year structure built 1939 or earlier”; “year structure built 1960 to 1969”; “home value less than $50,000”; and “median home value.” These variables all show a spatial distinction between the St. Louis area and the North GRR subregion.

The Greater St. Louis GRR begins in Lincoln County in the north and extends to Cape Girardeau County in the south. This subregion consists of eleven total counties, three of which (Warren, Franklin, and St. Francois) were newly added to the GRR region. The addition of these counties is grounded in data within this study but is also consistent with the St. Louis Missouri statistical area designation (U.S. Census Bureau 2020) These counties are more comparable with the demographics and socioeconomic makeup of St. Louis than with those of other regions in Missouri, including the North and South GRR subregions. Several variables help define the Greater St. Louis GRR region, including “bachelor’s degree or higher”; “no Internet”; “with broadband Internet”; “females in labor force”; “finance, insurance, real estate”; “median household income”; and “median home value.” These variables show a clear divide from the North GRR, above Lincoln County, and the South GRR, south of Cape Girardeau. These variables also show that three counties (Warren, Franklin, and St. Francois) share similar characteristics with the St. Louis area and the greater St. Louis GRR subregion.

The South GRR subregion begins in Scott County and includes the Missouri bootheel counties, extending to the southern border with Arkansas. A total of seven counties is included in this subregion, with three counties (Stoddard, Butler, and Dunklin) added beyond the original GRR designation. These seven counties closely associate with one another based on the variables “9th to 12th grade no diploma”; “unemployed civilians”; “construction, extraction”; “construction”; “households less than $10,000”; “median household income”; “year structure built 1960 to 1969”; “year structure built 2000 to 2009”; “home value less than $50,000”; “median home value”; and “African American.” These variables indicate unique characteristics separate from the Greater St. Louis GRR and North GRR subregions.

Data analysis of the GRR in Missouri provides an interesting look into not only the GRR but also the entire state of Missouri. Three subregions are identified as stated above, each with unique characteristics. St. Louis is a large urban center along the Mississippi River, with rural counties to the north and the south; however, an urban/rural distinction cannot be definitively proven, as within Missouri, northern rural counties and southern rural counties along the Mississippi River show different unifying characteristics based on the spatial analysis. These lead to a conclusion that the North GRR and South GRR in Missouri are distinct regions, with the urban center of St. Louis dividing the two. Finally, the data suggest that the economic regions of Missouri as denoted by MERIC are not conducive measures for attempting to define a GRR region or subregions.
This research completed within Missouri does not give a clear formal boundary for the GRR based solely on sociodemographic data from the U.S. Census. Data in this realm are helpful in identifying subregional patterns and urban and rural distinctions but, in general, fall short in identifying significant differences between Missouri counties and GRR counties. Additional analysis based on physical features along the Mississippi River, including topography, climate, vegetation, and wildlife, may help strengthen or dispute findings from this study.

The Great River Road is a distinctive feature in the heartland of the United States, but the cities, towns, and country it passes through are all unique. We have found that understanding this “region” requires an interplay of different regional approaches. Kasala and Šifta’s (2017) model for regional analysis consists of three approaches to understanding regions: (1) with objectivity, using contextual understanding; (2) with personality, through phenomena and specificities; and (3) with identity, through sense of place and subjective experience. Based on this model, the originating regional nature of the GRR might best be defined functionally as a coherent whole through its personality (#2)—that of a “Twainesque” cultural reflection within proximity of the Mississippi River. Undoubtedly, though, subregions within the GRR exist today. More formally defined subregions within Missouri were identified in this paper using objective sociocultural data (#1) and spatial analysis.

Finally, though not directly explored in this research, it is apparent that this regional analysis would be aided by further analysis of subjective experiences shaped by personal sense of place (#3). Such analysis of how, culturally, today’s GRR and its subregions shape and have been shaped by its historical “persona” will provide for a successful path toward sustainable development policy within a redefined GRR region.

REFERENCES


