An exploration of rural transportation policies through quantitative selection of case studies

by

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A REPORT

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Abstract

Personal automobile use is commonly recognized as impacting public health, environmental sustainability, land use, and household expense. Car use is closely tied to car ownership rates, and fewer cars per household could indicate greater utilization of alternative modes of transportation. Most car ownership and active transportation research focuses on urban areas. However, much of the United States remains rural, and different factors may impact car ownership in less-densely populated areas. This research examines car ownership trends in rural counties to identify communities with lower than expected rates of car ownership considering demographic factors. 2,285 counties in the continental United States were identified as rural according to guidelines found in the Agriculture Act of 2014. These counties were grouped into five regions based on U.S. Census Bureau definitions. To identify counties of interest, an Ordinary Least Squares regression was created for each region that incorporated data from the 1990 Decennial Census and 2014 5-year American Community Survey. Two counties from each region were selected and studied for policies that may be correlated with car ownership rates: a county with a lower-than-expected car ownership rate change and a county with a typical car ownership rate change to serve as a control. Local professionals were interviewed and relevant policies summarized.

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Dedication

In memory of my father, who had a fondness for pickup trucks.

Chapter 1 - Introduction

Community planners have a vested interest in household car ownership. Personal automobile use is commonly recognized as impacting public health, environmental sustainability, land use, and household expense. Automobile use contributes to obesity, traffic injuries and fatalities, greenhouse gas emissions and climate change, stormwater runoff, and sprawl. Car ownership is strongly correlated with the amount of miles driven (De Jong, Fox, Daly, Pieters, & Smit, 2004). As a result, automobile ownership has been extensively studied in an attempt to predict and reduce car ownership.

Most studies focus on urban areas, where there are typically more opportunities for people to walk or take public transit. However, the majority of the land area of the United States is still rural in nature. Urban land roughly quadrupled from 1945 to 2007, but as of 2007 only 61 million acres, or less than 3 percent of total land area, were classified as urban (Nickerson, Ebel, Borchers, & Carriazo, 2011). While the country continues to urbanize, a preference for urban living is a fairly new trend. Almost 20 percent of residents still lived in rural areas as of the 2010 Census (US Census Bureau, 2015a). Car ownership rates tend to be higher in rural areas. Higher rates mean that there is a greater potential for reduction.

Rural areas may benefit from different transportation demand management interventions than those recommended for urban areas. In fact, policies that may effectively reduce car ownership in urban areas may be ineffective or damaging to rural communities.

How, then, can planners find techniques to reduce car ownership that work well in rural areas? Experimenting with policies is time consuming, expensive, and potentially damaging. To reduce risk, planners often use other communities for benchmarks and ideas. But identifying positive role models can be haphazard: case studies are conducted on communities that are familiar, convenient, or famous. These selection criteria mean that excellent examples may go undiscovered.

Instead, the place to start is by identifying areas where car ownership rates are decreasing, or even increasing at a lower rate than expected, considering the area's demographic profile. Once such areas are identified and studied, proven policy interventions to reduce car dependence can be documented and shared.

Chapter 2 - Background

Car Ownership

There are many ways to categorize household vehicle dependence, including type of car, vehicle miles traveled (VMT) and number of cars owned. Considering the geographic scope of this research, the focus of this study is limited to vehicle ownership.

There is a strong interest in reducing car ownership rates in order to improve public health and reduce transportation's impact on the environment (Sallis, Floyd, Rodríguez, & Saelens, 2012; Wachs, 2000). Not surprisingly, car ownership has been correlated with many variables, including economic, demographic, and environmental factors.

Defining Rural

One key environmental factor is whether or not a household lives in an urban or rural setting. Pinning down exactly what urban or rural means is complicated: definitions vary quite a bit between and even within countries. The *Rural Transportation Planning Guidebook* notes that there are many ways to define rural. The US Department of Transportation considers all areas outside of metropolitan areas with a population of 50,000 or greater to be rural (Goodwin, Overman, & Rosa, 2004) while the United States Department of Agriculture defines rural as areas with a population up to 35,000 and rural in character (US Department of Agriculture Rural Development, n.d.). While the United States Government defines rural in more than one way, the Farm Bill definition includes the "rural in character" clause, which acknowledges that population density alone does not define rural areas. The Farm Bill is also tied to funding for home loans. Housing costs and location are closely related to transportation (Haas, Newmark, & Morrison, 2016).

As previously mentioned, most studies regarding car ownership focus on households in urban areas (Caulfield, 2012; Holtzclaw, Clear, Dittmar, Goldstein, & Haas, 2002; Lee & Senior, 2013). Greater population density generally provides more transportation mode options, but it also draws attention to issues such as traffic congestion or parking shortages. These two factors, transportation options and perceived need, make urban areas ripe for study. Rural areas are often overlooked by researchers, perhaps because of the misconception that there are no alternatives to cars in rural areas. Some studies happen to include rural areas because the datasets do, and a few

explicitly compare rural and urban areas (J. M. Dargay, 2002; Pyddoke & Creutzer, 2014). Occasionally a study focuses explicitly on rural areas (Jovic, Rankovic Plazinic, & Stepe, 2013).

As a result, transportation policies can be urban-centric, potentially to the detriment of rural communities. In fact, Jovic and Rankovic Plazinic (2013) argue that rural areas require separate transportation studies and policies from urban areas and Goodwin, et al. (2004) agree. Dargay (2002) found that certain factors were more strongly correlated with car ownership in rural areas than in urban. For example, households in rural areas of the United Kingdom are quite insensitive to fuel or car purchase cost increases, perhaps because they have little choice but to drive. She notes that instead of country-wide increases to car ownership costs, such as additional taxes, techniques such as congestion pricing may be more equitable. Jovic and Rankovic Plazinic expressed concern that increasing car ownership costs in order to decrease car use, an effective strategy in urban areas, penalizes rural residents who may not have other transportation options.

Demographic and Environmental Factors

Car ownership is typically studied at the household level. Pyddoke and Creutzer (2014) noted that individuals often have access to household cars that may not be registered in their name, so studying individuals alone would not reflect whether they contribute to purchasing and using a car. Income, too is usually shared among individuals in a household, and income is strongly correlated with car ownership (J. Dargay & Hanly, 2007; J. M. Dargay, 2002; Flamm, 2009; Schimek, 1996) for both rural and urban households (Pyddoke & Creutzer, 2014).

Age of the head of household and car ownership are also thought to be correlated. Pyddoke and Creutzer (2014) found that car ownership is impacted negatively if at least one adult in a household is older than 66 years or younger than 25. Schimek (1996) agreed that households with young heads had lower rates of car ownership, but defined under 35 as young. Dargay (2002) noted that over a lifetime, car ownership is fairly low for younger adults, and increases rapidly as they age. Once any children begin to move out of the house and the head of the household begins to approach retirement, car ownership rates begin to drop again. But this trend may not be attributable simply to age, because age is also correlated with income and family composition. Oakil et al. (2013) closely examined life cycle events and car ownership. They concurred with Dargay (2002) that as a head of household ages, households tend to increase in size due to marriage and births, events which lead to increased car ownership.

Population density is often correlated with car ownership. Although, there have been mixed conclusions about how strongly density by itself is correlated with car ownership, perhaps because density is often a proxy for other factors that discourage car ownership (Cao & Cao, 2014; Giuliano & Dargay, 2006; Holtzclaw et al., 2002; Schimek, 1996). Such factors include parking availability, proximity to transit, and congestion.

Modeling

Statistical models are often used to predict car ownership rates, car purchasing trends, and vehicle model popularity. These statistical models are used by the private sector to anticipate market growth for new vehicles, and also by the public sector to anticipate congestion, pollution, and parking demand. Most models attempt to forecast the future. See De Jong et al. (2004) for an extensive summary of car ownership models developed for the public sector up to 2002. Anowar et al. (2014) detail more recent car ownership models designed to predict decisions at the household level, categorizing them as exogenous or endogenous and static or dynamic. Models designed to optimize prediction by including an extensive list of variables may be less useful for policy recommendations (Haas et al., 2016).

Car ownership rates are not static. Certain generations may be more inclined to own cars, although as a cohort ages those trends may change (Thakuriah, Menchu, & Tang, 2010). Many studies use longitudinal data to study and predict change in car ownership levels over time on both the national and household level (Clark, 2015; J. M. Dargay, 2002).

Matched Pair Analysis

Research in the field of community planning has its limitations. Like any of the social sciences, it is a challenge to set up a scientific experiment that exactly tests the effects of only one variable. Cervero and Goreham (1995) and Khattak and Rodriques (2005) utilized quasi-experimental approaches by comparing two different neighborhoods that shared many demographic and structural elements but did not share the variable to be tested. Neither study found matching "control" neighborhoods that exactly fit their initial criteria. Both emphasized the importance of considering household income; Cervero and Goreman (1995) specified that the median household income of the matching neighborhood be within 10% of the median household income of the test neighborhood (p. 213).

Rural Focus

As mentioned above, there are few studies of car ownership that directly address rural areas. Some studies do contrast urban with rural, but there is little work that highlights the differences among rural communities. The Federal Highway Administration's publication *Planning for Transportation in Rural Areas* encourages a multimodal approach and notes that "bicycling and walking are often the 'forgotten modes' of transportation planning – especially in rural areas" (2001, p. 13). A more recent publication by the Federal Highway Administration, *Small Town and Rural Multimodal Networks* directly addresses the challenges of designing multimodal infrastructure for rural areas, but provides few policy guidelines (2016). It appears that interest in rural transportation options may be growing, but resources are still limited. Community leaders can look to urban areas for examples, but policies that help reduce car dependence in densely populated regions, such as tolls or a gas tax, may not inspire the same results in rural areas. To help rural communities, it is important to specifically seek out and examine existing transportation policies that promote modes other than personal cars. Identifying such policies will help other policymakers effectively and efficiently reduce car dependence in their own communities.

Chapter 3 - Methodology

Research Question

Community leaders are looking for ways to reduce dependence on private automobiles and increase the number of residents that use active transportation for recreation and commuting. Practical guidance tends to focus on policies and infrastructure in urban areas. Rural communities that want to decrease their dependence on private automobiles have few places to look for guidance. These circumstances lead us to ask: are there policies correlated with reduced car ownership rates in rural counties, and if so, what are they?

Rationale

Since guidance is scarce for rural communities that want to reduce dependence on private cars, the goal is to find case studies to serve as practical examples. Rural counties with notably reduced rates of car ownership, especially when considering other demographic factors, may be implementing policies that others can utilize. A quantitative approach to finding case studies allows a broad, objective look at counties across the country. Examining these counties closely with qualitative methods will divulge tactics that may not be recognized as affecting car dependence, and those tactics can then be shared with other rural communities. This philosophy leads to three main phases of research: Identify Counties, Examine Counties, and Generalize Findings.

Identify Counties: Quantitative Analysis

The Agricultural Act of 2014, commonly known as the Farm Bill, defines rural areas as those with population up to 35,000 and rural in character (US Department of Agriculture Rural Development, n.d.). While the United States Government defines rural in more than one way, the Farm Bill definition includes the "rural in character" clause, which acknowledges that population density alone does not define rural areas. The Farm Bill is also tied to funding for home loans. Housing costs and location are closely related to transportation.

For this study, rural areas were defined as counties that did not contain any ineligible (i.e. urban) land area as defined by the Farm Bill. There are 3,108 counties in the continental United

States: 2,285 counties met this criterion. Counties in Alaska and Hawaii were not included in the dataset to simplify modeling (Figure 3.1).
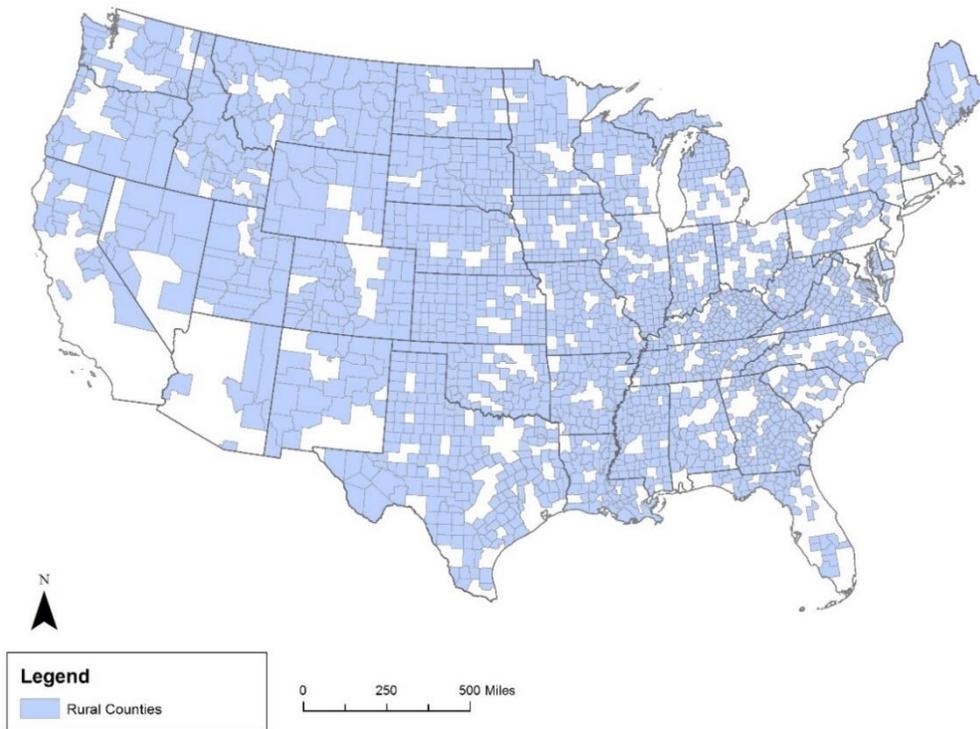
Figure 3.1 Rural counties across the continental United States

The next step of the quantitative analysis phase was to gather demographic data from the 1990 Decennial Census and the 2014 5-Year American Community Survey (Minnesota Population Center, 2016; US Census Bureau, n.d.). 2014 data was the most recent available at the time of the study. 1990 was chosen as a base year because 24 years is long enough to establish ongoing trends, but still recent enough that cultural factors, such as two-earner households, would remain relatively comparable. Data on a wide array of variables typically correlated with car ownership rates was retrieved at the county level, including but not limited to age, income, employment, family size, and presence of children.

Counties and county equivalents were chosen as the unit of analysis because data is consistently available at the county level across the United States. County boundaries also tend to remain very stable over time which makes them an appropriate unit for longitudinal studies. US Census Bureau TIGER/Line Shapefiles were used for the county boundaries.

Unlike statistical models that predict household car ownership, this method uses aggregate county-level data to predict an average car ownership rate. As a result, the dataset is comprised of interval data, not integer data. For example, a household can own 0, 1, 2, or more cars, but a county can average 1.8 or 1.9 cars per household. The nature of the data makes an Ordinary Least Squares (OLS) regression analysis—a powerful, straightforward statistical analysis—a logical place to begin modeling.

Creating a model makes it possible to identify counties where the percent change in car ownership rate decreased at a higher rate—or, increased at a lower rate—than would be expected according to selected demographic characteristics. Choosing counties to study on car ownership rate change alone might lead to counties home to a rapidly aging population or economic challenges, since age and income are both correlated with car ownership.

A linear regression was created using R statistical software for each of five regions of the United States: The Midwest, Northeast, Southeast, West, and West South Central (Figure 3.2).
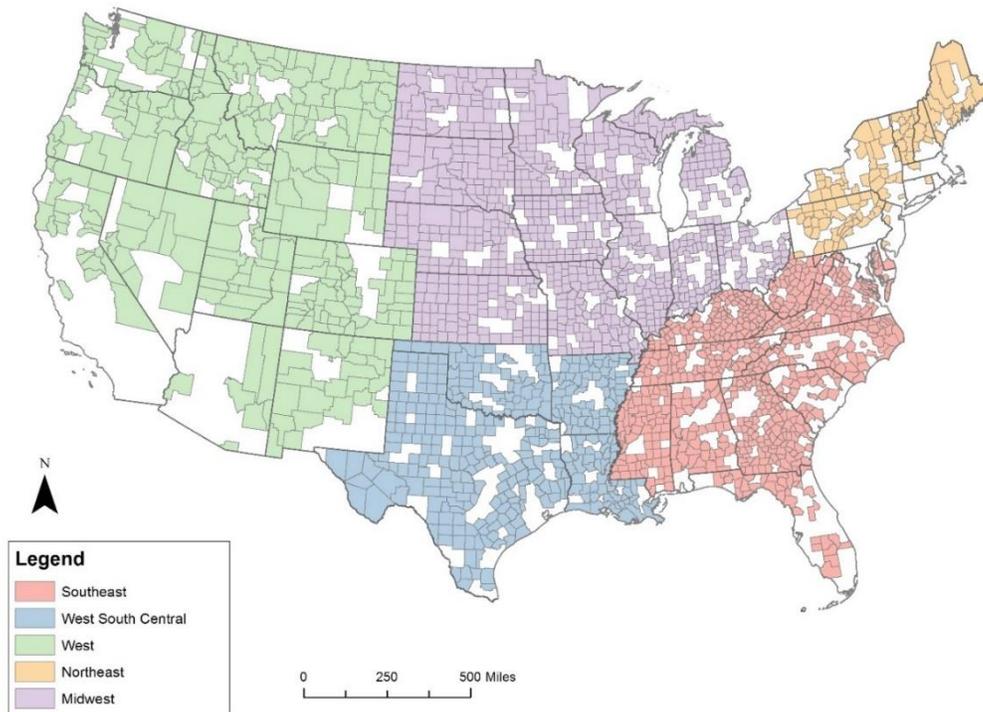
Figure 3.2 The five regions

Modeling and selection by region ensures that not all counties of interest are grouped into one state or area of the country. The dependent variable was the percent change in household car ownership rates, by county, between 1990 and 2014. As seen in Figure 3.3, the majority of counties saw an increase in their household car ownership rate during this time, although some did decrease.
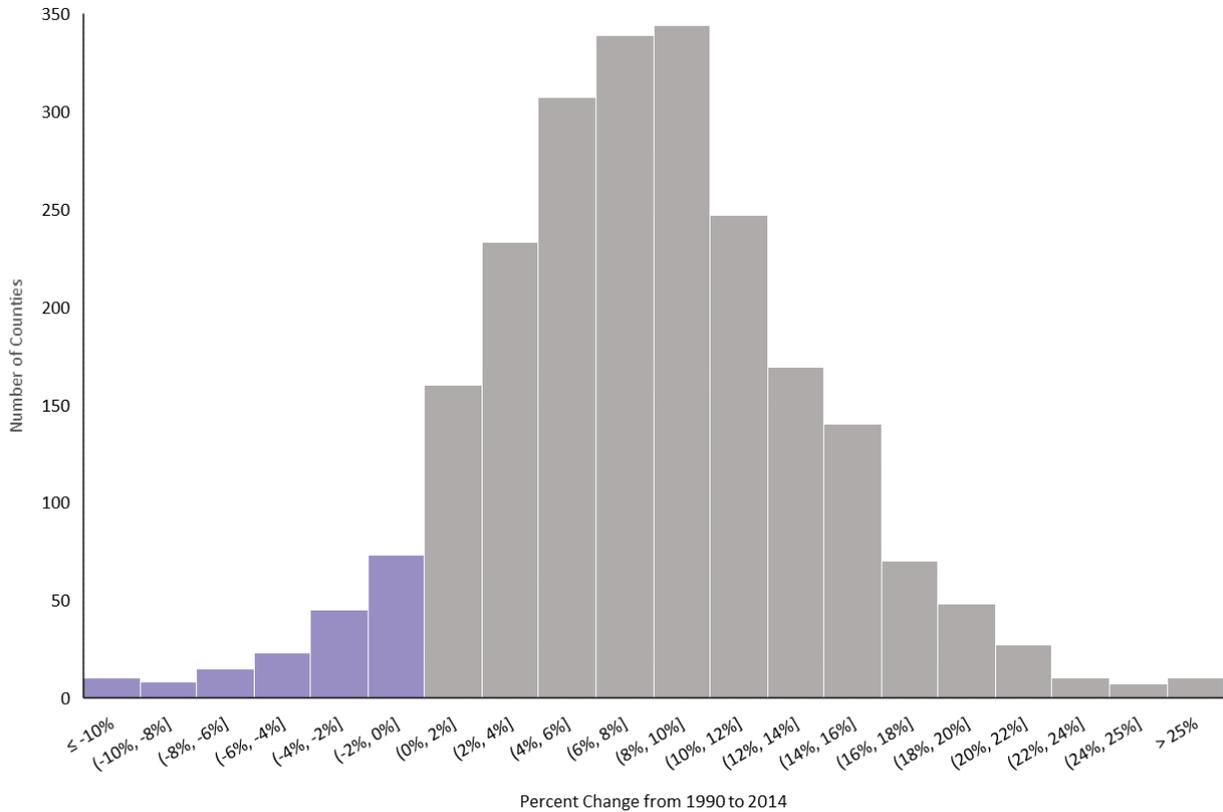
Figure 3.3 Histogram of percent change in car ownership rates from 1990 to 2014

The independent variables varied by model and included: percent change in median household income over the same period, percent change of total population from 1990 to 2014, and percent change of the percentage of the population aged 65 and older from 1990 to 2014. Table 3.1 through Table 3.5 show the models chosen for each region.

Table 3.1 Midwest model

Residuals:	Min	1Q	Median	3Q	Max	
	-17.45	-2.4766	0.2123	2.6578	19.163	
Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)		
(Intercept)	-1.72518	0.78544	-2.196	0.0283	*	
change_over_65	-0.0439	0.01031	-4.257	2.31E-05	***	
change_income_1990_2014	0.40035	0.03138	12.76	< 2e-16	***	

Signif. codes:	0 '***'	0.001'**'	0.01 '*'	0.05 '.'	0.1 ' '	1

Residual standard error: 4.499 on 821 degrees of freedom
Multiple R-squared: 0.217, Adjusted R-squared: 0.2151
F-statistic: 113.8 on 2 and 821 DF, p-value: < 2.2e-16

Table 3.2 Northeast model

Residuals:	Min	1Q	Median	3Q	Max	
	-10.0584	-2.1188	-0.0024	1.8976	9.4495	
Coefficients:	Estimate	Std. Error	t value	Pr(>|t|)		
(Intercept)	-6.84346	3.05544	-2.24	0.0273	*	
change_over_65	-0.05318	0.02659	-2	0.0482	*	
change_income_1990_2014	0.77817	0.14189	5.484	3.13E-07	***	

Signif. codes:	0 '***'	0.001'**'	0.01 '*'	0.05 '.'	0.1 ' '	1

Residual standard error: 3.584 on 100 degrees of freedom
Multiple R-squared: 0.3291, Adjusted R-squared: 0.3156
F-statistic: 24.52 on 2 and 100 DF, p-value: 2.159e-09

Table 3.3 Southeast model

Residuals:	Min	1Q	Median	3Q	Max	
	-23.6082	-3.3694	0.0124	3.3658	21.438	
Coefficients:	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**		
(Intercept)	-2.98668	0.90699	-3.293	0.00105	**	
change_age_17_under	-0.07506	0.02381	-3.153	0.00169	**	
change_income_1990_2014	0.49923	0.04193	11.905	< 2e-16	***	

Signif. codes:	0 '***'	0.001'**'	0.01 '*'	0.05 '.'	0.1 ' '	1

Residual standard error: 5.341 on 641 degrees of freedom
Multiple R-squared: 0.2138, Adjusted R-squared: 0.2114
F-statistic: 87.17 on 2 and 641 DF, p-value: < 2.2e-16

Table 3.4 West model

Residuals:	Min	1Q	Median	3Q	Max	
	-19.1856	-2.7328	-0.0728	3.0249	16.0653	
Coefficients:	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**		
(Intercept)	-5.16294	1.68521	-3.064	0.00246	**	
change_income_1990_2014	0.51737	0.07623	6.787	1.07E-10	***	

Signif. codes:	0 '***'	0.001'**'	0.01 '*'	0.05 '.'	0.1 ' '	1

Residual standard error: 5.639 on 217 degrees of freedom
Multiple R-squared: 0.1751, Adjusted R-squared: 0.1713
F-statistic: 46.07 on 1 and 217 DF, p-value: 1.074e-10

Table 3.5 West south central model

Residuals:	Min	1Q	Median	3Q	Max	
	-27.2058	-3.5064	0.1463	4.0463	16.8551	
Coefficients:	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**		
(Intercept)	-6.24725	1.68521	-3.476	0.000584		***
per_change_pop	0.04687	0.01297	3.615	0.000352		***
change_income_1990_2014	0.54494	0.06581	8.281	4.01E-15		***

Signif. codes:	0 '***'	0.001'**'	0.01 '*'	0.05 '.'	0.1 ' '	1

Residual standard error: 5.918 on 302 degrees of freedom
Multiple R-squared: 0.2142, Adjusted R-squared: 0.209
F-statistic: 41.17 on 2 and 302 DF, p-value: < 2.2e-16

Counties of interest were identified as those with standardized residuals more than 2.0 standard deviations below the mean, indicating that car ownership rates in the county had decreased at a higher rate (or increased at a lower rate) than would be expected according to the regional models. Comparison counties to serve as controls were identified as those with standardized residuals between -0.2 and 0.2, indicating that the car ownership rates in the counties had performed as the regional model predicted (Figure 3.4).
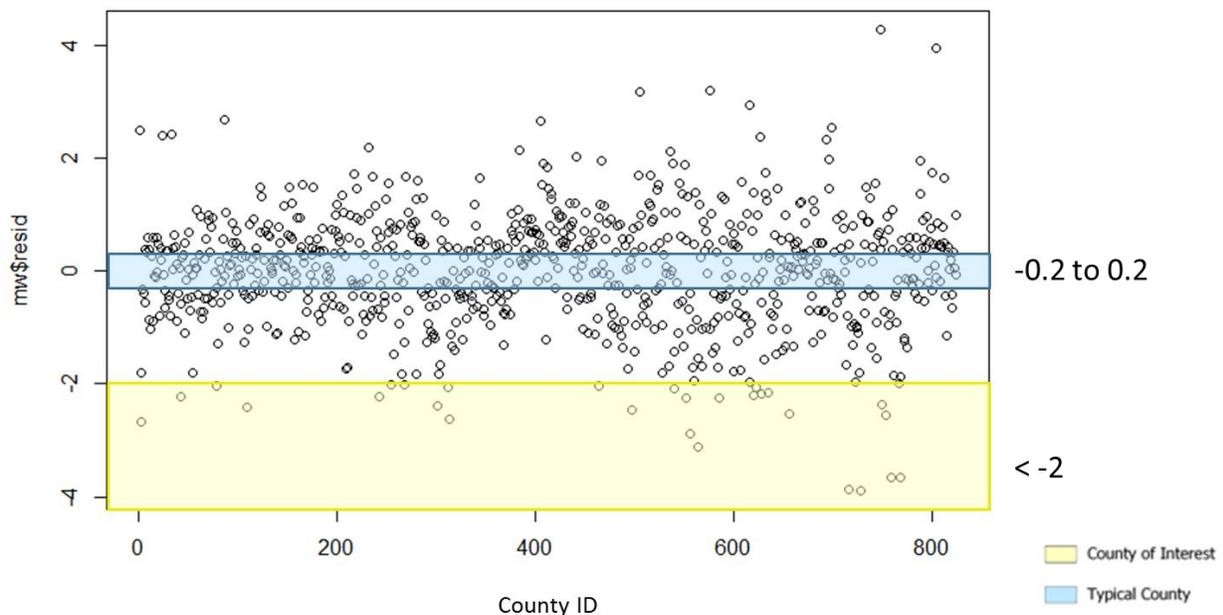

Figure 3.4 Example of county selection by standardized residuals

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A list of counties of interest was generated for each of the five regions, ranging from a low of three counties for the Northeast region to a high of 29 counties for the Midwest region. A list of comparison counties was also generated, ranging from 22 counties for the Northeast region to 131 for the Midwest (Figure 3.5). All counties with a total population of less than 10,000 people in both 1990 and 2014 were eliminated from the lists, except in the West County where none of the counties of interest met the minimum population threshold. One county of interest was then selected for each region, with careful attention to avoid counties with unique or very uncommon characteristics, i.e. located on an island by itself. A comparison county for each region was then selected according to the following criteria: the median household income and total population were similar to that of the county of interest in both 1990 and 2014, as well as similar values for any other variables. For all pairs, a comparison county from the same state as the county of interest was selected to minimize variation in state-level climates or policies.

FIPS	Geography	resid	total_pop_1990	total_pop_2014	income_median_1990	income_median_2014	change_over_65
36041	Hamilton County, New York	-3.026415842	5279	4783	23.2	52.939	44.72
36123	Yates County, New York	-2.235840568	22810	25281	24.87	50.061	12.91
36057	Montgomery County, New York	-2.192416592	51981	49951	24.07	44.167	-12.51
36039	Greene County, New York	-0.152010959	44739	48618	27.47	49.864	18.13
50025	Windham County, Vermont	-0.14585785	41588	44050	27.77	50.526	36.52
33003	Carroll County, New Hampshire	-0.112134904	35410	47623	28.15	52.393	40.42
36107	Tioga County, New York	-0.099542598	52337	50464	31.5	56.167	53.93
42067	Juniata County, Pennsylvania	-0.092249963	20625	24793	25.36	47.269	29.12
42055	Franklin County, Pennsylvania	-0.089114653	121082	151517	28.81	53.394	20.4
50019	Orleans County, Vermont	-0.06836918	24053	27160	22.81	41.437	42.1
42065	Jefferson County, Pennsylvania	-0.057103479	46083	44935	22.06	42.295	8.48
42103	Pike County, Pennsylvania	-0.05647094	27966	56883	30.31	58.906	20.03
36115	Washington County, New York	-0.042212003	59330	62910	28.66	51.494	23.73
42093	Montour County, Pennsylvania	-0.008559337	17735	18475	27.26	53.604	15.77
42031	Clarion County, Pennsylvania	-0.007880208	41699	39437	21.6	42.88	23.09
25007	Dukes County, Massachusetts	-0.000685125	11639	16915	31.99	65.518	14.93
42109	Snyder County, Pennsylvania	0.035234033	36680	39922	25.86	48.718	27.94
42063	Indiana County, Pennsylvania	0.039569288	89994	88301	22.97	45.168	17.51
42037	Columbia County, Pennsylvania	0.048466925	63202	67089	24.21	46.367	4.56
42087	Mifflin County, Pennsylvania	0.060310408	46197	46705	22.78	40.947	21.39
50023	Washington County, Vermont	0.069501815	54928	59333	29.62	58.293	24.31
36031	Essex County, New York	0.08038874	37152	39072	25	50.322	32.95
23023	Sagadahoc County, Maine	0.103364572	33535	35102	31.95	55.046	61.1
25019	Nantucket County, Massachusetts	0.131981545	6012	10414	40.33	86.529	-6.04
34037	Sussex County, New Jersey	0.149630745	130943	146888	48.82	87.397	49.05

Figure 3.5 Example county list generated from model

Examine Counties: Qualitative Analysis

One county planning department employee was contacted via phone or email in each of the ten counties, where available. If no county planning department was publicly listed, or the

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department was unresponsive, an employee of another local government or organization was contacted. The employee was asked to recommend someone knowledgeable about local transportation policies and projects. Based on these recommendations, an appropriate interviewee was contacted in each county and asked a series of fourteen (14) questions regarding transportation trends or changes in the area (see Appendix A.). Some interviewees shared key documents, including recent survey results, comprehensive plans, or transportation plans. The interviews and planning documents were used to pinpoint any local policies or trends that may impact car ownership rates.

Chapter 4 - Case Studies

Midwest Region
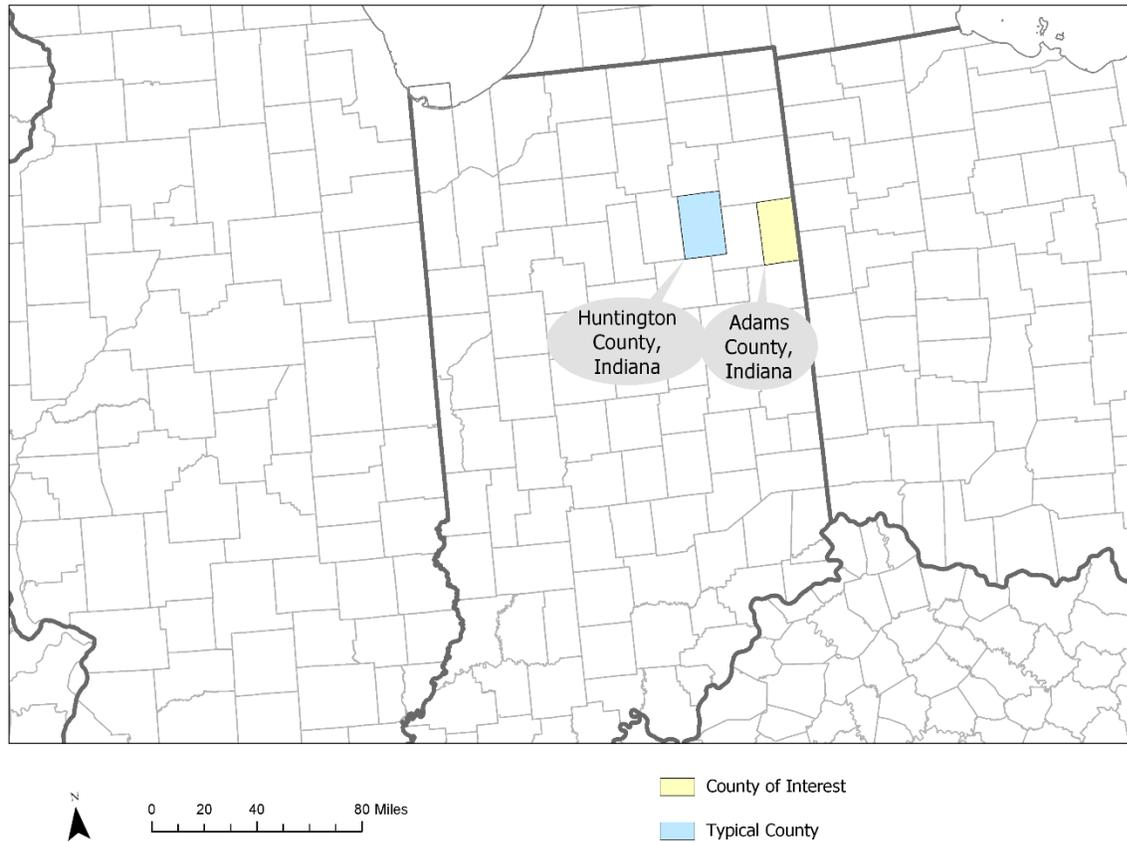
Figure 4.1 Map of Midwest matched counties

Adams County, Indiana, and Huntington County, Indiana were chosen as the matched pair for the Midwest region. They are both located in northeast Indiana, each approximately 12 miles south of Fort Wayne with one county separating them from each other (Figure 4.1). They are each their own Micropolitan Statistical Area as defined by the U.S. Census Bureau, as well as part of the Fort Wayne-Huntington-Auburn, IN Combined Statistical Area (US Census Bureau, 2015b). Both counties have a population less than 40,000 but have grown slightly over the last 24 years, and have very similar median household incomes (Table 4.1). Although a similar percentage of residents travel in by car, truck, or van to work, approximately 15.5% carpool in Adams County, while only approximately 8.3% of Huntington County residents carpool to work (Table 4.2).

Table 4.1 Midwest matched counties selection criteria

	County of Interest	Typical County
	Adams County, Indiana	Huntington County, Indiana
Standardized Residual	-2.0319	0.0195
1990 Population	31,095	35,427
2014 Population	34,533	36,959
Median Household Income 1990	28,790	29,680
Median Household Income 2014	47,964	47,356
Percent Change Population 65 and Over	5.04	6.55

Table 4.2 Midwest counties journey to work

	Adams County	Huntington County
	% Estimate	% Estimate
Car, truck, or van	91.4	92.5
Drove alone	76.0	84.2
Carpooled	15.5	8.3
Walked	2.1	2.7
Bicycle	1.0	0.2
Taxicab, motorcycle, or other means	1.6	0.6
Worked at home	3.9	3.8

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0801

Adams County, Indiana
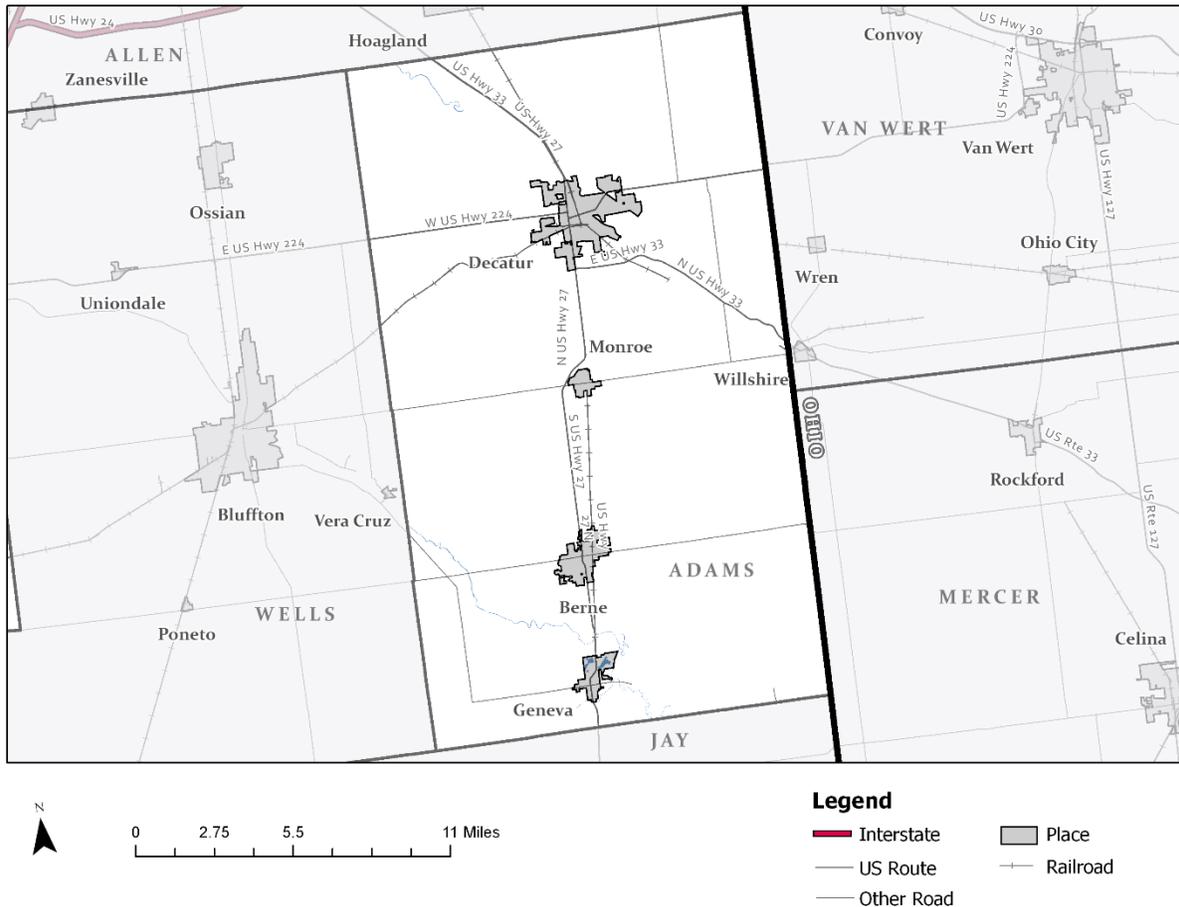
Figure 4.2 Map of Adams County, Midwest county of interest

A professional in Decatur, the county seat, shared some background on the area by answering the interview questions.

Major changes to area transportation in the last two decades includes the construction of the US 33 bypass. Its previous route took all traffic through the heart of downtown Decatur. US 27 was also widened, and is four lanes from Decatur to Monroe. There are no policies in place that promote multimodalism. The Adams County Council on Aging provides services to senior citizens and people with disabilities. It is not considered public transportation. The Agency has suggested to the Indiana Department of Transportation that there is a need for a public transportation service, and INDOT is currently conducting a study to gauge demand.

There are local trail systems, but none connect communities. School buses are available to all students. Community Development Block Grant funds were used to fund streetscape

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improvements to downtown Decatur. The Stellar Communities program, a multi-agency initiative run through the Indiana Office of Community and Rural Affairs (2017) inspired the creation of the Greater Decatur Initiative (GDI). The GDI has a plan to improve the Decatur downtown and incorporate the annual art tour into the streetscape.

The Building and Planning Department sets aside $50,000 every year for the Sidewalk Assistance Program, which provides a 50/50 match on residential sidewalk improvements. The program pays for half the cost of the sidewalk and the full cost of demolition ("City of Decatur, Indiana Comprehensive Plan of 2010," 2010). It is a popular program and the money is usually spent every year. Neighbors often partner with each other to get a better rate with contractors.

Adams County has a significant Amish presence. Local estimates are around 12,000, while a 2010 estimate from the Association of Religion Data Archives lists 6,343 adherents (Grammich, Clifford et al., 2010a). A wheel tax was recently enacted to help address maintenance on county roads, many that the Amish typically use. Since the Amish tend to have large families, their presence may explain the large portion of residents under 9 years of age (Figure 4.3).
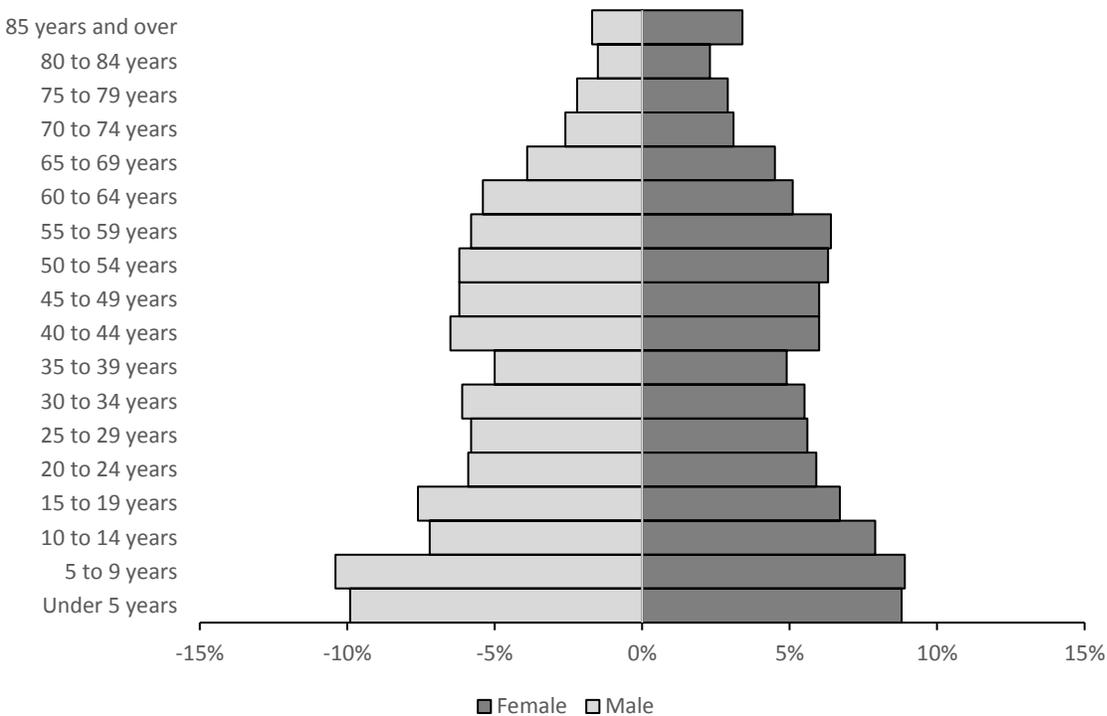

Figure 4.3 Adams County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

The *Data Snapshot: Adams County* report notes that manufacturing jobs decreased significantly between 2003 and 2014 (Purdue University, 2016). The authors speculate that the related decrease in real median household income combined with an increase in real per capita income indicates that income inequality in the county may be growing, with relatively few residents experiencing income growth.

The 2010 Decatur Comprehensive plan recommends increasing downtown housing options, bicycle and pedestrian infrastructure, public transportation options, and generally following smart growth principles ("City of Decatur, Indiana Comprehensive Plan of 2010," 2010).

Huntington County, Indiana
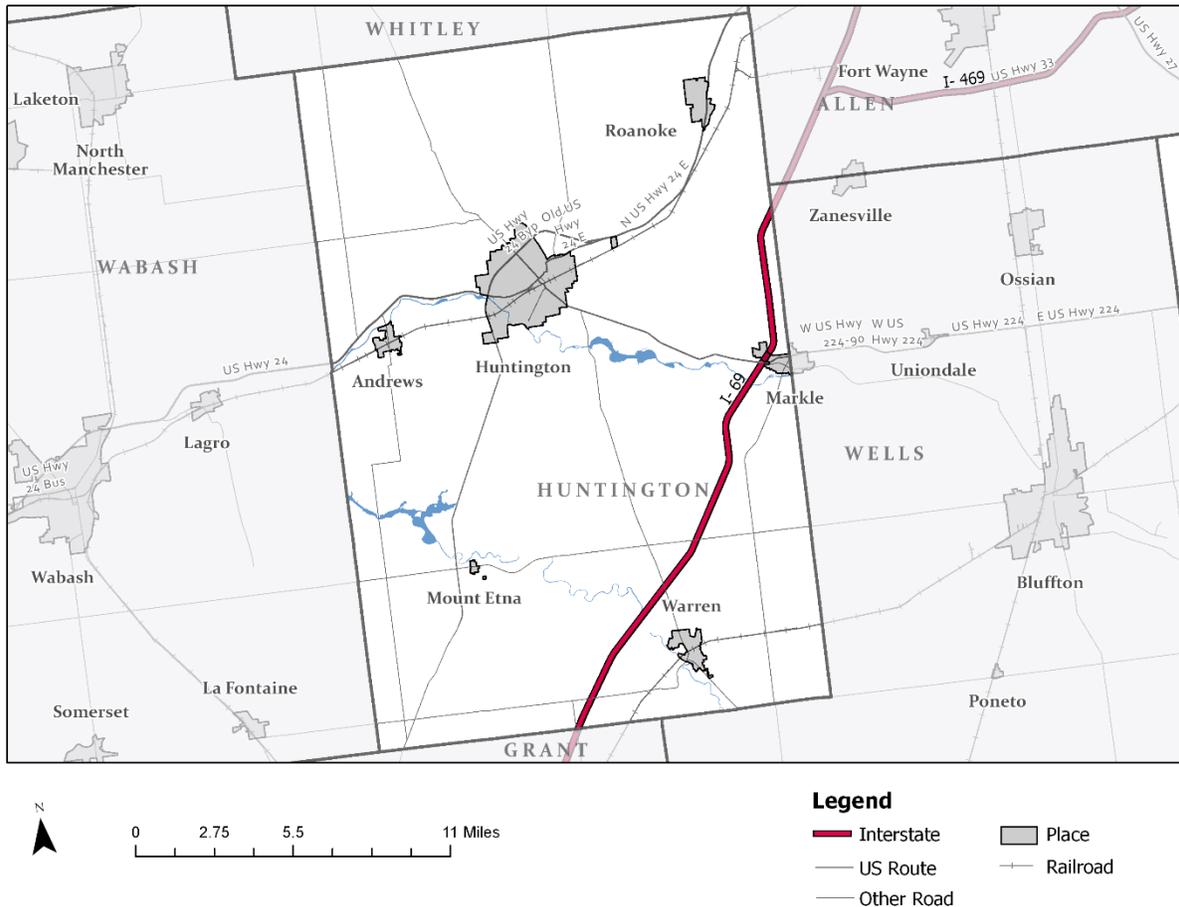
Figure 4.4 Map of Huntington County, Midwest typical county

A professional in the City of Huntington shared some background information by answering the interview questions.

Huntington is home to Huntington University, a private college with about 1,200 enrolled students (Huntington University, n.d.). The city has grown quite a bit in the last couple of years, primarily towards the highway bypasses. There is a mixed-use zoning district in the City, and most mixed-use buildings are in the downtown core. However, developers can also currently request a waiver to avoid constructing a sidewalk that they would otherwise be required to build.

A number of older, underutilized roadways are being eyed for alternative transportation options, and county roads that generally need to be improved. While there are no policies that promote multimodalism, city officials are in the midst of constructing five miles of multi-use trails to supplement the existing one mile of trail, and are increasing their use of shared lane

markings for bicycles. The trails are funded through the Indiana Economic Development Corporation's Regional Cities Initiative (Indiana Economic Development Corporation, 2016). The current mayor is enthusiastic about bicycling, although residents may be uncertain about the changes. The City of Huntington's website mentions a planned bike share system, to be implemented in the coming year (2017).

School buses are available to all students. Huntington Area Transportation, a demand-response public transportation service, is managed by the Huntington County Council on Aging. Limited out-of-county service is available. The program uses funds from the Indiana Department of Transportation. A wheel tax was adopted in 2016 to fund transportation projects, although there is no Amish presence in the county.

Huntington County's 2014 population pyramid reflects a common Baby Boom and Echo Boom profile, with many residents in their 50s and early 20s (Figure 4.5). The young adult population numbers may also reflect the presence of the university.
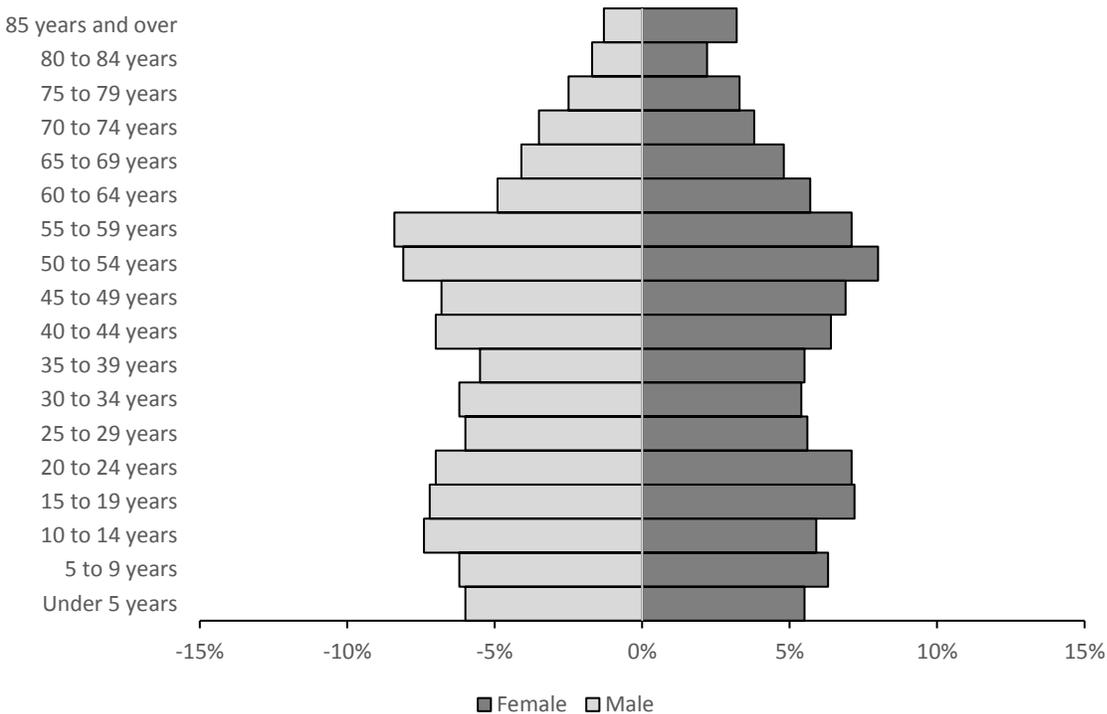

Figure 4.5 Huntington County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

Northeast Region
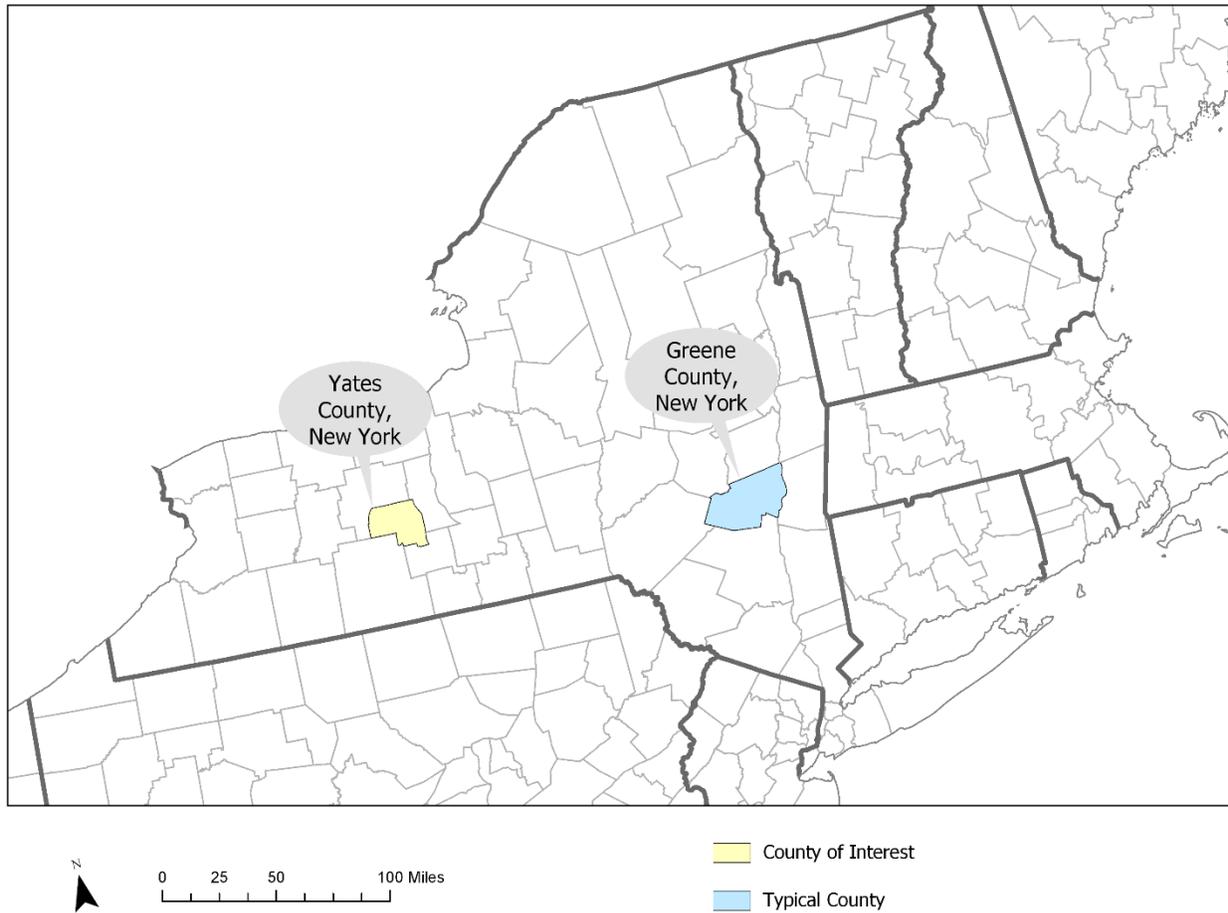
Figure 4.6 Map of Northeast matched counties

Yates County, New York, and Greene County, New York, were chosen as the matched pair for the Northeast region. They are both located in upstate New York, Yates County to the west and Green County to the east (Figure 4.6). Yates County is part of the Rochester, NY Metropolitan Statistical Area and the Rochester-Batavia-Seneca Falls, NY Combined Statistical Area. Greene County is not part of a Metropolitan Statistical Area. This discrepancy means that Greene County is not an ideal control for Yates County, but the household income and percent change population numbers match well, and it was the best match that could be found within the same state (Table 4.3). While more people in Green County travel to work by public transportation than in Yates County, Yates County has a lower percentage of people driving to work in a car, truck, or van, and significantly higher percentages of people walking or bicycling to work (Table 4.4).

Table 4.3 Northeast matched counties selection criteria

	County of Interest	Typical County
	Yates County, New York	Greene County, New York
Standardized Residual	-2.2358	-0.1520
1990 Population	22,810	44,739
2014 Population	25,281	48,618
Median Household Income 1990	24,870	27,470
Median Household Income 2014	50,061	49,864
Percent Change Population	12.91	18.13

Table 4.4 Northeast counties journey to work

	Yates County	Greene County
	% Estimate	% Estimate
Car, truck, or van	80.3	89.8
Drove alone	71.0	81.9
Carpooled	9.3	7.8
Public transportation (excluding taxicab)	0.2	0.9
Walked	8.3	2.2
Bicycle	2.4	0.1
Taxicab, motorcycle, or other means	1.0	3.0
Worked at home	7.7	4.0

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0801

Yates County, New York
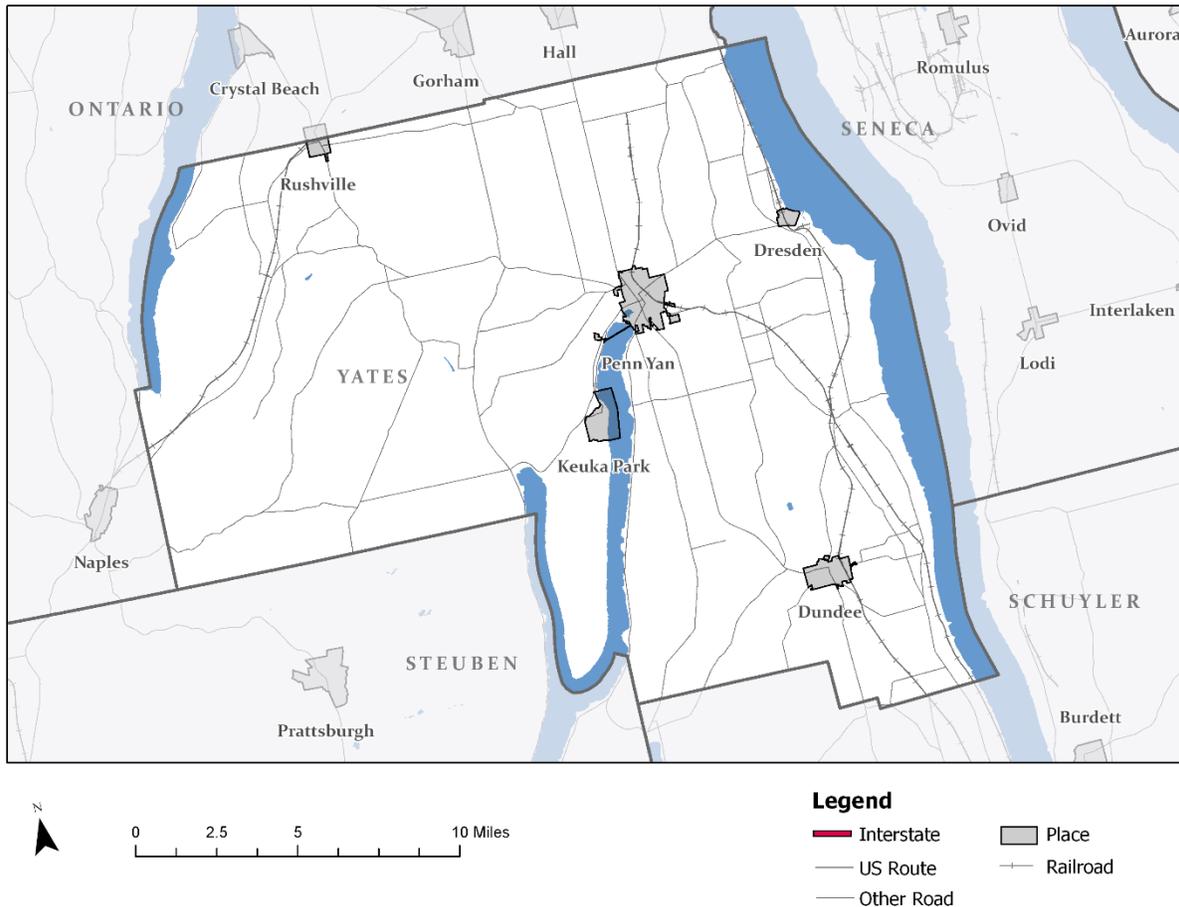
Figure 4.7 Map of Yates County, Northeast county of interest

A professional in Yates County provided background information by answering the interview questions.

This county is located in the Finger Lakes Region and has a strong agricultural identity with a focus on dairy and vineyards (Yates County, New York, 2015). There have been no major changes to the roads over the last two decades. Public transportation was just implemented on January 1, 2017 after a long process that began with a study in 2000. They received 5311 federal funds via New York State. The new Yates Transit Service is run by the Arc of Yates, which already had an established transportation service for their clients with disabilities. The new contract allows members of the general public to utilize the system (Yates Transit Service, Inc, 2013).

While no intercity bus providers service the area, the Yates Transit Service does connect to public transportation routes in adjacent counties. The schedule was created to minimize delays for people traveling to the nearby city of Rochester via the bus system in Ontario County.

School bus service is provided to all students except those living near the school in the village of Penn Yan. Penn Yan itself was described as very walkable, even though the county itself is not. There are no policies to promote walkability, but site plans for new developments are reviewed with an eye towards improving the walkability of the community.

No employers currently provide transportation, but officials are looking into the possibility of scheduling additional trips to employers in nearby Geneva on the Yates Transit Service. The area has many trails and a culture that supports hiking and bicycle touring.

The Association of Religion Data Archives (Grammich, Clifford et al., 2010c) notes an Old Order Mennonite presence of approximately 1,000 adherents in 2000; however it is difficult to compare these numbers to 2010 data because of a change in reporting. A 2014 population pyramid for the county reflects the Baby Boom and Echo Boom pattern, with many residents in their 50s and early 20s (Figure 4.8).
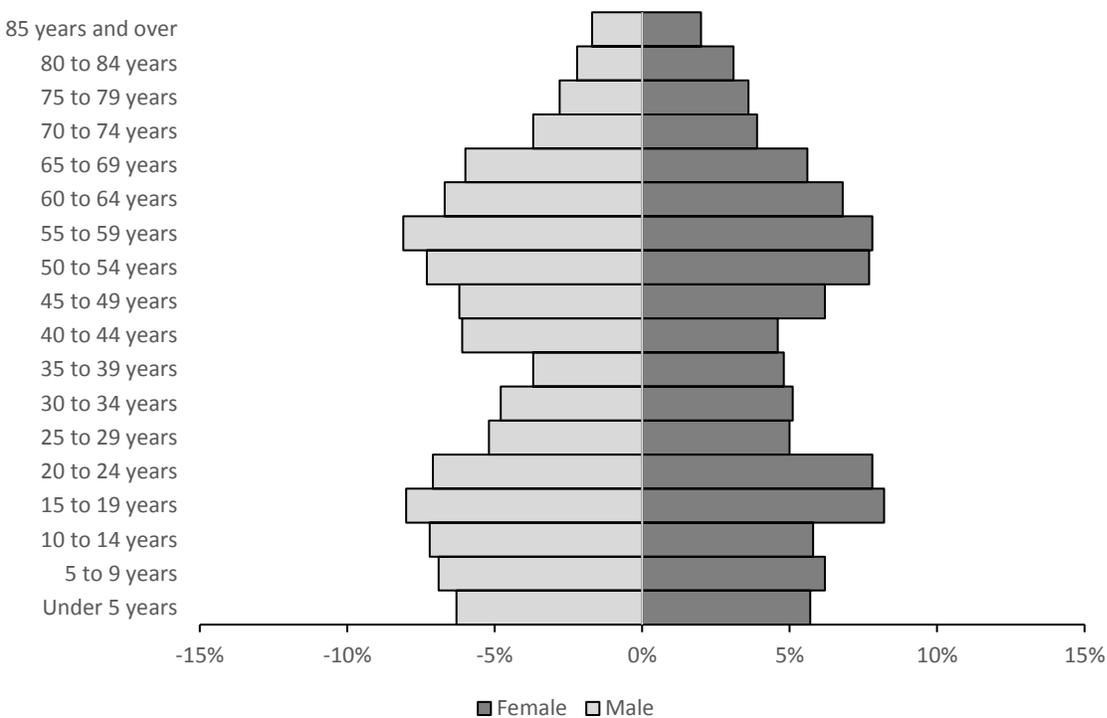

Figure 4.8 Yates County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

Greene County, New York
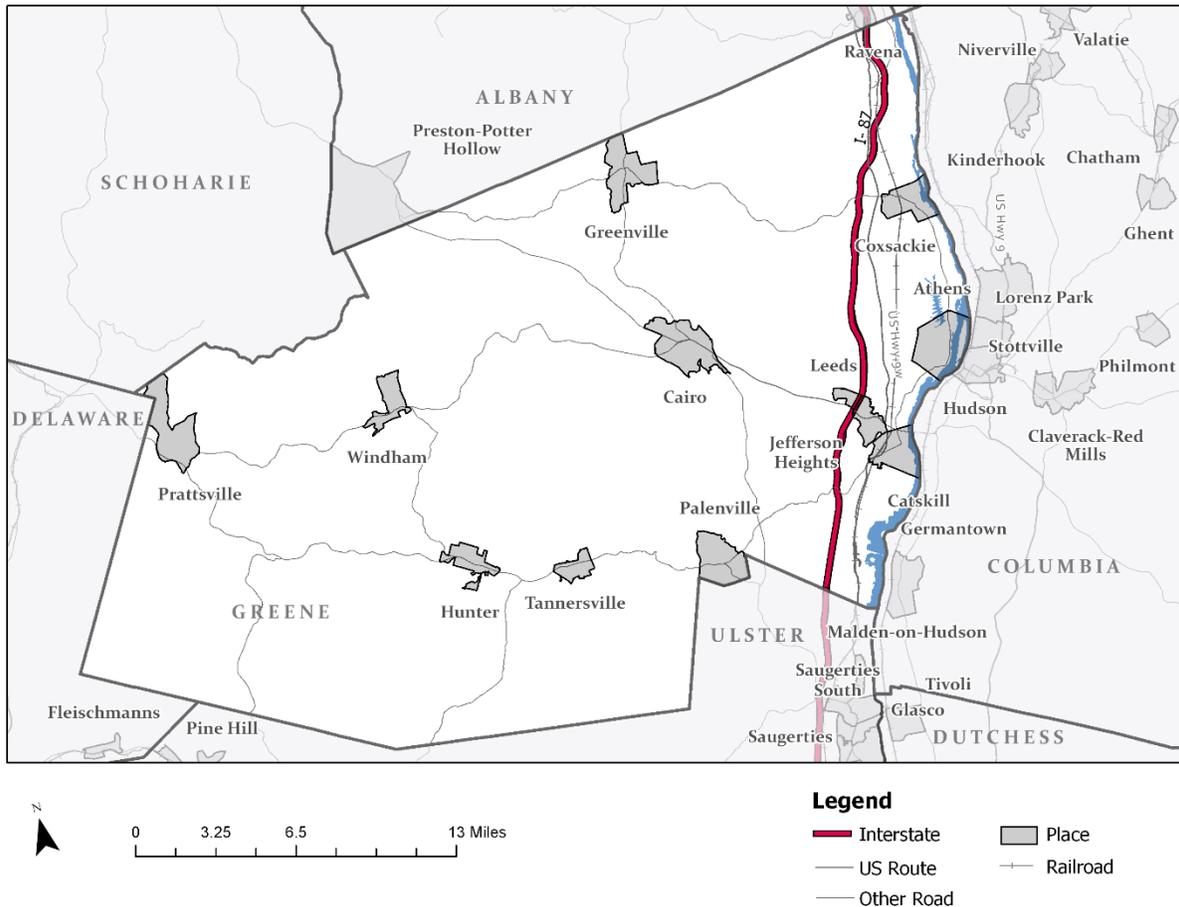
Figure 4.9 Map of Greene County, Northeast typical county

A professional in Greene County provided some background information by answering some of the interview questions.

No policies to promote multimodalism or sustainable transportation are currently in place. Public transportation service was drastically expanded in June of 2016 (Greene County, New York, 2016). The Greene County Transit system is now run by the Arc of Ulster-Greene, which had previously managed transportation for residents with disabilities. The new public transit operation is a fixed route system with seven routes connecting residents to Catskill, the county seat. Federal funding through NYDOT supports the bus system.

School buses are available for children, and Adirondack Trailways offers inter-city bus service (Trailways, 2017). The county is easily accessible by interstate highway, and approximately 40 miles south of Albany, the state capital. A population pyramid for 2014 shows

substantially more men in their 20s than women (Figure 4.10). This is likely due to the presence of two men's correctional facilities in the town of Coxsackie (New York State, n.d.).
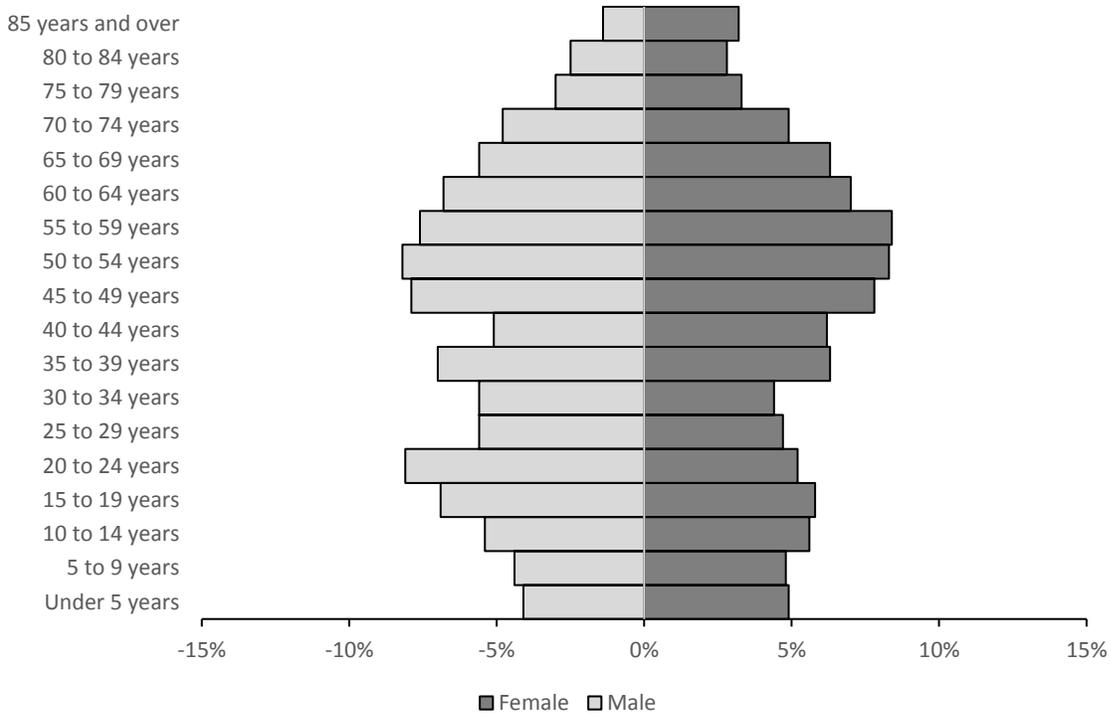
Figure 4.10 Greene County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

Southeast Region
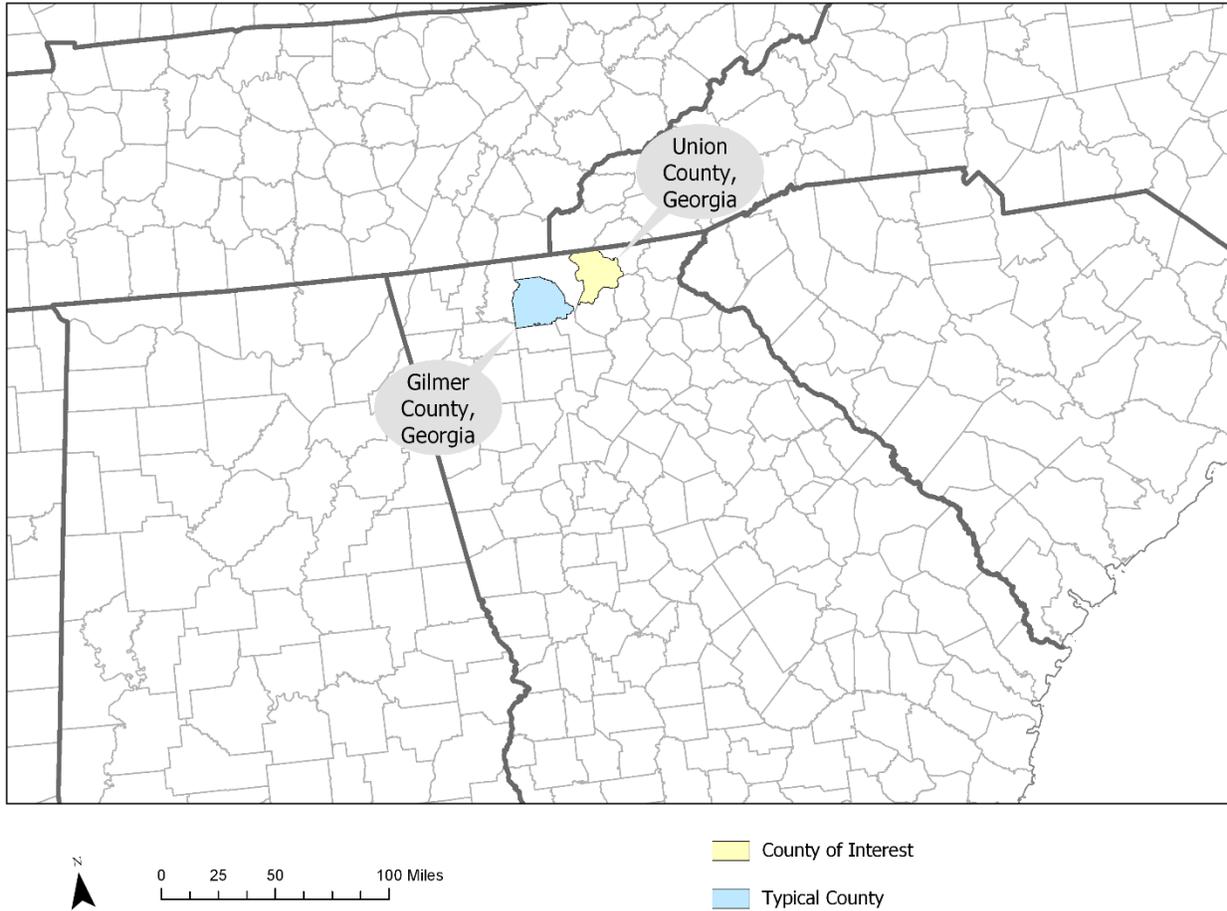
Figure 4.11 Map of Southeast matched counties

Union County, Georgia, and Gilmer County, Georgia were chosen as the matched pair for the Southeast region. They are both located in northern Georgia, one county apart from each other (Figure 4.11). A significant portion of each county is within the Chattahoochee National Forest. Neither county is within a Metropolitan or Micropolitan Statistical Area. The two counties have comparable median household incomes and percent change in the population 17 and under. The population in Gilmer County has grown more than that of Union County (Table 4.5). Although a higher percentage of Union County residents walk to work, residents of Gilmer County are more likely to carpool or bicycle to work (Table 4.6).

Table 4.5 Southeast matched counties selection criteria

	County of Interest Union County, Georgia	**Typical County** Gilmer County, Georgia
Standardized Residual	-2.6335	0.0126
1990 Population	11,993	13,368
2014 Population	21,553	28,441
Median Household Income 1990	20,280	21,410
Median Household Income 2014	39,179	39,581
Percent Change Population 17 and Under	-18.79	-15.75

Table 4.6 Southeast counties journey to work

	Union County % Estimate	**Gilmer County** % Estimate
Car, truck, or van	95.2	92.2
Drove alone	88.3	80.0
Carpooled	7.0	12.2
Public transportation (excluding taxicab)	0.0	0.2
Walked	1.6	0.9
Bicycle	0.0	0.2
Taxicab, motorcycle, or other means	0.4	2.5
Worked at home	2.8	4.0

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0801

Union County, Georgia
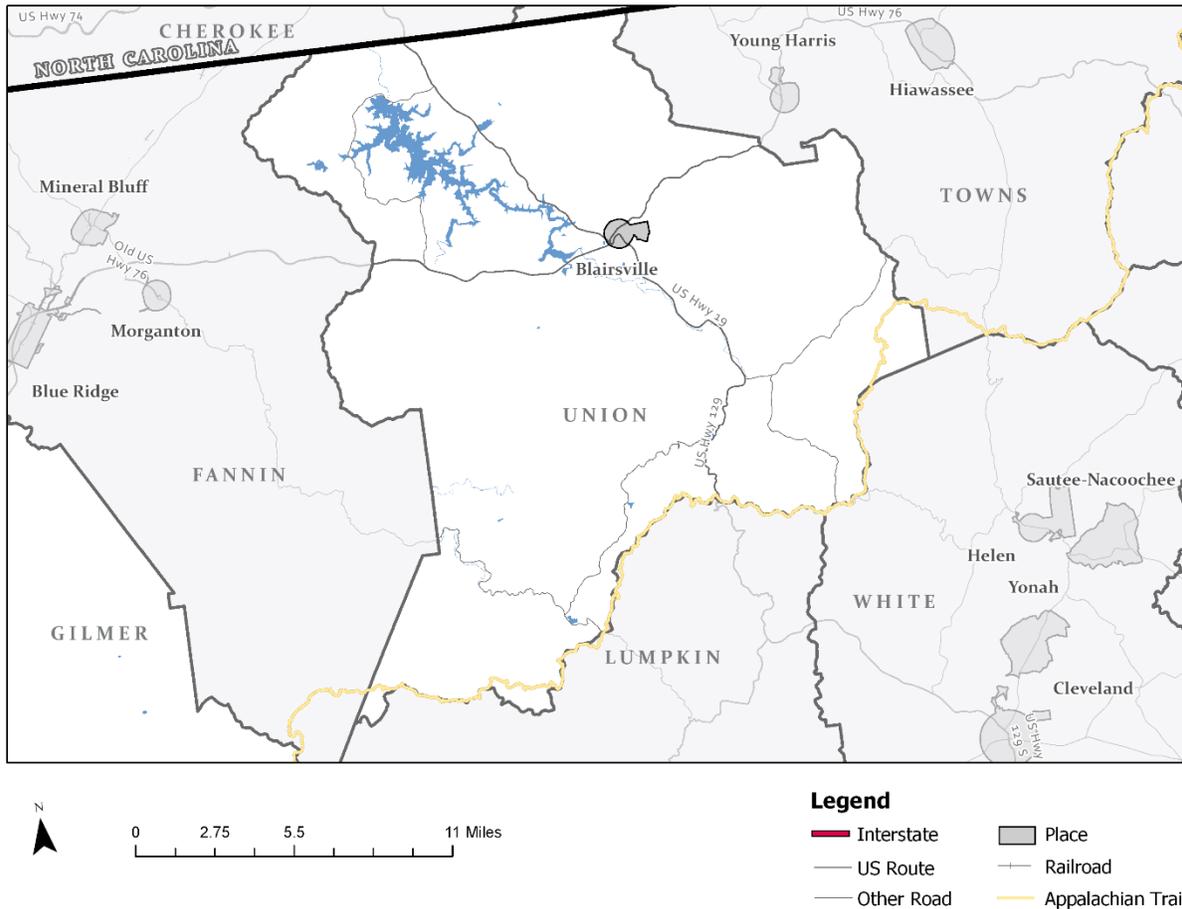
Figure 4.12 Map of Union County, Southeast county of interest

A professional in Blairsville, the county seat, provided some background information by answering the interview questions.

Over the last twenty years the area has transformed from a sleepy community to a destination. There is strong cooperation among community leaders to reach shared goals. A number of large employers have moved to the county, thanks in part to the highway that travels directly from Atlanta through Blairsville. The county was one of four rural counties in Georgia to show positive population growth from 2015 to 2016. While young people have started to settle in the county, it remains a popular retirement destination, which is reflected in the 2014 population pyramid, which is very skewed towards residents in their 60s (Figure 4.13).
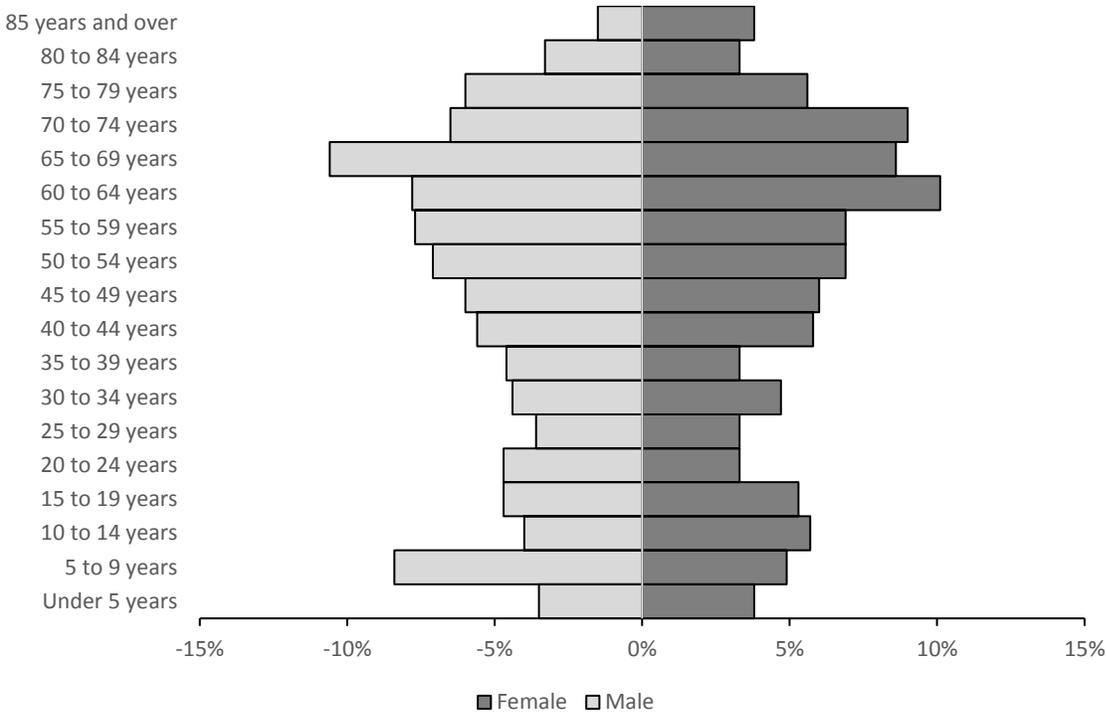
Figure 4.13 Union County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

There are no policies that promote multimodalism or sustainable transportation in the area. A sidewalk project was completed on the city square a few years ago to help increase retail traffic. The Union County Transit System has two ten-person vans and helps transport residents to medical appointments (Union County, GA, 2014).

Blairsville itself is geographically constrained by topography and land ownership, and national retailers do not want to locate far from the city center. The City and the Downtown Development Authority purchased a couple of acres adjacent to downtown that they plan to develop as a mixed-use area to serve many audiences.

School buses are available for children, and there is a designated park and ride at the southwest corner of Blairsville where commuters can park their vehicle and share a ride to Atlanta.

Gilmer County, Georgia
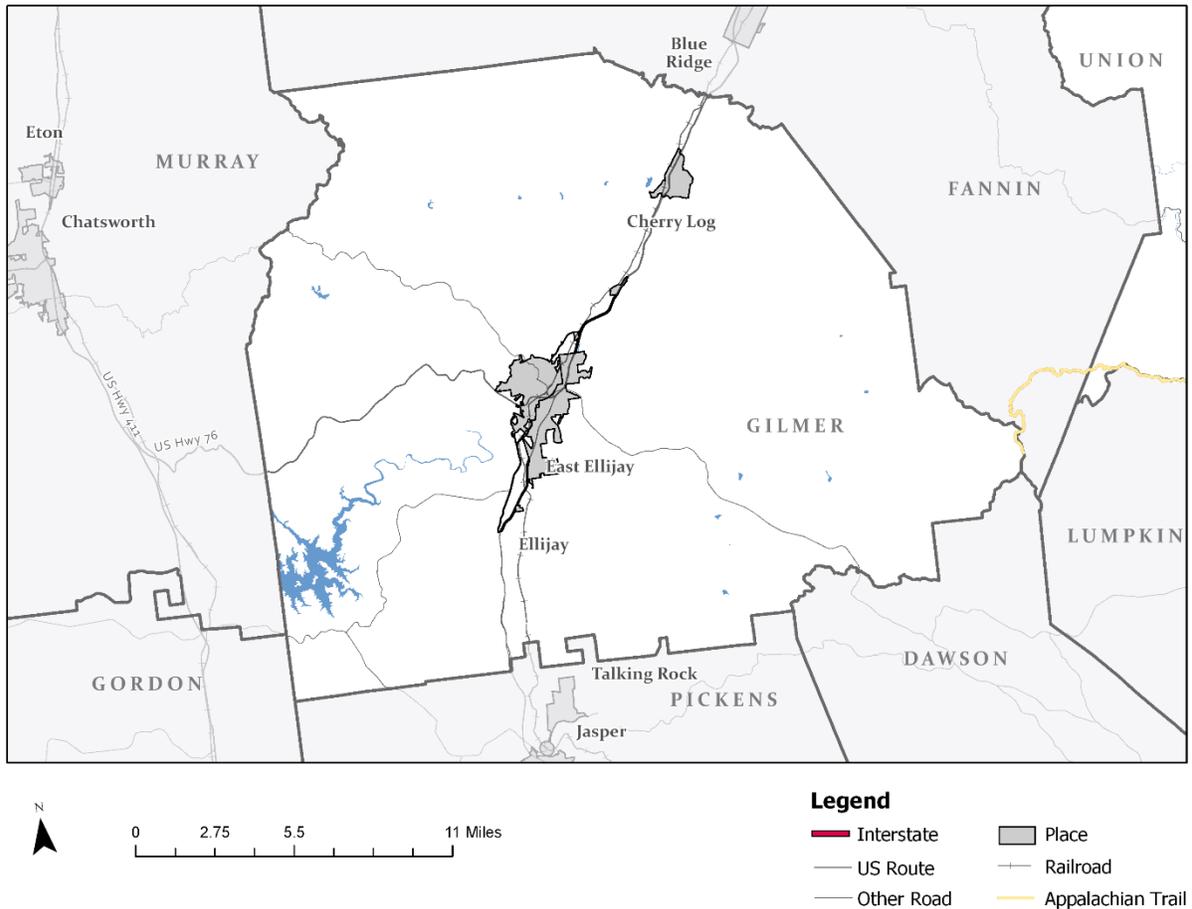
Figure 4.14 Map of Gilmer County, Southeast typical county

A professional in Gilmer County provided background information by answering the interview questions.

The city of Ellijay, the county seat of Gilmer County, is known as the Mountain Bike Capital of Georgia (Go Outside and Play, n.d.). The Mountain Area Transportation System provides demand-response service for seniors and people with disabilities (North Georgia Community Action, 2017). The area was described as car-dependent. The zoning ordinance adopted in 2006 does allow for mixed-use development.

There is no public transportation or intercity transportation options. School buses are available for students and cover the whole community. Funds from the Georgia Department of Transportation have been used for road projects, and Federal Aviation Administration funding

has been utilized to expand the airport runway. A park and ride lot is located in East Ellijay (Georgia Commute Options, 2017).

A 2014 population pyramid for the county shows relatively stable population with the Baby Boom generation approaching their 60s (Figure 4.15).
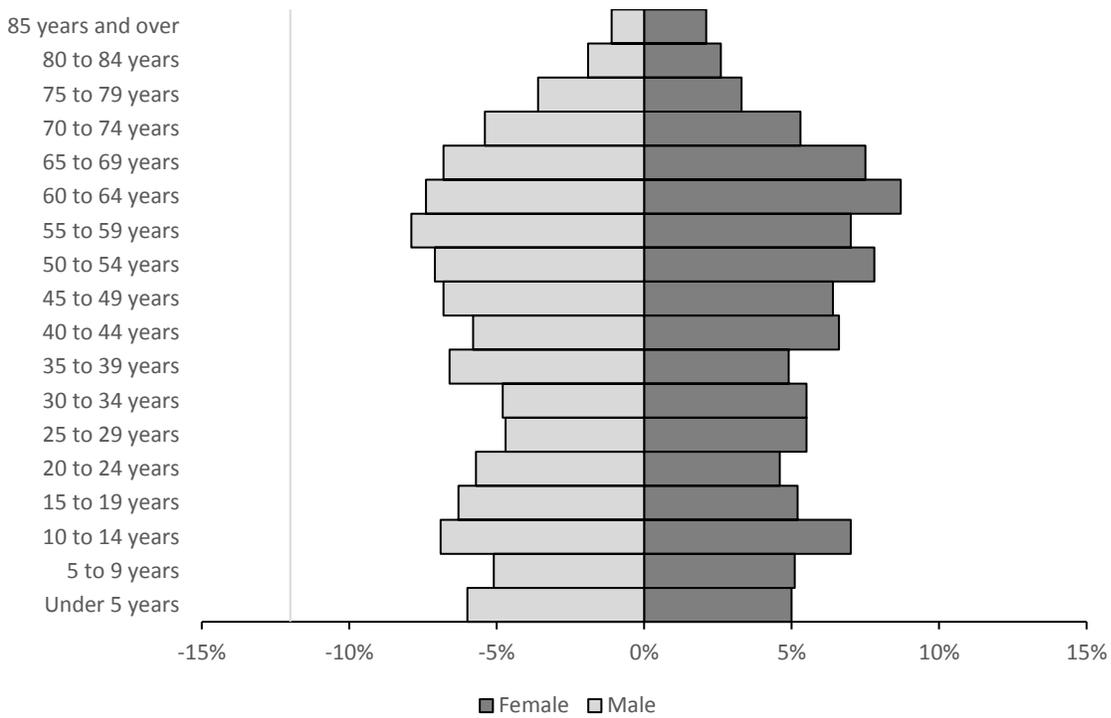

Figure 4.15 Gilmer County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

West Region
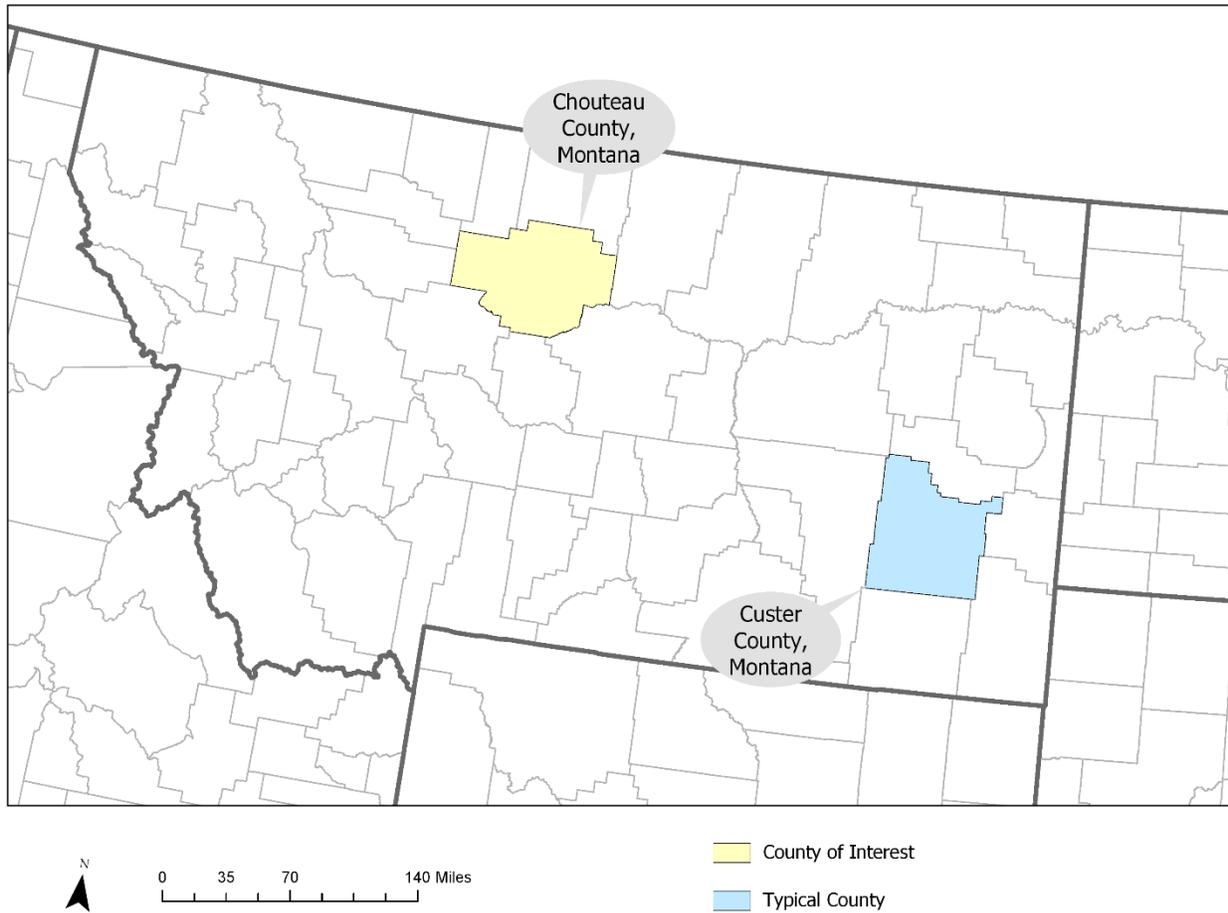
Figure 4.16 Map of West matched counties

Chouteau County, Montana and Custer County, Montana were chosen as the matched pair for the West region. Custer County is in eastern Montana, while Choteau County is in north central Montana (Figure 4.16). Neither county is within a Metropolitan Statistical Area. The population of Custer County is approximately twice that of Chouteau County, and its median household income higher (Table 4.7). Residents in Chouteau County are much more likely to work at home, commute on foot or by public transportation than in Custer County (Table 4.8).

Table 4.7 West matched counties selection criteria

	County of Interest	Typical County
	Chouteau County, Montana	Custer County, Montana
Standardized Residual	-2.8652	0.0314
1990 Population	5,452	11,697
2014 Population	5,859	11,869
Median Household Income 1990	22,360	21,350
Median Household Income 2014	41,270	46,125

Table 4.8 West counties journey to work

	Chouteau County	Custer County
	% Estimate	% Estimate
Car, truck, or van	74.2	86.9
Drove alone	65.8	77.7
Carpooled	8.4	9.3
Public transportation (excluding taxicab)	1.5	0.5
Walked	8.9	4.5
Bicycle	1.1	1.3
Taxicab, motorcycle, or other means	0.2	1.1
Worked at home	14.3	5.7

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0801

Chouteau County, Montana
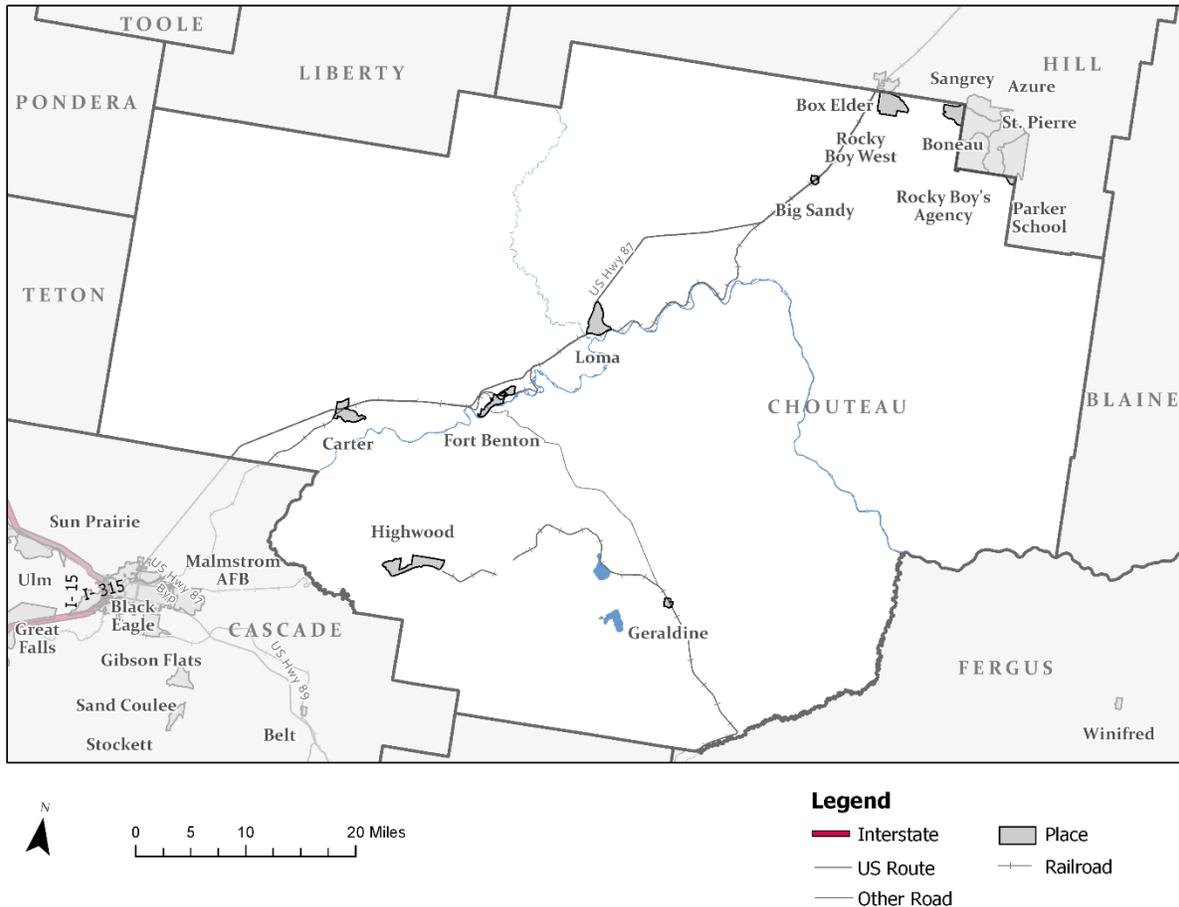
Figure 4.17 Map of Chouteau County, West county of interest

A professional in Chouteau County provided some background information by answering the interview questions.

Over the last twenty years, some major employers have moved to the area, including three superelevators and two fertilizer plants. Not much has changed for transportation, although three new turnouts were built to accommodate the new grain elevators. While there are school buses for children and the neighboring Liberty County Council on Aging provides on-demand service to Fort Benton and Big Sandy for senior citizens, there is no inter-city bus service and people tend to depend on their pickup trucks.

Chouteau County has a strong growth policy plan that was first adopted in 1985 and is updated every five years, most recently in 2017. The Missouri River was designated a Wild and Scenic River in 1976 and a National Monument in 2001, which prompted concerns that

excessive tourism would negatively impact the area (Chouteau County, n.d.). The Chouteau County growth policy is progressive and well-respected: it appears in the Western States Alliance manual and other counties reach out to ask for advice when crafting their own policies.

Hutterites have been purchasing substantial acreage in Chouteau County and are gradually growing their communities. The Association of Religion Data Archives notes 100 adherents in 2000, an increase from no adherents in 1990 (Grammich, Clifford et al., 2010b). Hutterites are Anabaptists, like the Amish, but they do not shun technology. However, they own property communally, so vehicles would be purchased by a colony and used by whichever members need them (Hutterites.org, 2017).

A Baby Boom and Echo Boom are reflected in the county's 2014 population pyramid, although some age groups show more of one gender than the other (Figure 4.18). This unbalance may be magnified because of the small overall population where a few people could have a large impact on a percentage.
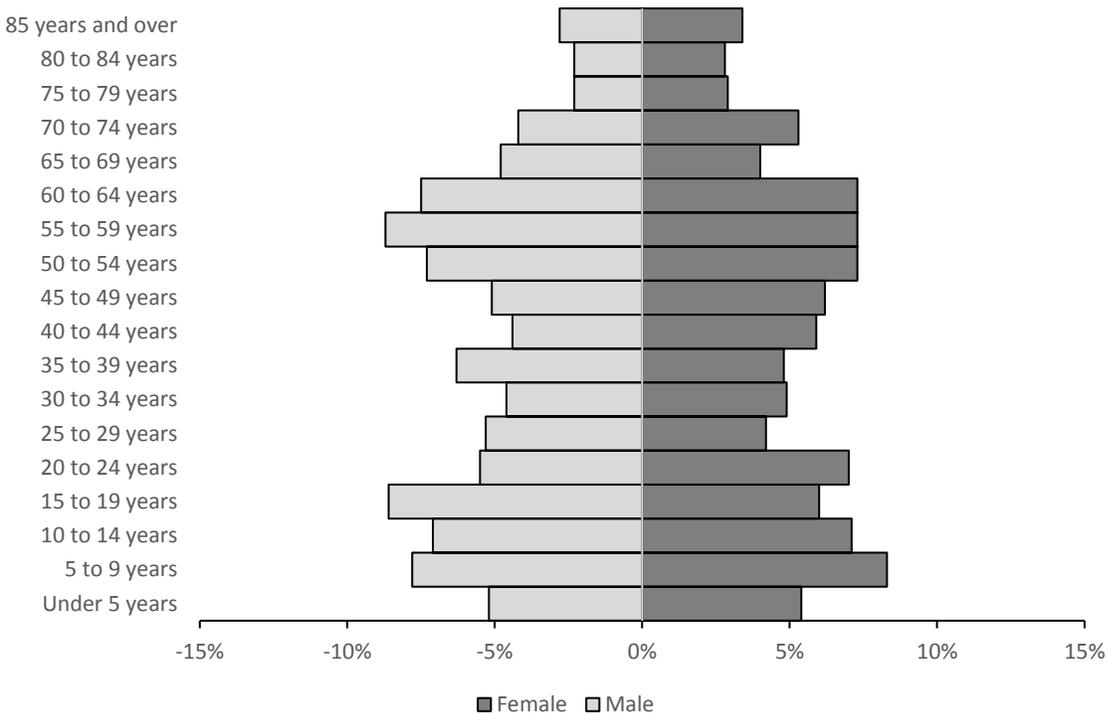
Figure 4.18 Chouteau County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

Custer County, Montana
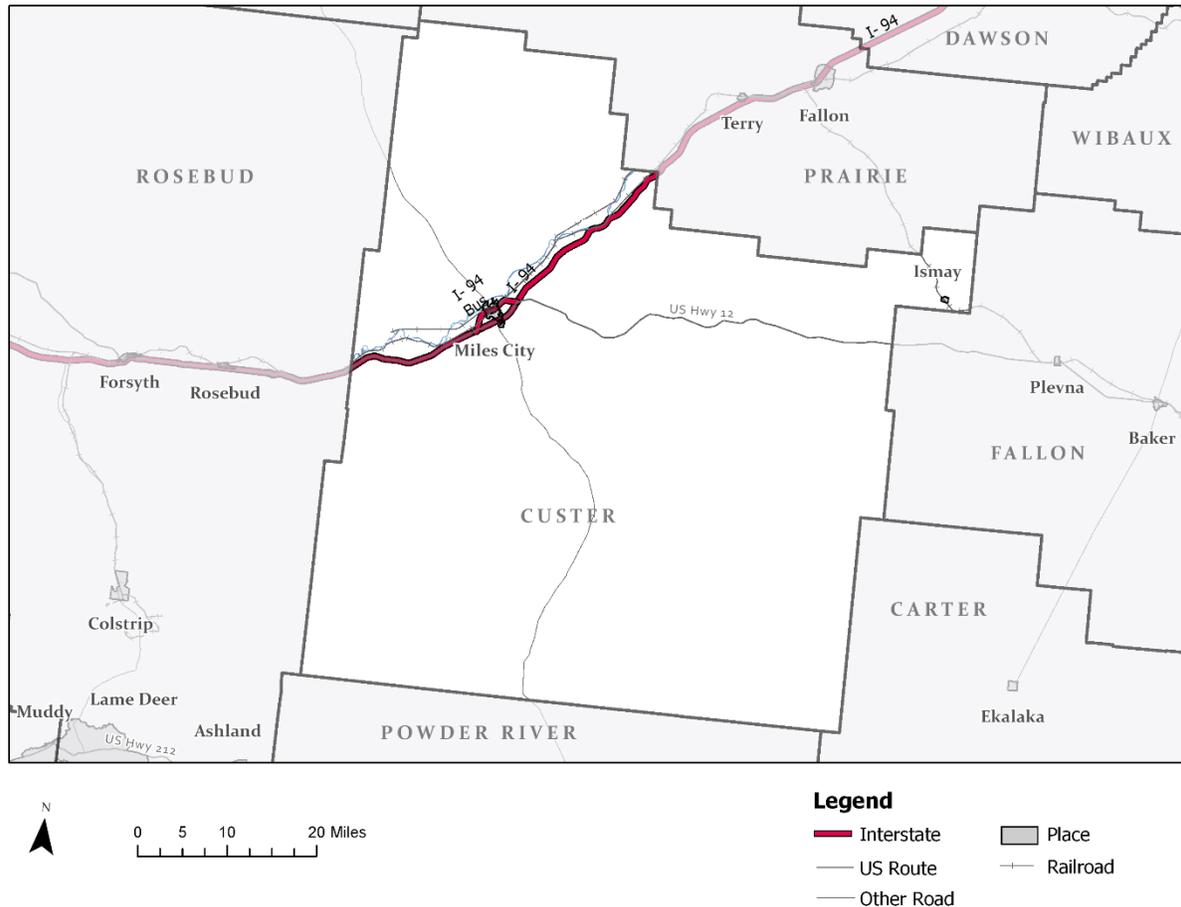
Figure 4.19 Map of Custer County, West typical county

A professional in Miles City, the county seat, provided some information by answering the interview questions.

The biggest project to impact transportation in the last two decades was improvements to Hanes Avenue, which was a two-lane dirt road until the early 1980s, when the Montana Department of Transportation paved it wide enough to accommodate four lanes of traffic, striping it for two lanes until demand increases. The road is now the major commerce center and has drawn business away from downtown.

In the last two years the growth policy was updated to promote more multimodalism. Some ordinances say that sidewalks should be constructed within 6 blocks of a school. As of 1981 all new streets should be constructed with 6-foot sidewalks, but that may have been

sporadically enforced. The updated growth policy also states that infill development should be prioritized over sprawl.

The first Transportation Plan for Miles City is expected to be adopted in 2017. The plan will loosely address multimodalism but will not include an official complete streets policy. Public transportation was briefly implemented in 2007 but was discontinued due to management concerns. Officials with Custer County recently applied for a public transportation grant, and many people in the community say there is a need for public transportation. The Veterans Administration care center has their own transportation service to take veterans to medical appointments. Daily intercity bus service is available through Greyhound.

School bus service is available to students who live in some of the areas outside of city limits. Students who live within the city limits need to either walk or be driven to school. A 2014 population pyramid for the county shows a stable population with slightly more residents in their 60s than any other age group (Figure 4.20).
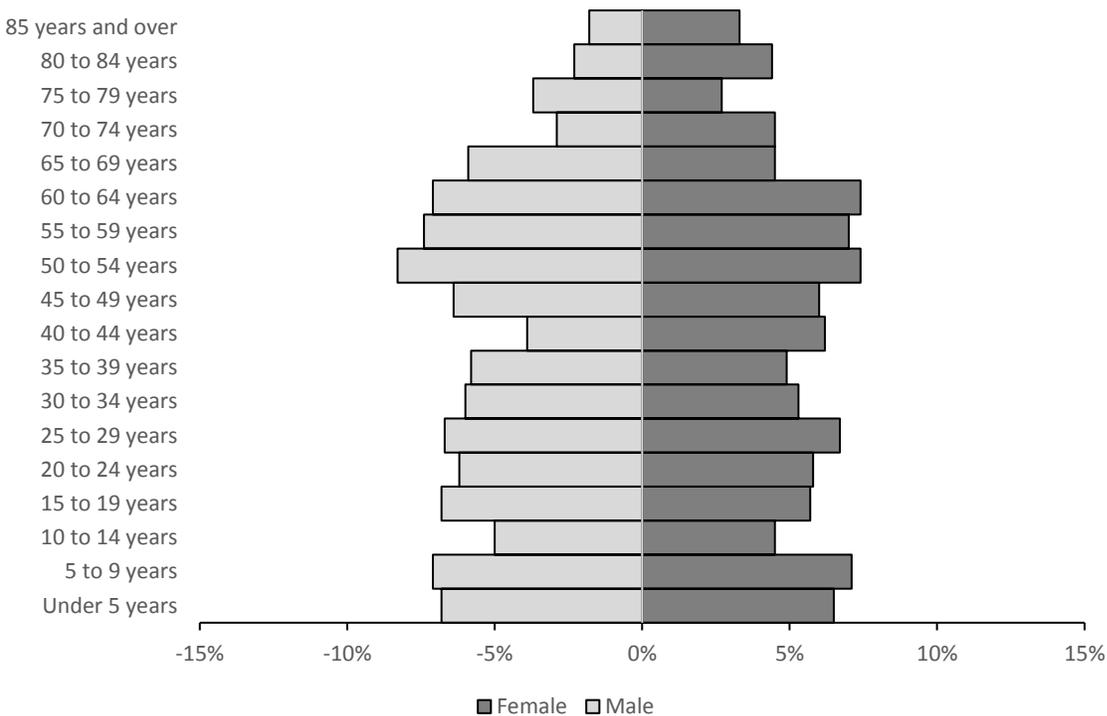

Figure 4.20 Custer County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

West South Central Region
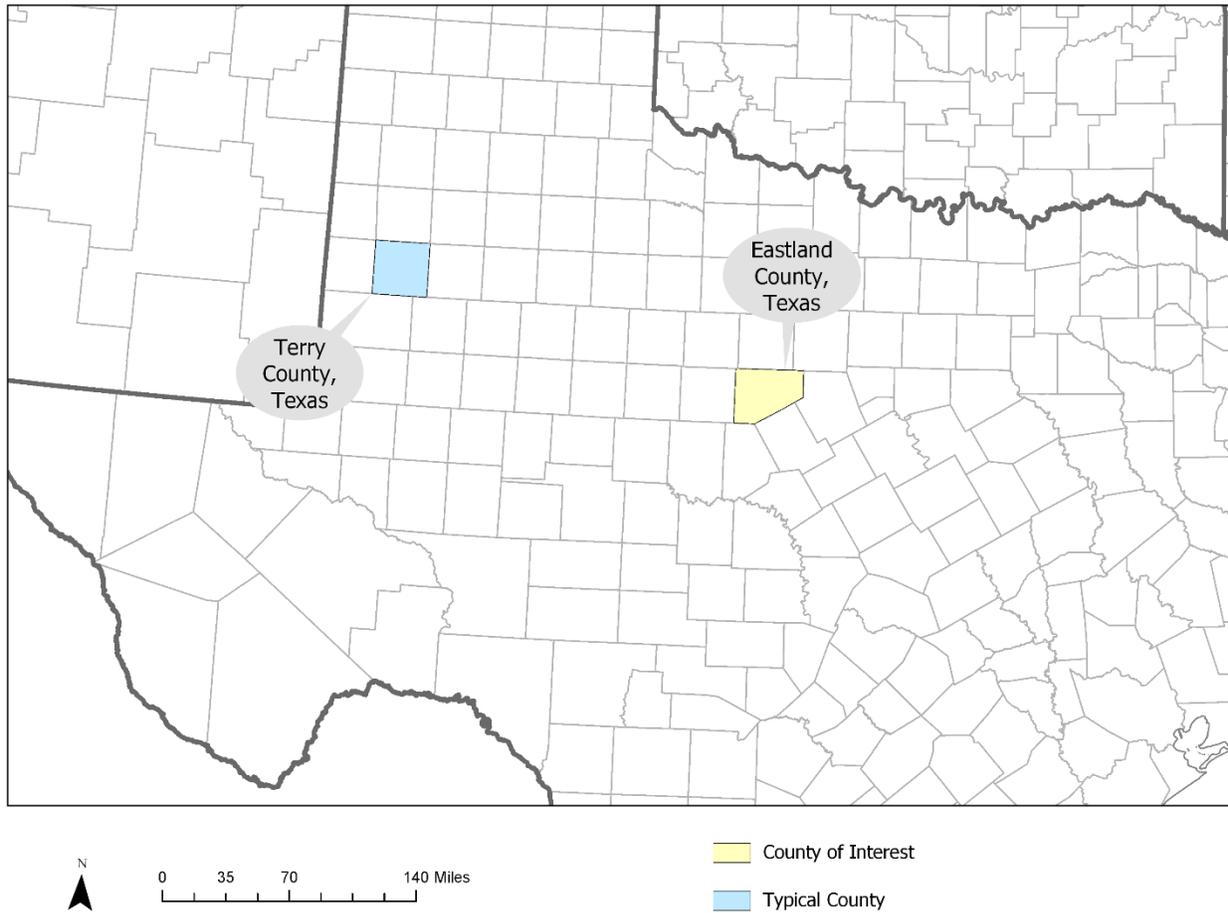
Figure 4.21 Map of West South Central matched counties

Eastland County, Texas, and Terry County, Texas, were chosen as the matched pair for the West South Central region. Neither county is part of a Metropolitan or Micropolitan Statistical Area. Terry County is located towards the western edge of Texas, while Eastland County is in the north central part of the state (Figure 4.21). The population of both counties decreased between 1990 and 2014, but only slightly. The median household income in Eastland County more than doubled, while income in Terry county increased more modestly (Table 4.9). While a similar percentage of residents travel to work by car, truck, or van in both Eastland and Terry Counties, residents of Terry county are much more likely to carpool while residents of Eastland County are more likely to walk to work or work at home (Table 4.10).

Table 4.9 West South Central matched counties selection criteria

	County of Interest	Typical County
	Eastland County, Texas	Terry County, Texas
Standardized Residual	-2.7820	-0.0755
1990 Population	18,488	13,218
2014 Population	18,403	12,681
Median Household Income 1990	15,770	22,390
Median Household Income 2014	35,221	39,494
Percent Change Population	-0.46	-4.06

Table 4.10 West South Central counties journey to work

	Eastland County	Terry County
	% Estimate	% Estimate
Car, truck, or van	93.8	96.0
Drove alone	84.3	81.5
Carpooled	9.4	14.5
Public transportation (excluding taxicab)	0.1	0.0
Walked	2.2	1.0
Bicycle	0.0	0.0
Taxicab, motorcycle, or other means	0.5	1.6
Worked at home	3.4	1.3

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0801

Eastland County, Texas
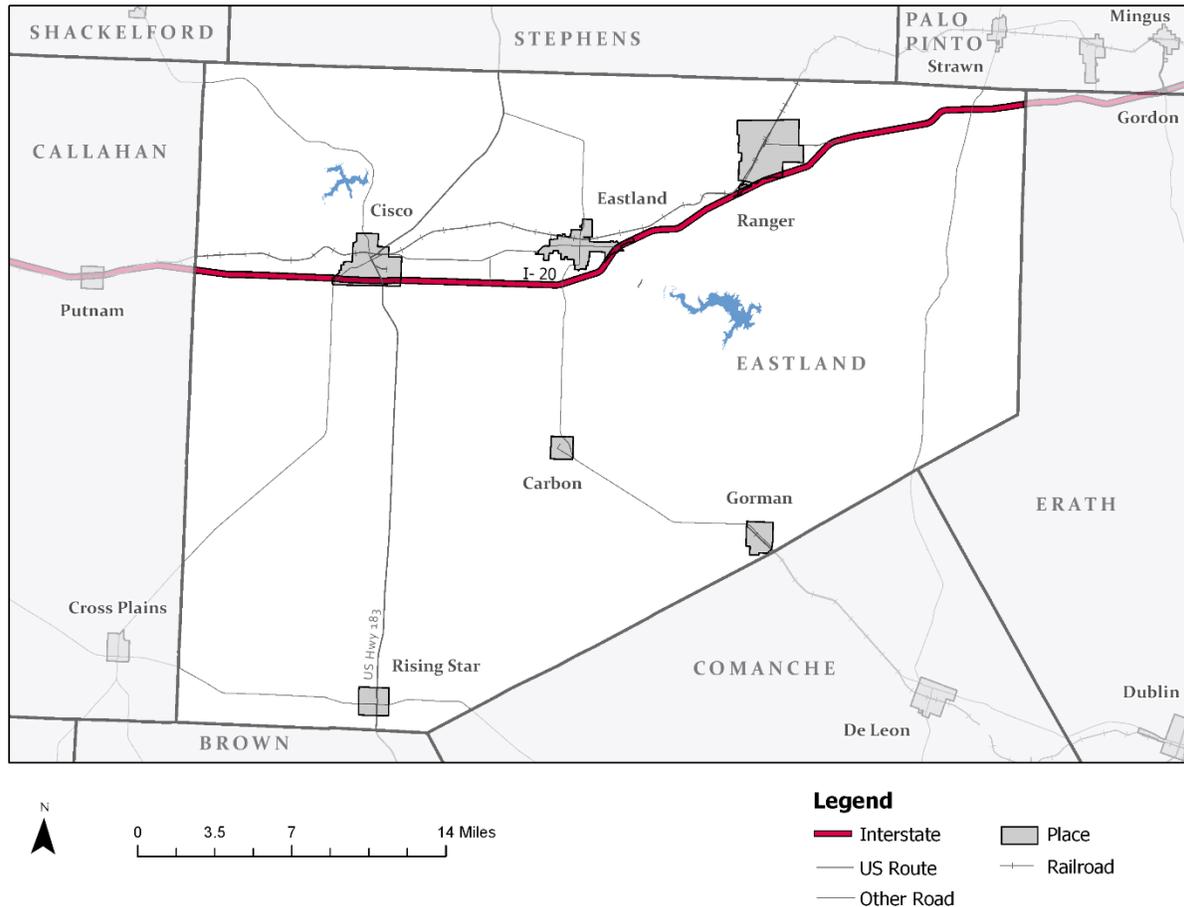
Figure 4.22 Map of Eastland County, West South Central county of interest

     A professional in the City of Eastland, the county seat, provided some information by answering the interview questions.

     No major events or projects directly impacting transportation have occurred in the last two decades. A couple of bike paths have been constructed, and sidewalks were added near the schools about 10-12 years ago. The school system requested the sidewalks, and they were funded through a grant from the Texas Department of Transportation. Zoning was implemented for the first time in 2007 and there are no allowances for mixed-use zones.

     Public transportation is available throughout Eastland County, provided by City and Rural Rides (CARR) and operated by Central Texas Rural Transit District. A taxi company also serves the City of Eastland. School bus service is available for students who live outside of the city limits. Students with disabilities within the city limits may also ride the bus.

A 2014 population pyramid for the county reflects a fairly standard Baby Boom, Echo Boom pattern (Figure 4.23).
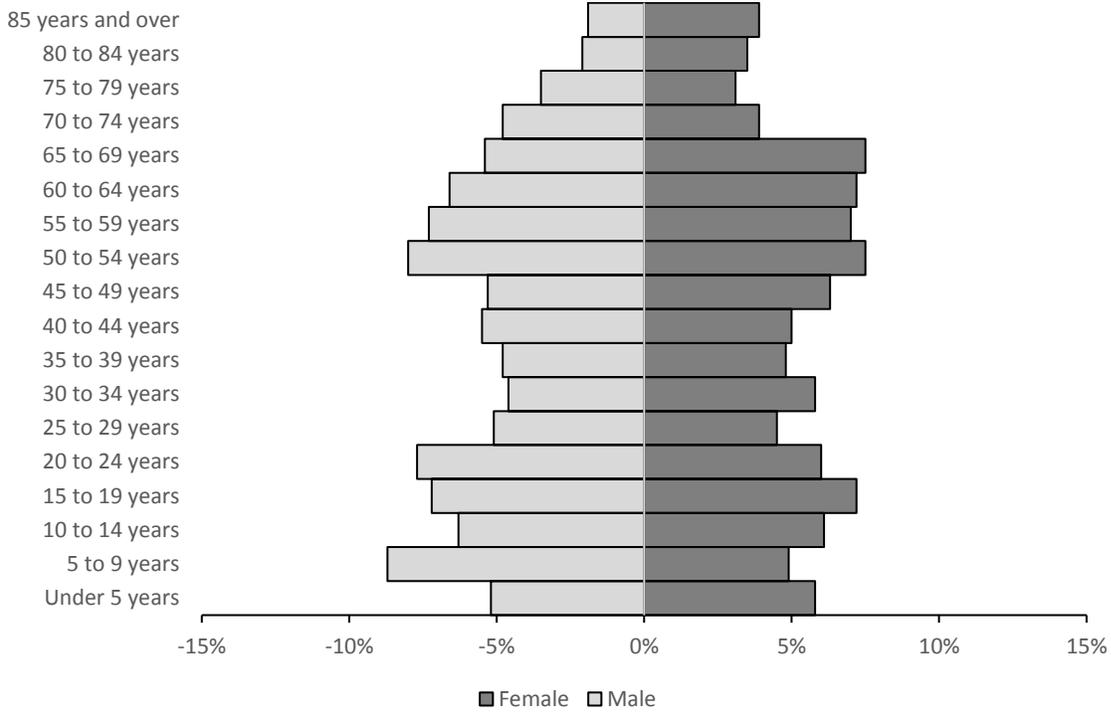
Figure 4.23 Eastland County population pyramid

Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101

Terry County, Texas
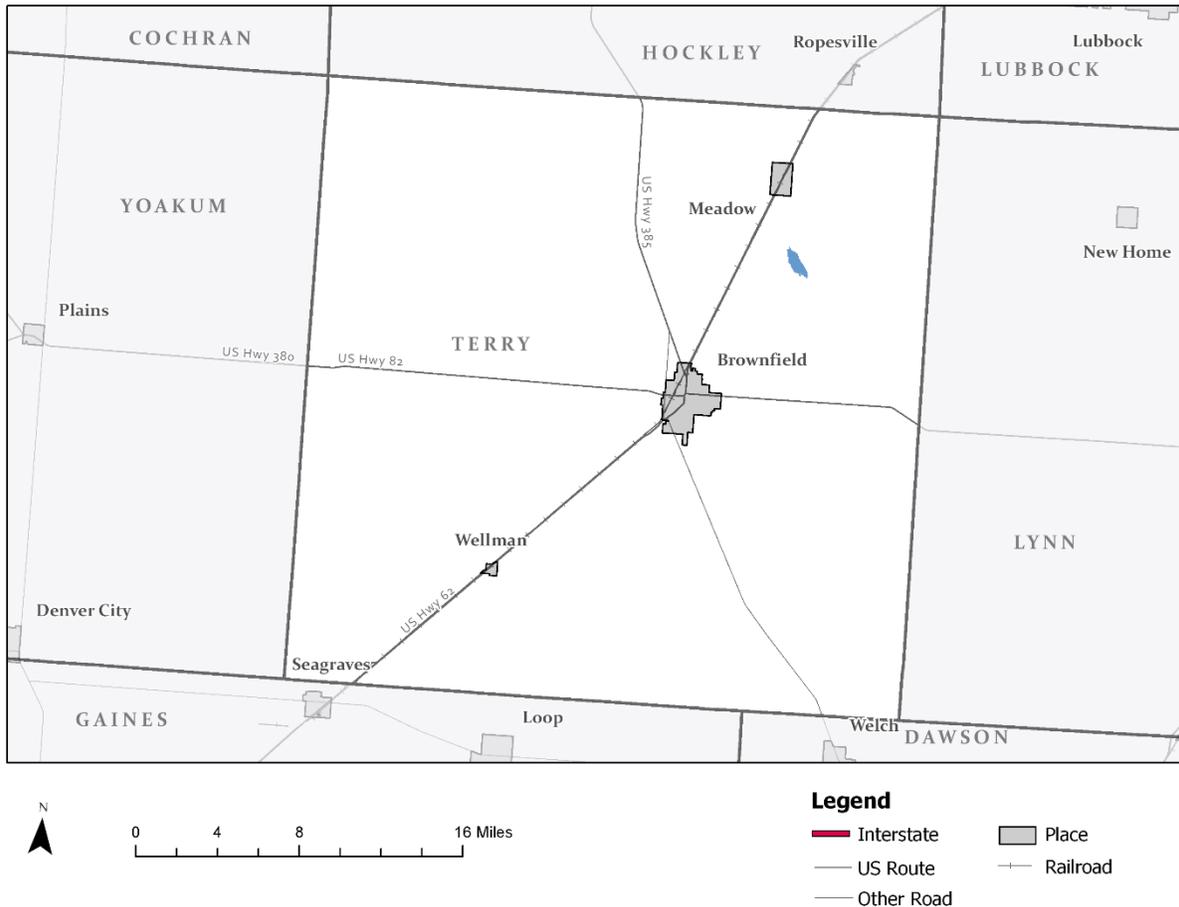
Figure 4.24 Terry County, West South Central typical county

A professional in the City of Brownfield, the county seat, provided some background information by answering the interview questions.

Over the last twenty years, some major employers have left Terry County, and others major employers have arrived. Haliburton is rapidly growing their operation in Terry County, although modernization means more tasks are becoming automated. While there are good jobs in Brownfield and Terry County, most people of means prefer to live in Lubbock, which is about 40 miles away. Only those who cannot afford a car walk or bike.

Despite the fact that very little housing has been built in the last thirty years, the population growth rate is consistently positive from year to year. The community is well connected by its roads to markets and sees steady car traffic moving through. School buses are available for children, but parents often choose to drive their children to school instead of using

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the bus. Many residents of Brownfield drive their children to the smaller neighboring towns for school, or even all the way to Lubbock. The South Plains Community Action Partnership runs the SPARTAN Public Transportation system, a multi-county demand-response service that is available to the general public (SPARTAN Transportation, 2012).

A 2014 population pyramid for the county shows more males than females for ages 20 to 44, likely a reflection of types of jobs available in the local oil industry (Figure 4.25).
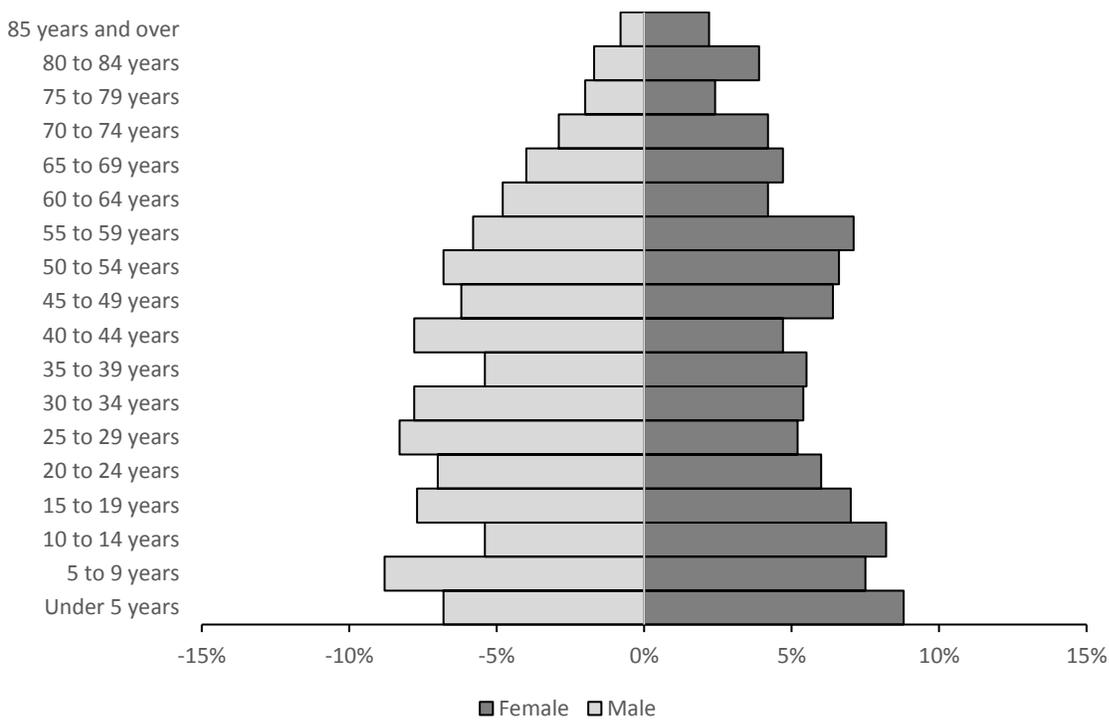
Figure 4.25 Terry County population pyramid

*Source: U.S. Census Bureau, 2010-2014 American Community Survey, table S0101*

Chapter 5 - Discussion

Demographic Factors

The goal of the modeling step was to select counties of interest that were not demographically exceptional, in order to highlight policies that may impact household car ownership rates. However, of the five counties of interest, four contain populations that tend to own cars at lower rates. Adams County, Indiana is home to a significant Amish population; Yates County, New York contains an Old Order Mennonite population; Union County, Georgia is a retirement community and home to a disproportionate number of older residents; and Chouteau County, Montana has seen Hutterites establish colonies since 1990. Eastland County, Texas is the one county of interest that does not appear to be demographically exceptional. In rural counties with low populations, even a modest cultural change can have a significant impact. The typical counties of each matched pair do not show similar demographic characteristics, which indicates that the exceptional demographic factors could explain the unexpected changes in car ownership rates.

Comparing Rates

It is important to note that while the identified counties are outliers, their actual car ownership rates and related changes are often not so different from typical counties. As shown in Table 5.1, the car ownership rates for each of the ten counties hovers around two cars per household.

Chouteau County and Custer County have remarkably similar 2014 car ownership rates, at 2.056 and 2.021, although the first has decreased since 1990 and the second has increased. Regardless of whether a rate increased or decreased, most of the selected counties saw a change of approximately 1/10th of one car per household, which is perhaps a small enough change that locals would not notice any trend.

Table 5.1 Comparison of car ownership rates

	1990 Household Car Ownership Rate	2014 Household Car Ownership Rate	Absolute Change	Percent Change	Std. Residual
Adams County, Indiana	1.902	1.807	-0.095	-4.984	-2.032
Huntington County, Indiana	1.852	1.919	0.067	3.592	0.019
Yates County, New York	1.678	1.703	0.025	1.471	-2.236
Greene County, New York	1.712	1.809	0.097	5.659	-0.152
Union County, Georgia	1.964	1.871	-0.092	-4.700	-2.633
Gilmer County, Georgia	1.820	1.970	0.151	8.277	0.013
Chouteau County, Montana	2.312	2.056	-0.256	-11.075	-2.865
Custer County, Montana	1.871	2.021	0.150	8.036	0.031
Eastland County, Texas	1.775	1.654	-0.121	-6.827	-2.782
Terry County, Texas	1.741	1.794	0.053	3.064	-0.075

Counties

As stated earlier, counties are a convenient, stable, and relevant geographic unit. Their borders remain consistent over time, and they correlate with political jurisdictions, unlike census tracts which may change with each census and are not related to any government unit, or cities that may annex land and residents. However, each county contains multiple neighborhoods, communities, and governments that complicate case studies. For this study, some professionals were familiar with the entire county, but perhaps not trends within incorporated communities, while others were familiar with a particular incorporated community but perhaps not the county as a whole. Especially because many policies are implemented within a city or town, it may have been easier to tease out the impacts of a particular program or policy if the case studies focused on units smaller than counties. Using a smaller geographic unit may be feasible for subsections of the country, or in a study focused on one year and not change over time.

Policies

Regardless of whether or not the policies mentioned here are explicitly correlated with a decrease or slower increase in household car ownership rates, the case studies did unearth some interesting transportation-related policies, programs, and trends. The 50/50 sidewalk funding program from Adams County, Indiana was described as a popular program that encouraged collaboration between neighbors and a healthy competition to keep up appearances. Many

communities utilized state or federal pass-through funding to fix or build sidewalks or trails: projects that may be challenging to fund with scarce local dollars. Almost all rural public transportation programs received 5311 Rural Transportation Assistance Program funds. Many professionals also mentioned receiving federal funds for local airports.

While some planning initiatives begin at the local level, state-level requirements and resources can provide a spark of inspiration or needed capacity to implement a change. The New York State Department of Transportation supported the newly-implemented Yates Transit Service, in large part through a grant program. Both counties in Indiana benefitted from state-level programs: Adams County started the Greater Decatur Initiative in response to the Indiana Stellar Communities Designation Program, while both Adams and Huntington County will receive funding for trail projects through the Indiana Regional Cities Initiative. The professional in Terry County, Texas mentioned the impact a state-level program *could* have on rural communities, if adequately funded.

Most interviewees responded that they did not have documented policies to promote multimodalism. At least one mentioned a sidewalk policy that may not be uniformly enforced, and another noted that their planning document was successful because it is consistently referenced and used as a guide.

Study Limitations

The definition of rural used to eliminate counties from the dataset is potentially too limiting and also too generous. Too limiting in that there are many small communities that are rural in nature that happen to be in a county that also contains an area defined as urban. Because counties were the chosen unit, these areas were removed from the dataset along with the urban area. The selection definition was perhaps too generous in that a small community, rural in nature, could have been included in the dataset while also being very close, geographically and economically, to an area defined as urban in the adjacent county.

For obvious reasons, this is not a double-blind study. The counties were selected and locals interviewed with the knowledge that some would serve as controls and others would serve as test cases. Interviewees were all given and asked the same information, but the interviewer knew if a county was categorized as a control or an outlier. Therefore, it was a challenge as a

researcher not to automatically identify policies as correlated with higher or lower car ownership rates.

Even though counties with fewer than 10,000 residents were generally eliminated from the study set, it was still challenging to reliably reach someone knowledgeable about transportation trends and policies at either the county or city level for some counties. Many practitioners were surprised that someone from out of state was interested in their community.

The models were designed to capture change in car ownership rates over time, to find communities that may be less car-dependent now than there were in the past. However, interviews conducted in the present day may not effectively capture community changes over time, either because an individual is not familiar with the history, or current events tend to overshadow long-term changes.

Chapter 6 - Conclusion

Summary of Findings

The goal of this study was to discover and document communities that had lessons to share about reducing dependence on personal car ownership. Because most of the identified counties of interest have unusual demographic characteristics, the policies mentioned may not be correlated with reduced car ownership rates. However, the case studies do highlight some patterns in rural transportation planning.

Public transportation, at a minimum demand-response service for older adults and those with disabilities, was surprisingly common in both the counties of interest and the typical counties.

The interviews conducted for this study revealed that what might be considered a minor project in an urban area can be a major change in a rural community. State or federal funding is instrumental to completing projects or initiating new programs. Since rural communities are non-entitlement communities, how a state government structures its initiatives, grant programs, and technical support can greatly impact a small community's ability to plan and execute transportation-related projects.

Culture can have an outsize influence in rural areas: if new populations move in, they may have a noticeable impact on transportation trends. Likewise, if a population is supportive of cycling and walking, residents may be more likely to walk or bike to work, regardless of infrastructure and topography. If traveling by anything but private car is viewed as a last resort, it likely does not matter how well connected sidewalks are. A champion for alternative modes of transportation may help to influence culture, but they still need support from colleagues.

While many rural communities employ innovative, experienced planners, rural areas may not have much transportation planning capacity because staff time is limited. Outside technical help from a state agency or local university may provide much-needed support.

These case studies just brushed the surface of the circumstances of these counties. The brief interviews and document research cannot begin to capture the historical circumstances and present-day attitudes of dozens of communities, not to mention their leaders, citizens, visitors, and infrastructure. However, taking a broad glance at rural counties across the country did unearth some policies and tactics that were new to this researcher, and showed the value of

looking for ideas in new places. Most interviewees requested a copy of this report and expressed a desire to learn new strategies and lessons from other communities.

Further Research

Rural transportation research is important because, as stated in earlier chapters, a significant portion of the United States is rural. For this study 2,285 of 3,108 counties, or 74% of counties in the lower 48 states, were categorized as entirely rural. Because rural residents tend to have larger carbon footprints than urban dwellers, who often live in attached dwelling units and utilize public transportation, pursuing even modest reductions in emissions across rural counties is worthwhile.

If the counties of interest do have lower than expected car ownership rates because of the noted populations, it may be helpful to study these populations to glean insights about effectively living car-free or car-lite. A specific age or religious belief is not a prerequisite to adopting a car sharing program or another logistical or community-based tactic.

Counties are a useful unit to study over time because they have consistent boundaries and correlate with government entities, unlike census tracts, but case studies of cities may prove to be more straightforward and revealing. Future research efforts may benefit from more in-depth case studies at the local and state levels, to better understand the local transportation context.

Selecting case studies via modeling has potential. While the models in this study did not effectively account for important demographic factors, a few modifications to the case study selection methods may yield counties that truly stand out for their policies. These modifications could be introduced separately or combined as necessary. First, define smaller regions of the country to reduce geographic variability and better tailor the models to highlight counties that stand out for their policies. Second, include more demographic variables in the statistical models to more effectively account for counties with noteworthy changes in populations or cultures. Consider including religious variables, more age variables, or employment variables such as proportion of residents working in agriculture or manufacturing. Third, vet outliers more closely before selecting them for case studies, and perhaps select a few counties across the spectrum of standardized residuals to compare as a group instead of in pairs.

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Appendix A - Interview Protocol

Soliciting Advice from County Officials

Hello. My name is Emma Rearick and I am a graduate student in Regional and Community Planning at Kansas State University. I am researching rural transportation and have identified _____ County as one of my case studies. I would like to interview a County or City employee about local transportation policies. Can you recommend anyone that would be knowledgeable about policies and trends in your area?

Introduction

Hello. My name is Emma Rearick and I am a graduate student in Regional and Community Planning at Kansas State University. I'm researching rural transportation and have identified _____ County as one of my case studies. I have about a dozen questions to ask about public policies in your community. Our conversation should take about half an hour. Is this time still good for our call?

Thank you. I need to inform you that this study is considered research. I will interview about a dozen people across the country and the study will be completed by April 2017. The outcome will be a collection of case studies and transportation policy recommendations for rural communities. Your participation is entirely voluntary and can be terminated at any time without penalty. Your identity will be kept confidential. Do you consent to be interviewed?

(Potentially) Is it okay if I record our conversation to help me remember your answers?

Interviewee
First, I have a few questions about your role in the community.
1. What is your name?
2. What organization do you represent, and what is your official title?

3. How long have you worked for this organization? How long have your worked and/or lived in the area?

Open-ended Policy

Okay, now I have some questions about local policies.

4. Have there been any substantial transportation changes over the last 20+ years? For example, new ways to get around, major roads built, etc.

5. Are there any policies that promote sustainable transportation in the area? When and how were they implemented? Were there any particular driving forces?

6. Are there any policies that promote multimodalism? For example, complete streets or routine accommodation guidelines. If so, when and how were they implemented?

7. Are there any policies that promote density, or mixed-use development? When and how were they implemented? Are they restricted to any specific parts of the community?

Specifics

Thank you. Now I'd like to ask about some specific services in your area.

8. I see that _____ (organization) offers public transportation (buses / trains / other). What sort of role does this service play in the community?

9. I see there is _____ (intercity bus/train/trail). What sort of role does this service play in the community?

10. Are school buses available for kids? Do the routes cover the whole community, or just parts?

11. Do any employers offer transportation? For example, a bus or van that picks up employees at a central location and brings them to and from work. If so, what employer?

Federal Funding

12. Do you know if your community utilizes any federal funds for transportation? For example, 5311 funds for public transportation.

13. Do you know if Community Development Block Grants have ever been utilized? If yes, how?

Further Research

    14. Are there any relevant key documents I should look into or people I should contact?

Thank you for taking the time to help me with my research. Would you be interested in receiving a copy of my report when it is finished?

If you have any further questions or thoughts about my research, please contact me at 508-353-6980 or erearick@ksu.edu.

Appendix B - Policies

Local Policies

That may help to reduce car dependence:

Collaborating and contracting with existing public transportation services

Coordinating time tables to facilitate connections with adjacent transit services

Funding to build trails

Funding to install and improve sidewalks

Growth plans and policies

Park and ride lots to encourage carpooling to major employment destinations

That may hinder:

Sidewalk waivers to avoid building required sidewalks

State or Federal Policies

That may help to reduce car dependence:

5310 Funding for public transportation

Programs to provide planning and financial support for rural development

Public transportation studies

Require comprehensive planning

That may hinder:

Community Development Block Grant Low Moderate Income Requirements