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FINAL REPORT
VOLUME 2

ECONOMIC IMPACT ANALYSIS OF GEORGIA'S RURAL AND SMALL URBAN TRANSIT SYSTEMS

OFFICE OF PERFORMANCE-BASED MANAGEMENT AND RESEARCH

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16. Abstract

On March 30, 2017, the Georgia Legislature passed House Resolution 848 to create a Commission on Transit Governance and Funding. The Commission's mission is to "study and assess the needs for and means of providing a system of mass transportation…in the state and [identify] potential methods of funding such systems" (HR 848). Currently, the State of Georgia has 21 distinct Federal Transit Administration (FTA) grant recipients that provide transit service to 14 urban areas and 114 counties with rural populations. GDOT is responsible for administering and providing oversite for FTA grants received by small urban areas with a population less than 200,000 and rural counties.

The establishment of the Commission shines a spotlight on transit in Georgia. To justify additional funding for transit, the Commission will need information on the economic impact of the provision of transit services on the State's economy. The final report for this project is divided into two volumes. Volume 1 quantifies these economic impacts in the rural and small urban areas that fall under GDOT's responsibility. Volume 2 conducts an analysis of mobility and accessibility in rural areas in Georgia using a database of rural transit trips and provides a high-level assessment of costs of expanding and initiating service from 6 AM – 4 PM Monday through Saturday in all Georgia counties with rural populations. The analysis shows that expansion and initiation of service at the proposed level would increase ridership by 400,000 (or 38 percent from FY 2018 levels) and costs by $9M (or about 21 percent from FY 2018 levels). Further, many of the areas in which service would be initiated are in counties with the lowest levels of accessibilities.

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Final Report

ECONOMIC IMPACT ANALYSIS OF GEORGIA'S RURAL AND SMALL URBAN TRANSIT SYSTEMS

Volume 2

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LIST OF SYMBOLS AND ABBREVIATIONS

ACS	American Community Survey
ADA	Americans with Disabilities Act
AHS	Agency of Human Services
APTA	American Public Transportation Association
CARTA	Chattanooga Area Regional Transit Authority
CRAN	Comprehensive R Archive Network
CRC	Coastal Regional Commission
CSRA-RC	Central Savannah River Area Regional Commission
DART	Dallas Area Rapid Transit
DCH	Department of Community Health
DFCS	Department of Family and Children Services
DHS	Department of Health and Human Services
DREDF	Disability Rights Education & Defense Fund
FIPS	Federal Information Processing Standard
FTA	Federal Transit Administration
FY	Fiscal Year
GDOT	Georgia Department of Transportation
HGRC	Heart of Georgia Regional Commission
LCRTA	Lower Chattahoochee Regional Transit Authority
LEHD	Longitudinal Employer–Household Dynamics
LODES	LEHD Origin–Destination Employment Statistics
MARTA	Metropolitan Atlanta Regional Transit Authority
MOU	Memorandum of Understanding

MSA	Metropolitan Statistical Area
NAICS	North American Industry Classification System
NGRC	Northwest Georgia Regional Commission
NPR	National Public Radio
OWPT	One-way Passenger Trip
RHST	Rural and Human Services Transportation
RTAP	Rural Transit Assistance Program
RVRC	River Valley Regional Commission
SGRC	Southern Georgia Regional Commission
SWGRC	Southwest Georgia Regional Commission
TCQSM	*Transit Capacity and Quality of Service Manual*
TDI	Transit Dependency Index
TNC	Transportation Network Company
TRRC	Three Rivers Regional Commission
UNC	University of North Carolina
USDA	U.S. Department of Agriculture
VRM	Vehicle Revenue Miles
VTrans	Vermont Agency of Transportation

EXECUTIVE SUMMARY

The School of Civil and Environmental Engineering at the Georgia Institute of Technology has worked with the Georgia Department of Transportation (GDOT) Transit Planning Division since 2015 to provide guidance on the administration and planning of the state's rural transit system. Background on Georgia's rural transit system is available in a 2018 report titled *Rural and Small Urban Transit Systems in Georgia* by Laurie A. Garrow, Thomas H. Douthat, Wenhui Yang, Anna Nord, Pooja Rao, and Sara Douglass. This report complements the 2018 report by diving deeper into the systems' current ridership and travel patterns. This report is volume 2 of a project funded by GDOT entitled Economic Impact Analysis of Georgia's Rural and Small Urban Transit Systems and represents tasks 5–7. This report is intended as both a standalone document and as a component of a larger effort to improve transit statewide in close collaboration with GDOT.

From 2011 to 2018, GDOT used the same software provider to track trips taken on Georgia's rural transit systems. Ridership data from that collection are used in this report to investigate three key research areas: (1) track the most important types of destinations for users of transit in rural environments, (2) quantify the benefits and costs of extending existing service hours and days of service currently provided, and (3) explore current trip patterns and what types of new services may better serve both current and potential riders.

Georgia's rural transit program has room to expand, and it needs to expand to meet the growing demand of the state's aging population. Population growth is declining or stagnating in rural areas, while rural poverty rates are higher than in the state's urban areas.

Access to vital services, such as healthcare, is becoming more constrained as hospitals across rural parts of the state close at an alarming rate (Williams 2015).

The analysis found evidence that Georgia's rural transit system is not currently meeting the needs of its users. Typical users tend to come from the poorest and most rural parts of the state. A number of counties in rural areas, though, offer no form of service; those that do often offer limited hours of operation and only serve a small area. Demand is present to expand service—particularly, to extend hours of operation into the early morning or evening hours, to expand service to counties where service is not currently offered, and to regionalize services—thereby making it easier for riders to visit destinations across county borders. Further opportunities exist to collaborate with neighboring states to provide services in counties along state lines and to offer additional services in areas of higher demand, such as in town centers.

An analysis using the routing database allowed the research team to calculate the costs of expanding and initiating service from 6 AM to 4 PM Monday through Saturday in all Georgia counties with rural populations. The analysis shows that expansion and initiation of service at the proposed level would increase ridership by 400,000 (or 38 percent from FY 2018 levels) and costs by $9M (or about 21 percent from FY 2018 levels). Further, many of the areas in which service would be initiated are in counties with the lowest levels of accessibilities.

CHAPTER 1 INTRODUCTION

With 83 separate transit service providers, Georgia has more rural transit providers than any other state (Federal Transit Administration [FTA] 2014). Georgia has the sixth-largest rural population in the United States, which makes its rural transit system one of the most decentralized systems in the country (U.S. Census Bureau 2015).

Taliaferro County in eastern Georgia has a population of 1,717. Its current mobility offerings are emblematic of the need for transit reform in Georgia. The county provides and operates its own transit service—a network of just two vehicles (FTA 2018). Virtually all destinations are located outside of the county, with the county itself home to only a few churches, a restaurant, and an assisted living center. Residents, meanwhile, may only use their own county's service; when they visit the closest hospital, located 20 miles away in Wilkes County, they are required to wait for the arrival of a return pick-up from their home county, rather than use the local network in that county.

This limitation adds unnecessary cost to Taliaferro County and inconvenience to the rider. It also makes it harder to attract new riders and adds confusion. In addition, residents must navigate multiple other services that are offered, such as medical transportation from the Department of Health and Human Services (DHS) or from shuttles provided by local community groups.

This report looks at sociodemographic measures of Georgia's rural community and attempts to assess the state's future transit needs. It aims to fill existing gaps in the understanding of public transportation needs in rural communities. Through the use of

several different methodologies, the report identifies gaps in current service and proposes new investments. The report envisions service improvements that are more customer-friendly and also more efficient to the State and county.

Transit reform initiatives have gained momentum in Georgia's state-level politics. In 2017, the State Legislature created the House Commission on Transit Governance and Funding. In 2018, the State passed landmark legislation allowing Atlanta-region counties to opt into a regional transit system with State funding (Georgia General Assembly 2017, SB 386). This report hopes to build on this momentum to call attention to the need for improvements to public transit in Georgia's rural counties.

CHAPTER 2 EXISTING RURAL AND SMALL URBAN TRANSIT SYSTEMS IN GEORGIA

As previously illustrated, Georgia has a fragmented rural transit system. Among the rural transit providers in Georgia, 58 percent operate five or fewer vehicles (National Transit Database [NTD] 2018a). The current system's structure poses challenges for riders. Many destinations are in other counties, and most providers have limited staff, making it hard to take advantage of the resources that are offered at a larger agency.

System Overview

Funding for public transportation in Georgia is provided by multiple agencies—the FTA, the DHS, the State of Georgia, and local counties. Every county in the state that the census defines as non-urbanized is eligible to participate in the FTA's Rural Transit Assistance Program (RTAP), often referred to as its "5311" funding program. Yet, not all eligible counties participate. Sources of operating funds for 5311 service are split, with 50 percent from the State and 50 percent from the county. Capital expenses are split, with 80 percent coming from the State, 10 percent from FTA, and 10 percent from the county.

Figure 1 shows transit offerings by county. In the state, 37 counties offer no service.

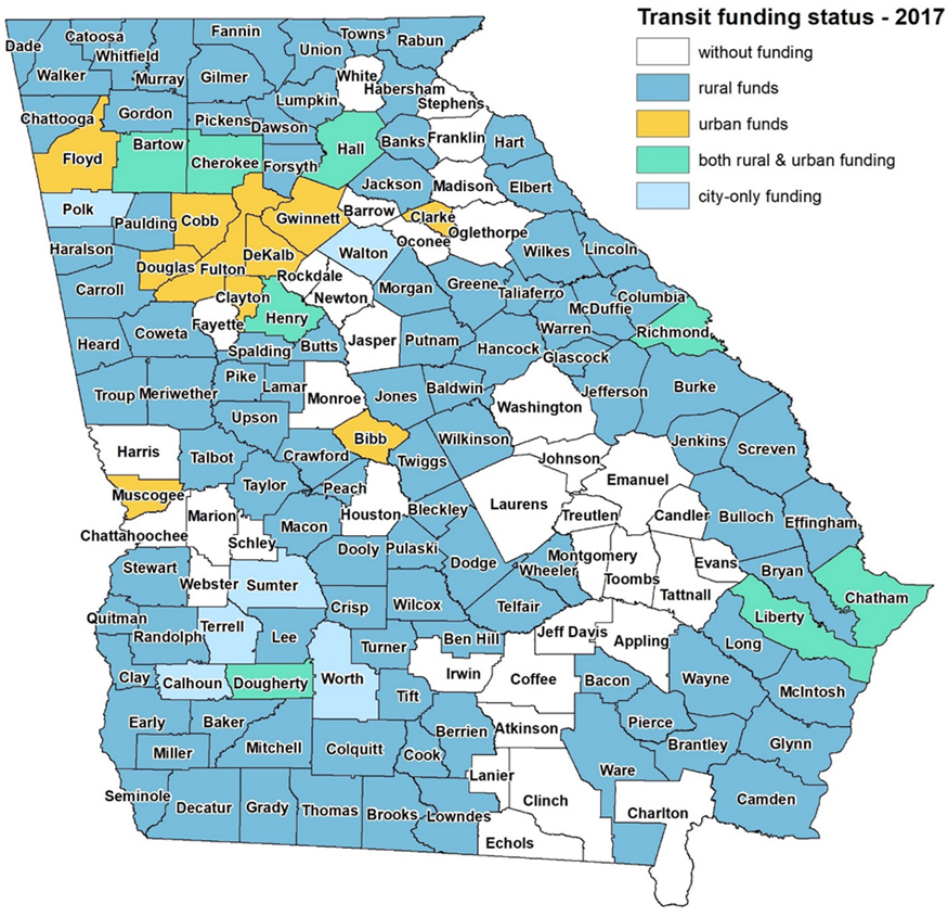


Figure 1. Map. Transit offerings in Georgia by county.

Most rural counties in Georgia run their own service. The Southwest Georgia Regional Commission (SWGRC) and the Coastal Regional Commission (CRC) are the only parts of the state to offer regionalized services, while the Three Rivers Regional Commission (TRRC) and the River Valley Regional Commission (RVRC) offer limited multi-county service. Figure 2 shows the borders of all 5311 rural providers statewide.

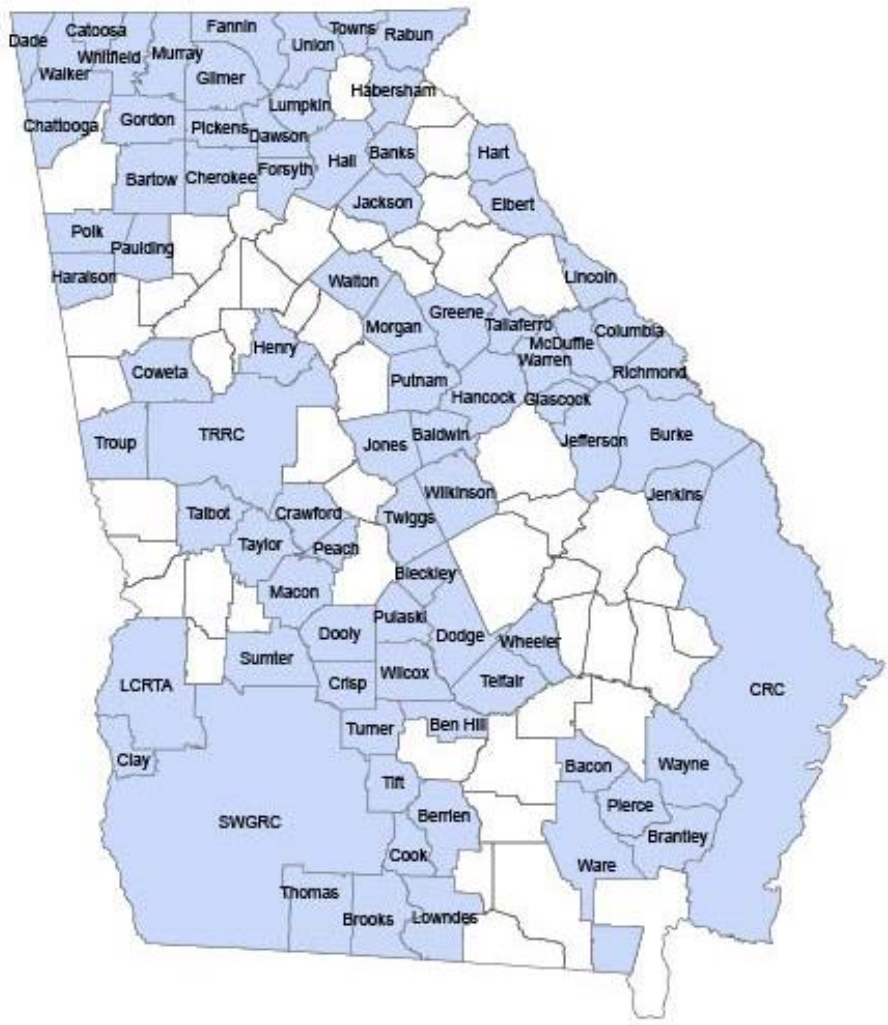
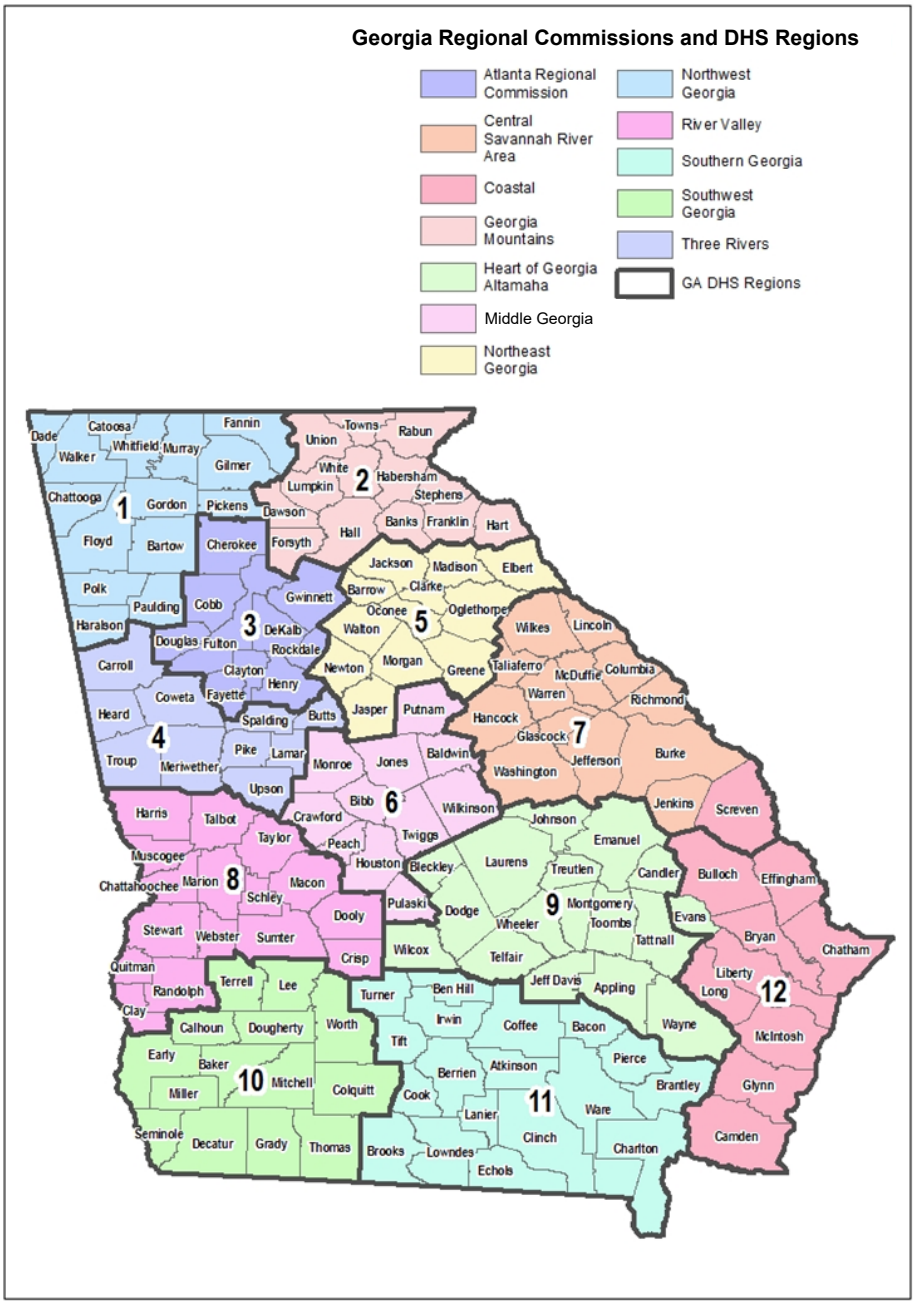


Figure 2. Map. Rural transit providers statewide.

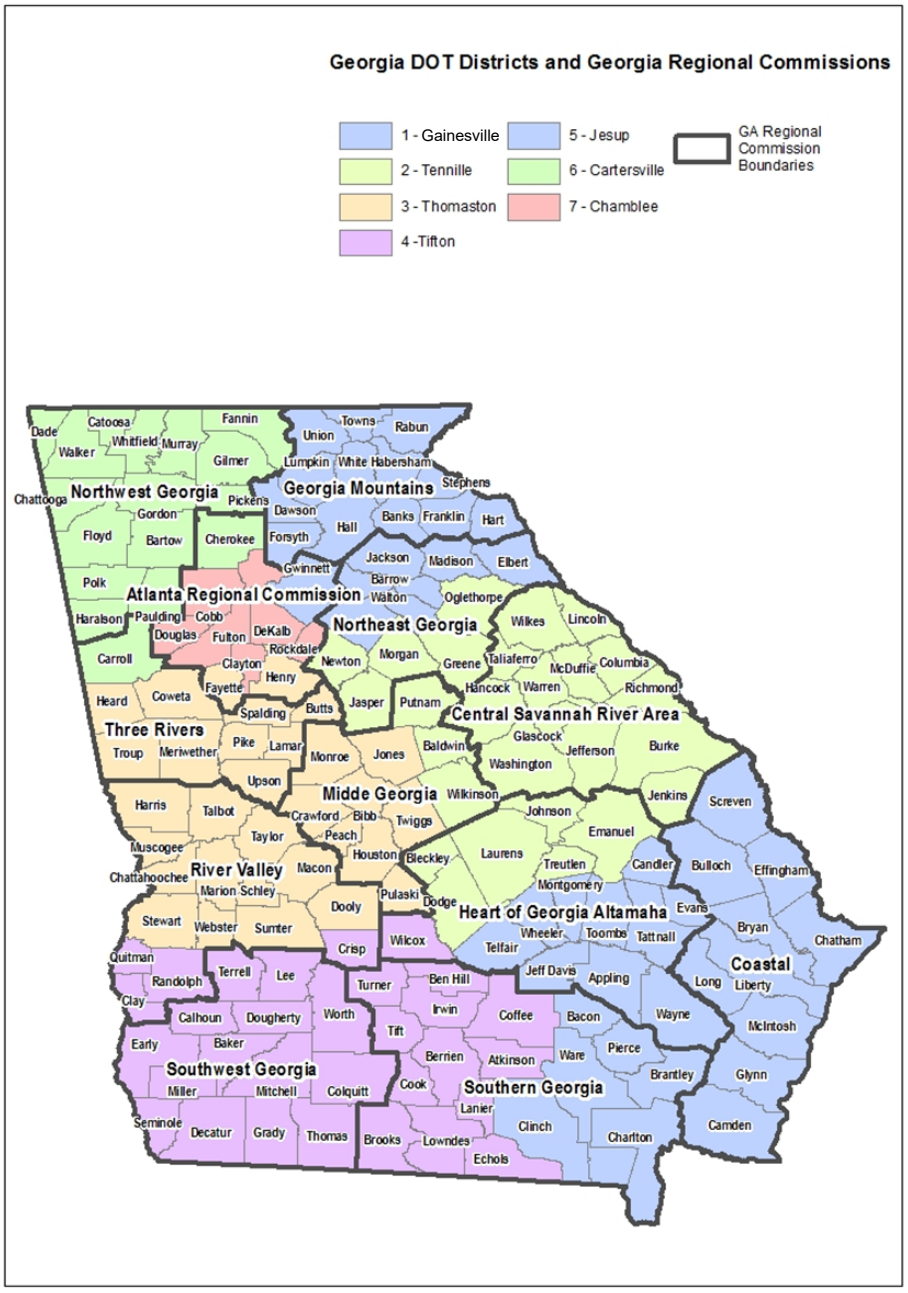
The DHS provides additional service focused on connecting qualified residents to health- and rehabilitation-related destinations. A 2018 report titled *Rural and Small Urban Transit Systems in Georgia* by Garrow et al. highlights the relationship between the Georgia Department of Transportation (GDOT), the DHS, and Georgia's 12 regional commissions. As shown in figure 3, there is a high degree of overlap between the regional-commission and DHS boundaries.



Source: Garrow et al. (2018, p. 11).

Figure 3. Map. Georgia regional commissions and DHS regions.

Regional-commission and GDOT boundaries, however, have little to no overlap, as shown in figure 4.



Source: Garrow et al. (2018, p. 11).

Figure 4. Map. Georgia DOT districts and Georgia regional commissions.

Consolidated services provide the opportunity to run more efficient service across a larger area, but only 2 of the 12 regional commissions in the state do so. Coordinating service

across different agency borders is a challenge, but that strategy has proven successful in other places.

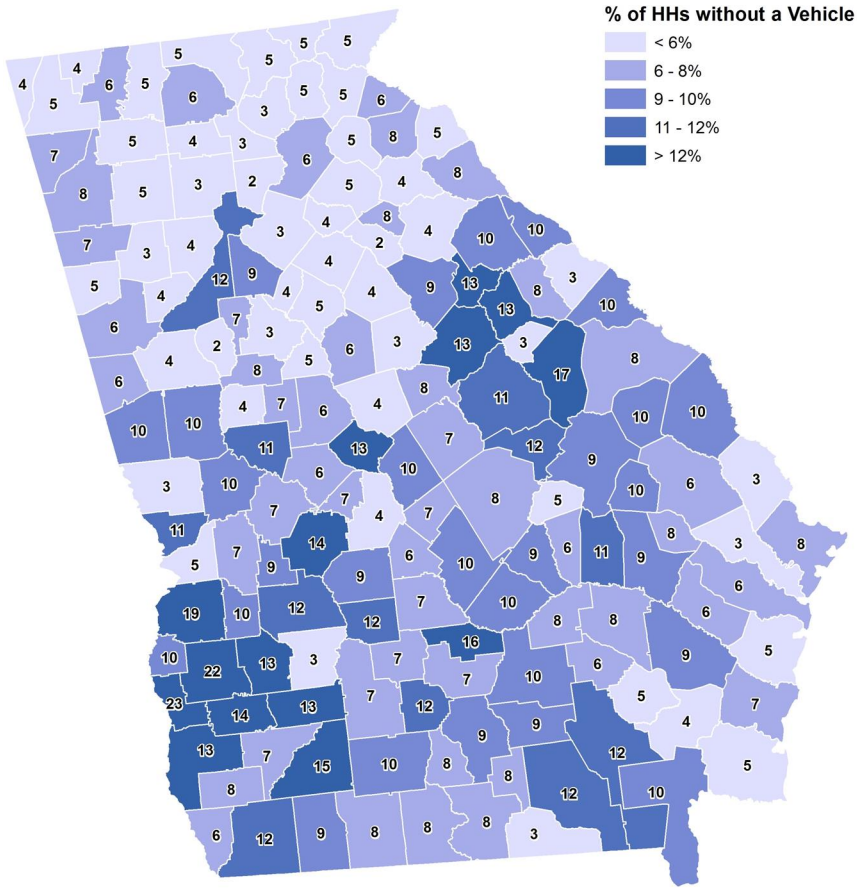
For example, Vermont defines a single provider for nine state regions; for two areas that are closely tied to cities across the border in Massachusetts and New Hampshire, the state contracts with the neighboring transit agency to run services in those towns (Vermont Agency of Transportation [VTrans] 2012). VTrans and the state's Agency of Human Services (AHS) have an official memorandum of understanding (MOU) adopted by the State legislation addressing how these services should operate in tandem (24 V.S.A., Chapter 126, Section 5090). Efforts are underway to further coordinate services into one seamless reservation system for the user (VTrans 2012).

Such consolidation may be one option Georgia could pursue to help provide more extensive service in rural areas throughout the state. In addition, Georgia—like many states—tends to offer service for limited hours during weekdays only. This schedule can make it difficult for rural systems to serve educational and employment trips, which can be important economic drivers for these rural communities. While GDOT manages the 5311 service, the lack of overlap between GDOT and DHS boundaries poses a challenge to running integrated services. Regionalization along regional-commission and DHS boundaries could prove more beneficial.

Transit Dependency Index

Georgia has the sixth largest rural population in the nation, but in many rural areas, automobile ownership is lower than in the state's urban counties. As shown in figure 5, the

percentage of households without a vehicle is over 20 percent in some parts of the state. Rates in many rural counties are higher than the state's most urban counties, such as Fulton or DeKalb Counties, which have 12 percent and 9 percent, respectively.



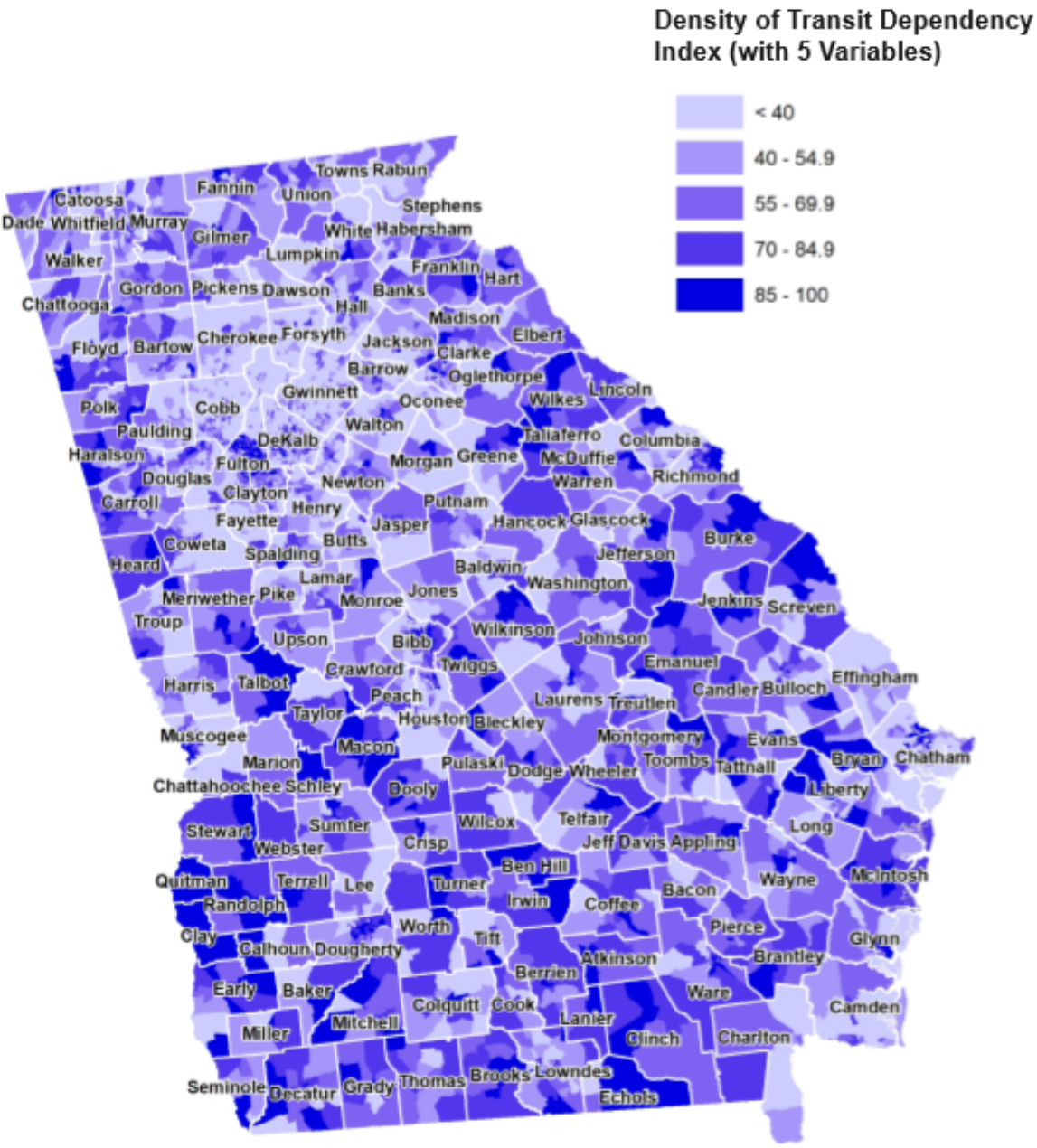
Source: Garrow et al. (2018, p. 52, Appendix).

Figure 5. Map. Percentage of households without a vehicle.

However, vehicle ownership is not the only factor in a resident's likelihood to use transit in rural areas. Garrow et al. define a transit dependency index (TDI) based on five factors: (1) persons aged 65+, (2) percent persons aged 10–19, (3) percent persons with disabilities, (4) low-income households (below poverty line), and (5) percent households without a

vehicle (Garrow et al. 2018, p. 3). Figure 6 shows the density of the TDI from the Garrow et al. report.

Even considering all five factors, most transit-dependent populations in the state still tend to live in rural areas. In a number of counties that offer no service, automobileless households account for at least 10 percent of the population. This includes, for example, Clinch County (12 percent), Johnson County (12 percent), Toombs County (11 percent), and Washington County (11 percent). Transit need is heavier in rural areas, but these areas do not lend themselves to the fixed routes commonly offered in more urban areas. Finding the proper way to serve such disadvantaged rural populations is a perennial challenge.



Source: Garrow et al. (2018, p. 82).

Figure 6. Map. Transit dependency index.

CHAPTER 3 FUTURE TREND ASSESSMENT

Growing rural poverty is a known phenomenon in the United States (National Public Radio [NPR] 2018). Current trends indicate that poverty will continue to grow in rural communities. According to the U.S. Department of Agriculture's (USDA) Economic Research Service, child poverty is most persistent in the Southern United States, notably across the southern parts of Louisiana, Mississippi, Alabama, and Georgia. Meanwhile, the total population in many rural areas is declining (USDA 2018).

Figure 7 shows the overall forecasted change in population in Georgia from 2020 to 2030. Total population and elderly population estimates are taken from the Georgia Governor's Office of Planning and Budget (2017).

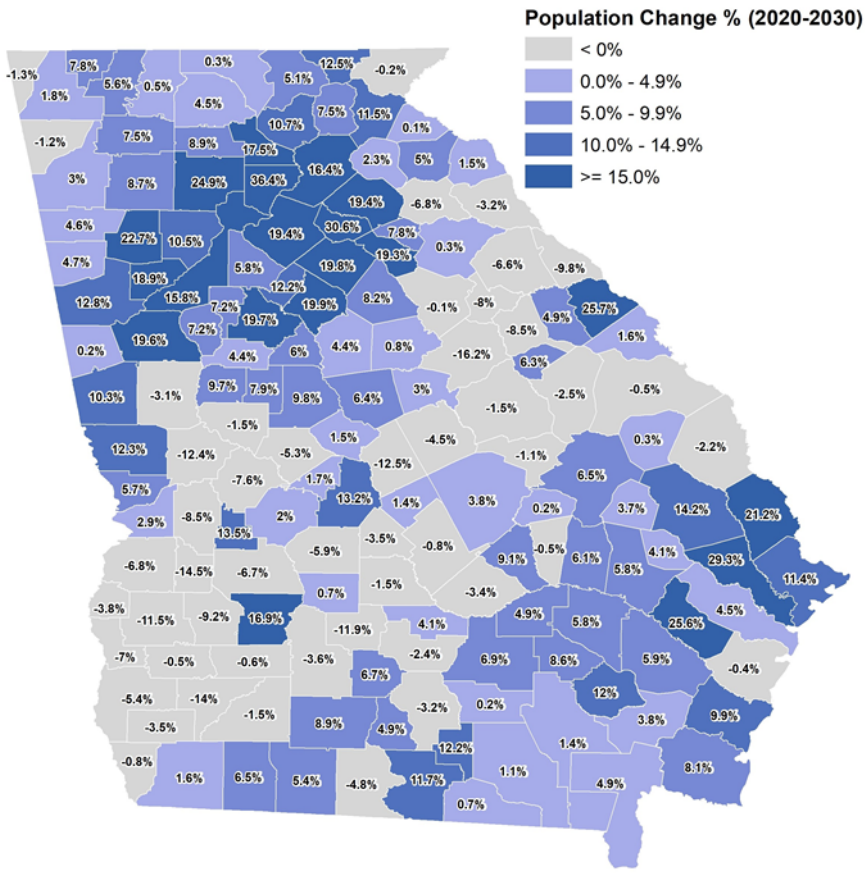


Figure 7. Map. Change in total population (2020–2030).

Population levels are forecast to rise most in suburban and exurban counties close to major cities, such as Atlanta. Rural counties are likely to continue to lose population. The same counties that are losing general population or that are growing the slowest (figure 7) are simultaneously increasing their share of seniors, as shown in figure 8.

In addition to poverty rates projections for 2020, the map shown in **Error! Reference source not found.** identifies 16 "focus counties" that the researchers define as counties in which: (a) the 2030 poverty rate is forecast to hit at least 45 percent, (b) there is a negative overall change in population, and (c) the percent elderly population is expected to grow by at least 5 percent. These counties include, in alphabetical order: Berrien, Brooks, Burke,

Calhoun, Chattooga, Hancock, Lincoln, Madison, McIntosh, Meriwether, Screven, Taliaferro, Taylor, Twiggs, Washington, and Webster. These counties are some of the most rural in the state, and the majority do not offer any form of transit.

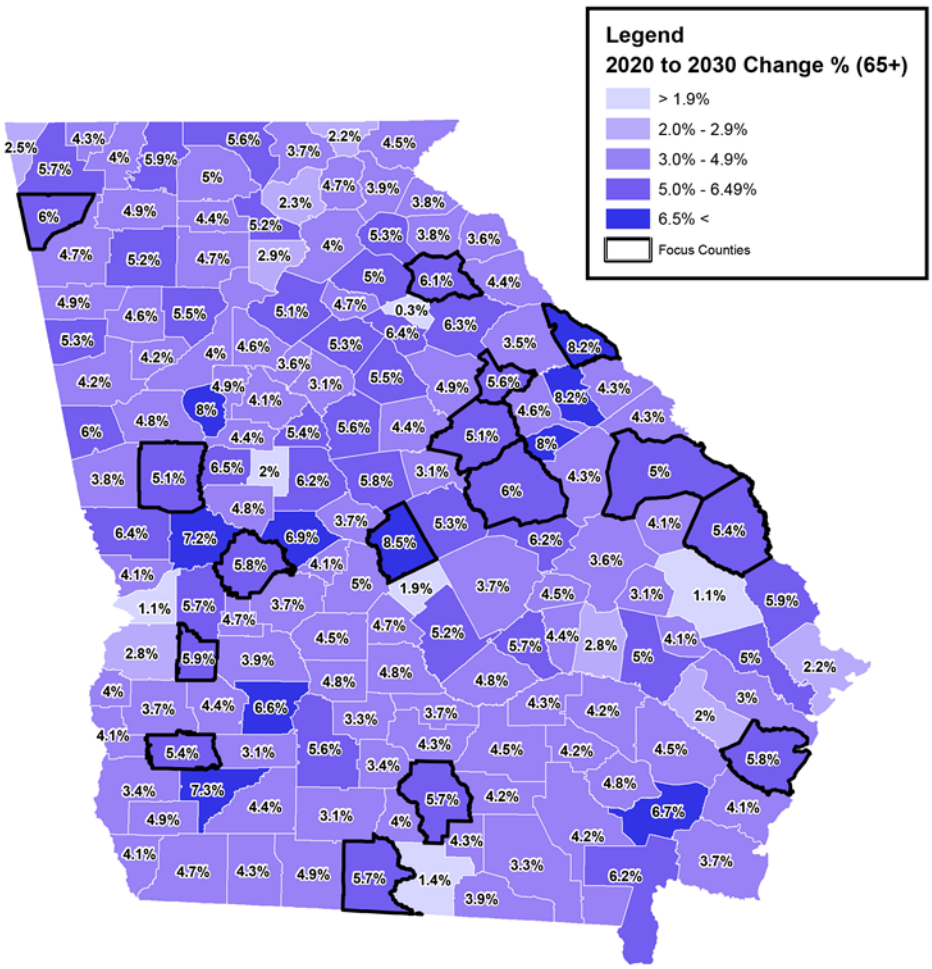


Figure 8. Map. Change in elderly population (2020–2030).

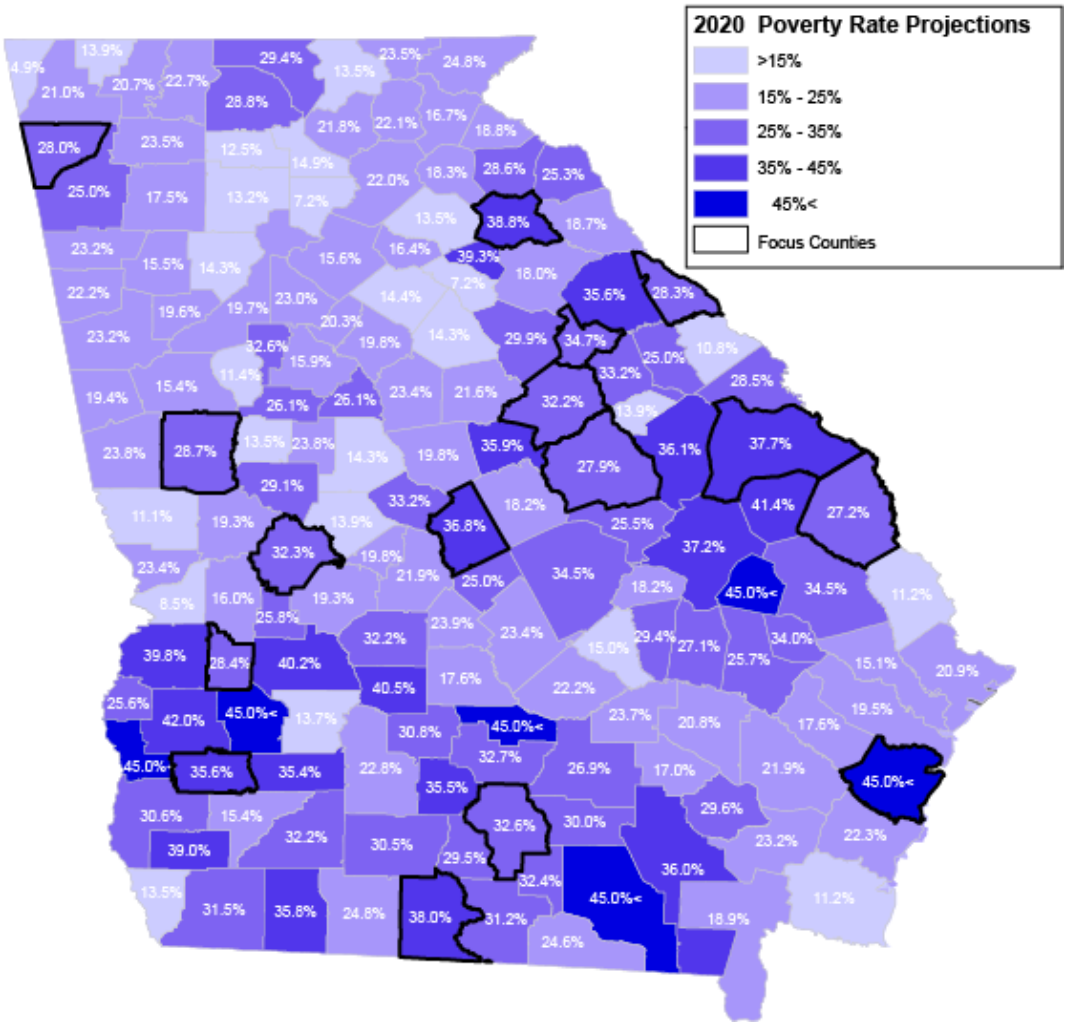


Figure 9. Map. Poverty rate (2020).

The elderly population is expected to grow statewide. The highest increase is seen in rural counties, whereas the lowest is seen in counties with large urban centers or counties with large universities, such as Clarke County (Athens; University of Georgia), Muscogee County (Columbus), Lowndes County (Valdosta), Bulloch County (Statesboro; Georgia Southern University) and Chatham County (Savannah).

Poverty projections are performed for the years 2020, 2025, and 2030. These are derived using shift-share analysis following the methodology described by Smith, Tayman, and

Swanson (2013). Poverty numbers for the most recent year, 2015, are obtained from the U.S. Census Bureau's American Community Survey (ACS). The projections assume that poverty levels will continue at the same rate of change that occurred from 2011 to 2015. The process is then repeated to calculate 2025 and 2030 poverty, using the forecast change in the two most recent years, 2015 to 2020 and 2020 to 2025.

In **Error! Reference source not found.**, projections for 2020 show pockets of poverty across the central and southern parts of the state. If current trends were to continue, poverty levels would remain below 15 percent for many of the state's urban counties, but in rural counties the levels could grow up to or exceed 40 percent.

This same trend is shown in figure 10 for the year 2025, with poverty rates greater in the state's most remote areas. Poverty rates will likely continue to grow across the central rural parts of the state.

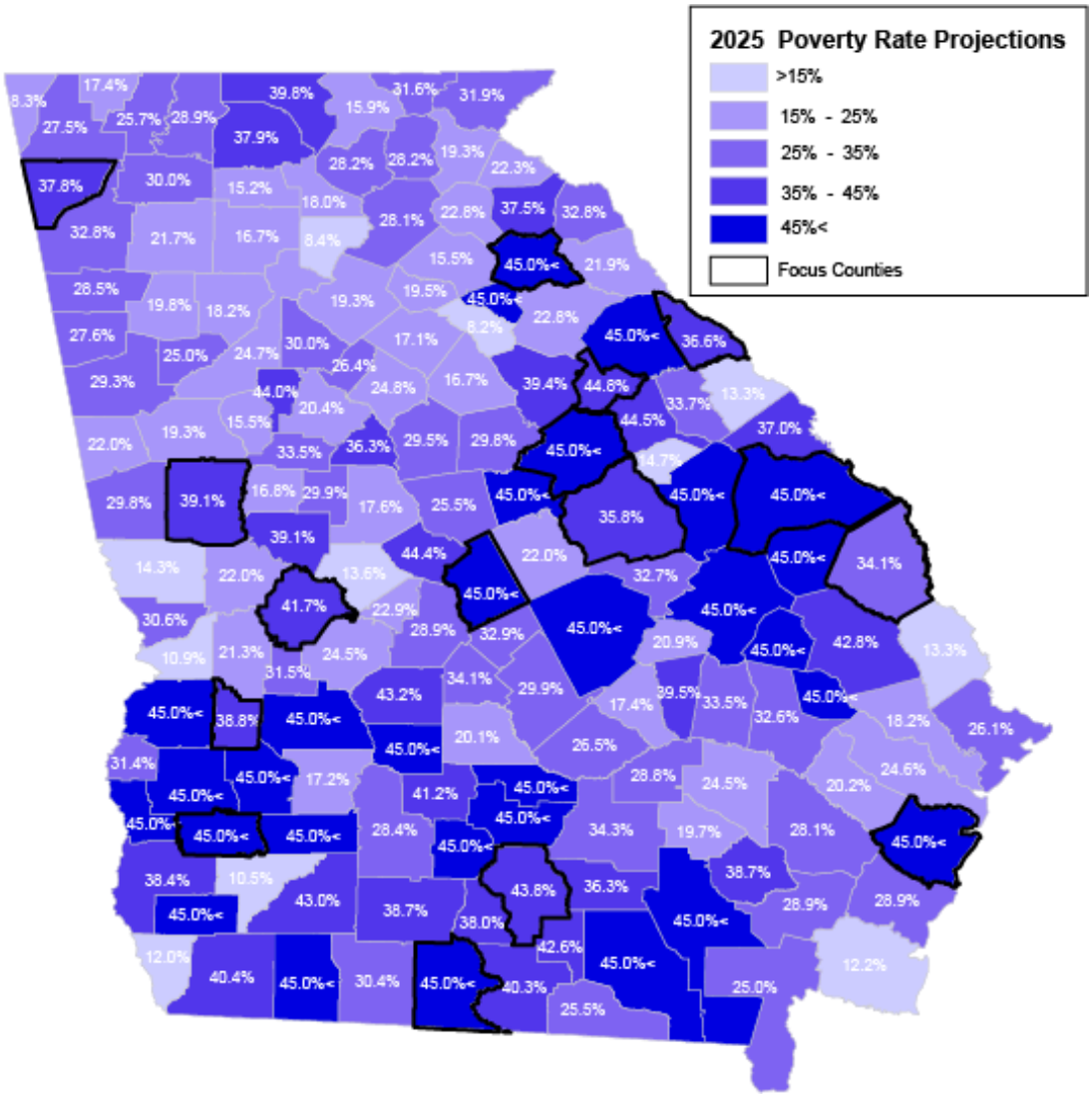


Figure 10. Map. Poverty rate (2025).

If current rates were to continue, by 2030, most rural counties in the state would have at least 45 percent of their residents living at or below the poverty line, as shown in figure 11.

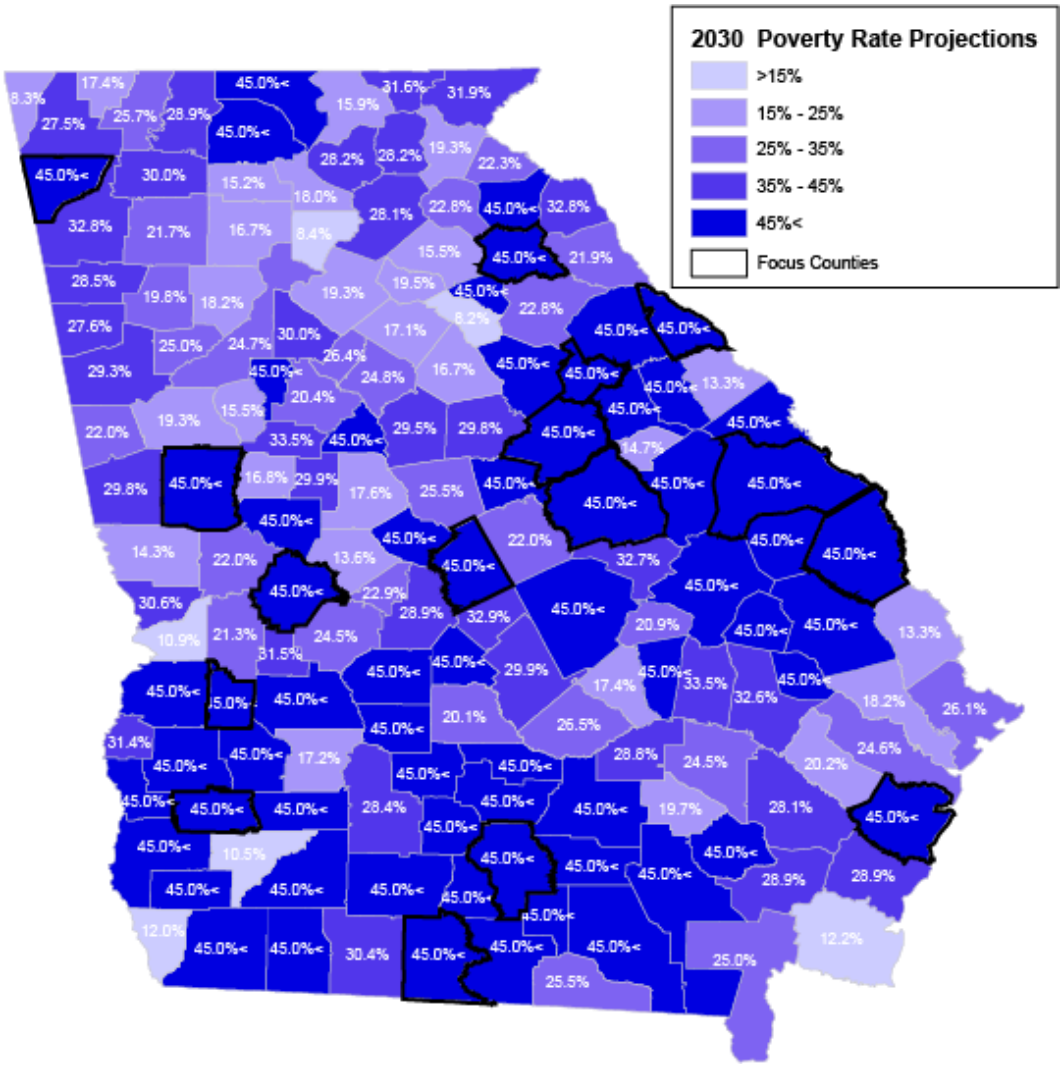


Figure 11. Map. Poverty rate (2030).

The shift-share projections forecast that poverty levels, the share of the population that is elderly, and transit dependency will rise in rural counties in Georgia. Meanwhile, total population levels in rural areas are expected to decrease. These projections, however, are only a reflection of trends from 2011 to 2015. While these projections are not meant as true predictions, they do show how severe recent trends in poverty in rural counties have been.

CHAPTER 4 DATA CLEANING

Software Background

From 2011 to 2018, GDOT retained a software company to track ridership on its 5311 Rural Transit Formula Program. The database provides individualized trip information statewide, including each trip's origin and destination coordinates, trip purpose, reservation time, and numerous other fields related to trip scheduling.

Ridership software has the potential to provide GDOT with very in-depth service and ridership information, but the sophistication of this particular dataset varied greatly. Field entries in the database lacked consistent formatting, and data reporting varied widely year to year and by provider.

In 2018, Georgia Tech researcher, James Cunningham, conducted an analysis of the rural transit trip database. Cunningham identified five consistent reporting issues throughout the dataset. Solutions were identified that addressed each issue, allowing the team to conduct more thorough analytical research. The issues and their solutions are listed in table 1.

Table 1. Data reporting issues.

Issue	Solution
Inconsistent reporting by year	Use a final year with 12 months of reporting selected for analysis (2015)
Inconsistent reporting by provider	Compare NTD-reported trips with software-reported trips
Inconsistent reporting of field entries	Reformat key fields to single consistent entry
Possibility for grouped trips	Group all entries in the database with the same starting coordinates, same time, and same customer ID field
Inconsistent trip purpose	Give Medicaid-funded trips a Medical trip purpose; use destination field names to make educated guesses (i.e., University, Tech, or State = Education trip purpose)

Inconsistent Reporting by Year

Table 2 displays the amount of ridership reported by fiscal year, defined from July 1 to June 30 of each year. Data used for Cunningham's analysis were available through October 31, 2016. Ridership numbers obtained from the dataset are compared against the ridership numbers officially reported to the federal government for each year in the National Transit Database. The dataset came closest to the number of NTD-reported trips during FY15 (July 1, 2015, to June 30, 2016), capturing about 48 percent of actual trips.

Table 2. Software dataset vs. NTD-reported trips by year.

Year (FY 07/01 – 06/30)	Reported Trips in Software	Total NTD-reported Trips (Rural Reporters)	Percent of Total Reported Trips in NTD (%)
2007	27,445	1,796,059	1.5
2008	40,986	1,927,233	2.1
2009	58,656	1,922,458	3.0
2010	70,283	1,594,574	4.4
2011	176,232	1,823,175	9.7
2012	306,505	1,995,393	15.4
2013	440,672	1,767,358	24.9
2014	566,925	1,705,740	33.2
2015	814,235	1,668,568	48.7
2016	294,354*	1,702,046	–

* Until 10/31/16

Inconsistent Reporting by Provider

For nine providers, the dataset captured at least 60 percent of trips, whereas, for an additional 25 providers, the software captured at least 20 percent of trips. This report will use the most reliable calendar year of data to analyze the ridership: January 2015 to December 2015. It will also rely only on data from the most reliable locations, which are illustrated in figure 12. Areas shown in dark blue represent those transit providers for which at least 60 percent of their total trips reported to NTD were in the software database. Areas shown in green represent those transit providers for which at least 20 percent but less than 60 percent of their total trips reported to NTD were in the software database.

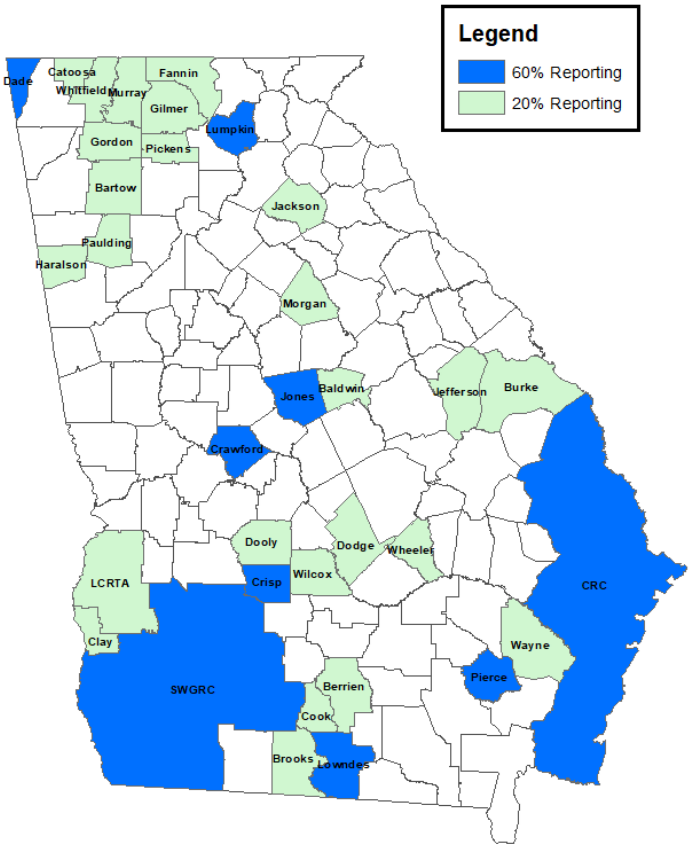


Figure 12. Map. Data reporting levels statewide.

Inconsistent Reporting of Field Entries

In many instances, the provider name field was blank or incorrectly reported. Fields for Customer Home County, Customer Home State, Trip Purpose Type, Customer Home, County Federal Information Processing Standard (FIPS) Code, Trip Start Year, Agency Name, and Trip Actual Start Time were reformatted. As part of the data cleaning process, the provider field was replaced with information tied to the customer's home county, which defines the person's service. Time and date fields were reformatted into a consistent format and null values or default values, such as "12:00:00 AM," were removed.

Grouped Trips

Cunningham also tested for the risk of grouped trips, the possibility that trips with multiple riders occurring at the same time between the same origin and destination are recorded as a single trip. This happens, for example, if two people living in the same facility receive a ride to the same event. A total of 16.8 percent of trips recorded statewide had the same origin and destination point and trip start time. Within these, 98 percent had the same Customer ID, but had different scheduled pick-up dates. This is an indication that repeat customers are using the service, and could be an indication of a "subscribed" trip, a repeated pick-up scheduled for the same time each day. Grouped trips represented less than 2 percent of these trips.

Inconsistent Trip Purpose

The default trip purposes reported in the dataset had inconsistencies such as blank fields or inconsistent spelling. Table 3 shows the original trip purposes provided in the trip database and the percent of trips each accounted for.

Table 3. Default dataset trip purpose.

Purpose	Number of Trips	Percent (%)
Daycare/Education	254,681	9.0
Employment	361,387	12.8
Medical	629,329	22.3
Nutrition	198,221	7.0
Shopping/Personal	309,966	11.0
Social/Rec	203,767	7.2
Blanks	**864,467**	30.6

Any trip reported as funded through Medicaid was assigned a Medical trip purpose. Other trip purposes were recoded based on keywords in the name of the destination. For example, destinations with "School," "College," "University," or "Tech" were assigned an Education purpose. This process continued until 93 percent of trips were accounted for, at which point the 7 percent of trips remaining without a clear trip purpose were removed. Table 4 shows the distribution of trip purposes after each trip was reassigned to a new category based on keywords.

Table 4. Reformatted dataset trip purpose.

Trip Purpose	Number of Trips	Percent of Trips (%)
Medical	**694,919**	25.7
Dialysis	88,616	3.3
Behavioral Health	154,001	5.7
Rehab	53,307	2.0
Child Care	74,108	2.8
Employment	312,687	11.6
Education	20,084	0.8
Nursing Home	11,129	0.4
Social Assistance	136,506	5.1
Shopping	537,846	19.9
Adult Daycare/Senior Center	122,512	4.5
Job Training	13,013	0.5
Social/Recreation	160,517	6.0
Other	117,962	4.3
Blanks (Removed)	196,815	7.3

Cleaning the original trip purposes proved to be incredibly powerful. Importantly, it allowed the researchers to match the purpose of a trip to the actual businesses or facility located at the trip's geographic destination point. Each trip purpose category was carefully selected to fall within categories of the North American Industry Classification System (NAICS). For example, "Nutrition" trips are spread out across both "Social Assistance"

and “Shopping” to distinguish between trips that may be headed to places such as a neighborhood food bank or the Department of Family and Children Services (DFCS), and those headed to a discount grocery, such as Dollar General or Walmart. The full list of potential destinations that was used can be seen in table 4.

Registered businesses in the state are sourced from Infogroup, a marketing services provider. The research team purchased the dataset in August 2017. The database includes an NAICS code classification for each business or institution. Medical trips, which serve a large portion of trips overall, were divided into three categories: (1) Medical Centers and Hospitals, (2) Federally Qualified Health Centers and (3) Local Doctor’s Offices. Hospitals and Federally Qualified Health Centers feature layers were taken from the DHS. Local doctor’s offices are defined as any business with an NAICS code of 621111, 621112, or 621210.

Places of employment, however, are too clustered to match a destination point to a nearby business. Instead, the number of low-wage jobs was calculated per census tract. This was gathered using Longitudinal Employer–Household Dynamics (LEHD) Origin–Destination Employment Statistics (LODES) data from the Census Bureau, which provides a summary of workplace characteristics based on various criteria (U.S. Census Bureau 2017b). Categories CE01 and CE02 of the LODES data were used, representing jobs with earnings of $1250/month or less and from $1251 to $3333/month, and the total was found for each census tract in the state. This is based on a methodology developed at the University of North Carolina’s (UNC) Department of City and Regional Planning (Lester 2014). The full results of the ridership analysis are explored in chapter 5.

Table 5 shows the full list of destination types, the trip purpose associated with each destination, and the data source.

Table 5. Distribution of trip purposes and matching data source.

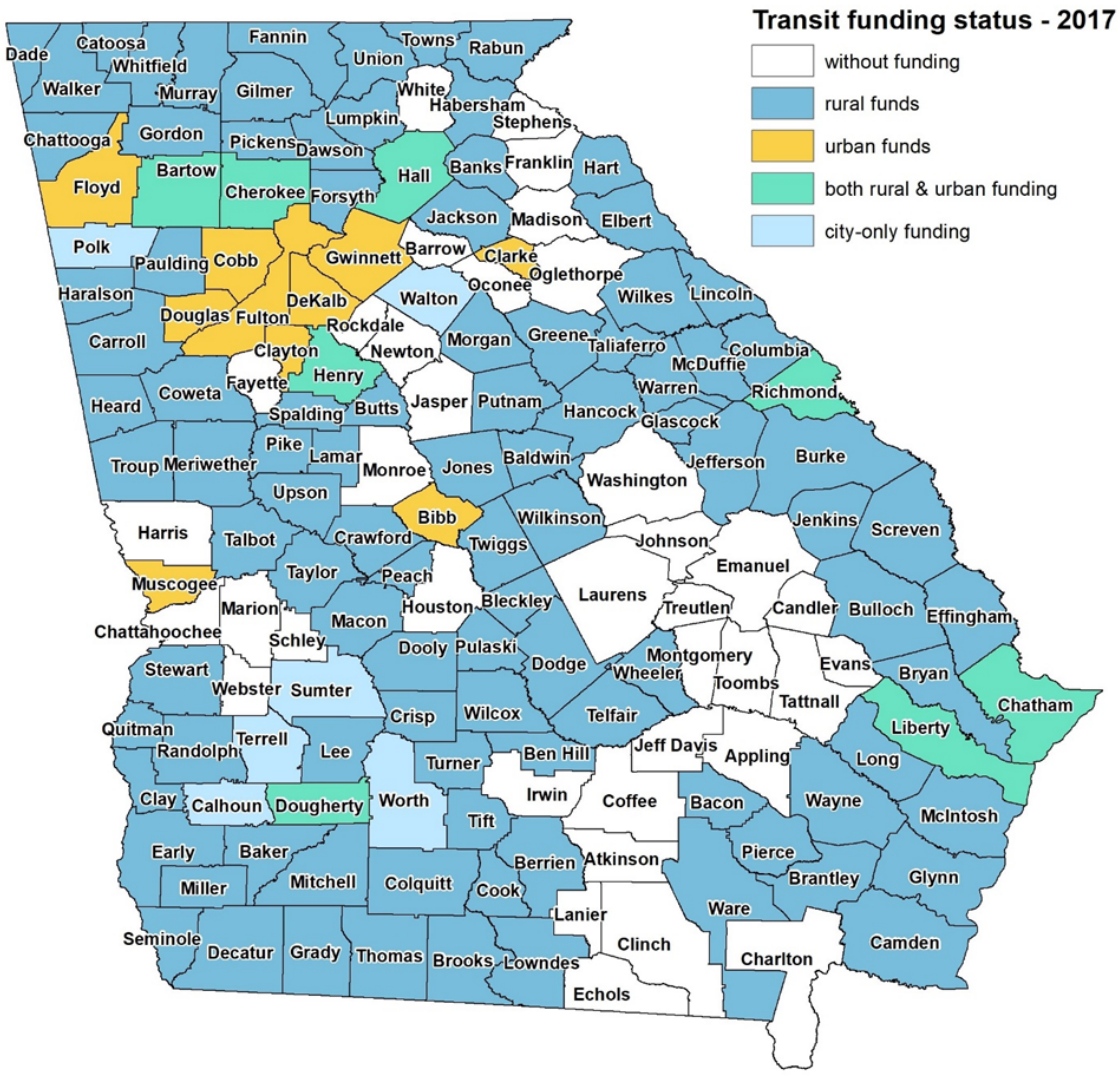
Destination Type	Trip Purpose	Data Source
Local Doctor's Office	Medical	NAICS Code 621111, 621112, 621210
Federally Qualified Health Centers	Medical	DHS
Medical Centers and Hospitals	Medical	DHS
Kidney Dialysis Centers	Dialysis	NAICS Code 621492
Offices of Mental Health Practitioners	Behavioral Health	NAICS Code 621330
Psychiatric and Substance Abuse Hospitals	Rehab	NAICS Code 622210
Child Day Care Services	Child Care	NAICS Code 624410
Employment	Employment	LODES
Educational Services	Education	NAICS Code 61 Family
Nursing Home	Nursing Home	DHS
Community Food and Housing, and Emergency and Other Relief Services	Social Assistance	NAICS Code 6242
Retail Trade	Shopping	NAICS Code 44-45
Continuing Care Retirement Communities and Assisted Living for the Elderly	Adult Daycare/Senior Center	NAICS Code 6233
Business Schools and Computer Management Training, Technical and Trade Schools and Vocational Rehabilitation	Job Training	NAICS Codes 6114, 6115, and 6243

CHAPTER 5 SERVICE GAP ANALYSIS

As noted, parts of Georgia offer transit service 24 hours per day. Others offer no service at all. Some communities are conveniently served, while others are more remote. This section will apply the data cleaning and trip purpose definitions used previously to explore key service patterns.

Areas Without Service

Figure 13 shows the state of transit service in Georgia by county. About 1,000,000 residents, or about 10.5 percent of the state's population, lack access to any kind of service.



Source: Garrow et al. (2018, p. 3, Appendix).

Figure 13. Map. Transit funding status in Georgia.

The *Transit Capacity and Quality of Service Manual* (TCQSM) defines service gaps for demand response transit by the availability of service (Kittelson & Associates 2004). A total of 37 counties in Georgia offer no transit service, listed in table 6 in order of population. All counties in the list meet the FTA's definition for a failing level of service.

Table 6. Counties in Georgia without transit.

County	Population	Percent of State Population (%)
Houston	152,213	1.46
Fayette	110,054	1.06
Newton	106,470	1.02
Rockdale	89,299	0.86
Barrow	75,869	0.73
Laurens	48,543	0.47
Coffee	43,907	0.42
Oconee	35,265	0.34
Harris	33,451	0.32
White	28,246	0.27
Toombs	27,723	0.27
Monroe	27,516	0.26
Tattnall	25,896	0.25
Stephens	25,794	0.25
Emanuel	23,245	0.22
Franklin	22,282	0.21
Washington	20,686	0.20
Appling	18,693	0.18
Jeff Davis	15,201	0.15
Oglethorpe	14,612	0.14
Madison	13,937	0.13
Marion	13,832	0.13
Jasper	13,759	0.13
Charlton	13,411	0.13
Chattahoochee	12,983	0.12
Candler	11,039	0.11
Evans	10,930	0.10
Lanier	10,712	0.10
Johnson	9,748	0.09
Irwin	9,428	0.09
Montgomery	9,023	0.09
Atkinson	8,340	0.08
Clinch	6,848	0.07
Treutlen	6,728	0.06
Schley	5,231	0.05
Echols	4,090	0.04
Webster	2,648	0.03
Total	**1,107,652**	**10.62**

As discussed in the system overview presented in chapter 1, most counties without service are in more remote parts of the state. Although service may be harder to provide in these areas, households without vehicles in these places are most prone to isolation. A few counties on the list, such as Houston or Fayette Counties, are more built-out and may need to evaluate other types of potential service, as well.

Hours without Service

Each provider in Georgia sets its own hours of service. A list of current service hours for all providers is available in table 33 in the appendix. As noted, the dataset captured at least 20 percent of NTD-reported trip levels for 34 providers out of the state's 83 providers. The software showed 17 of these 34 services provided trips either before 7 AM or after 5 PM or had stated hours outside of this time period. Trips for these 17 providers were queried by the hour.

Weekly Service

In many cases, the hours the dataset stated rides occurred did not match the provider's hours of service. It is unclear if these represent actual trips or trip recording errors. If accurate, service providers are flexing their current hours to meet existing demand; however, it is also possible that the data are unreliable. One recommendation is that questions be added to interviews that will be conducted as part of the upcoming statewide transit plan to help resolve this issue. This is explored further in the recommendations in chapter 8.

Table 7 provides a breakdown of the ridership patterns of the 17 queried providers.

Table 7. Weekly ridership by transit provider.

Provider	Stated Service Hours	Overnight Ridership[1] (%)	Late Night and Early Morning Ridership[2] (%)	Evening Service[3] (%)	Total Off-Peak Ridership (%)
Dooly County	Service Offered 24 Hours	16.80	11.08	1.11	29.00
LCRTA[4]	Service Offered 24 Hours	6.08	10.63	1.86	18.57
Wayne County Transit	Service Offered 24 Hours	0.01	10.88	7.00	17.89
SWGRC	6:00 AM – 8:00 PM	0.61	6.64	3.43	10.68
Burke County Transit[5]	6:00 AM – 6:00 PM	2.08	4.18	0.00	6.27
Clay County	6:00 AM – 6:00 PM	4.99	14.61	6.26	25.85
Crisp County	6:00 AM – 6:00 PM	1.51	5.68	0.66	7.84
Haralson County	7:00 AM – 6:00 PM	0.03	0.03	0.00	0.07
Jefferson County	6:00 AM – 6:00 PM	0.01	14.53	1.35	15.88
Morgan County Transit	6:00 AM – 5:15 PM	0.00	6.13	0.00	6.13
Whitfield County	6:30 AM – 6:00 PM	0.01	2.41	0.02	2.45
Wilcox County Transit	6:00 AM – 6:00 PM	30.03	9.43	2.82	42.28
Cook County Transit	7:30 AM – 5:00 PM	0.64	5.77	2.04	8.45
Coastal Regional Commission	7:00 AM – 5:00 PM	0.01	5.95	11.91	17.87
Dade County	8:00 AM – 5:00 PM	0.16	13.17	0.02	13.35
Pierce County	7:30 AM – 5:30 PM	0.22	2.58	7.59	10.39
Lowndes County	7:30 AM – 5:30 PM	0.70	4.22	5.56	10.48

[1] Midnight to 5 AM
[2] 9 PM to midnight and 5 AM to 7 AM
[3] 5 PM to 9 PM
[4] Lower Chattahoochee Regional Transit Authority
[5] Burke does not operate Tuesdays and Thursdays

Weekend Ridership

The dataset reported 17 transit providers serving riders during the weekend. Three of these 17 providers offer weekend service: Dooly County, LCRTA, and Wayne County Transit. They are the only three within the dataset that offer 24-hour service, as well. Others, e.g., Hancock County, that offer weekend service did not have trips adequately captured in the dataset.

As shown in table 8, all three providers with stated weekend service displayed strong Saturday ridership levels of at least 4.0 percent of the total weekly ridership, as did Clay, Crisp, and Lowndes Counties, and SWGRC. Sunday ridership was not as high for most. Wayne County and Lowndes County showed Sunday ridership levels of at least 4.0 percent of weekly ridership. For comparison, Saturday ridership on Georgia's one large urban transit system, the Metropolitan Atlanta Regional Transit Authority (MARTA), accounted for about 10 percent of weekly ridership. MARTA's Sunday ridership accounted for about 7.5 percent of weekly ridership (NTD 2018b).

Table 8. Weekend ridership by transit provider.

Provider	Percentage of Weekly Ridership Occurring Saturday (%)	Percentage of Weekly Ridership Occurring Sunday (%)
Dooly County	5.98	0.14
LCRTA	4.75	0.38
Wayne County Transit	4.64	6.92
SWGRC	6.63	0.06
Berrien County	1.96	–
Clay County	7.07	0.16
Coastal Regional Commission	2.79	2.26
Crisp County	9.25	0.43
Jackson County	1.22	0.14
Lowndes County	6.63	5.75

Note: Berrien County does not operate service on Sunday.

Summary of Time of Day Ridership Findings

The results from each transit provider are discussed below. As stated previously, it is unclear if trips outside of service hours are occurring or if these are due to data entry errors. If one assumes enough reliability in the data, three trends occur. *First*, most counties in the state display a need for service as early as 5 AM. *Second*, overall, evening ridership after 6 PM is less vital than early morning ridership. *Third*, more evening ridership is observed in parts of the state where transit service was regionalized and in counties where rural populations live in closer proximity to a major city.

When considering extending existing service hours, it is important to note what other services may exist in an area. For example, early morning ridership may fluctuate county to county depending on whether the transit provider is substituting in for school trips normally provided by the school district. Dialysis visits may also account for a sizeable portion of early morning trips. In other areas, churches or other community groups may be

running private shuttles as well to either supplement service or provide service during off hours.

Individual Provider Summaries

Burke: Burke County provides service from 6 AM to 6 PM, earlier and later than most agencies. However, it does not provide service on Tuesday or Thursday. The analysis found few trips later than 5 PM, but service as early as 4 AM. Trips before 7 AM accounted for 6.27 percent of service. Another 0.85 percent of service occurred on Saturdays. Burke County is located in Eastern Georgia and is part of the Central Savannah River Area Regional Commission (CSRA-RC), a region with little to no coordination at the regional commission level.

Clay: Clay County offers service Monday through Friday from 6 AM to 6 PM. The software reported a high number of trips occurring on the edges of its service hours, with about 8.0 percent of trips occurring between 5 AM and 6 AM, 3.6 percent of trips occurring between 6 PM and 7 PM, and about 7.0 percent of trips occurring on Saturdays. Significant demand for extended hours may exist if this is correct.

Crisp: Crisp County has stated service hours of 6 AM to 6 PM, Monday through Friday. The software reported that about 5.0 percent of trips occurred during the 4 AM to 6 AM time period, suggesting the need for an earlier start time. Few rides were reported after 6 PM, with service after 5 PM trailing the number of rides midday, suggesting that later evening service is less urgent than early morning service. About 9.0 percent of trips

reported occurred on Saturdays. Crisp County is located in the River Valley Regional Commission.

CRC: The operating hours of the Coastal Regional Commission's transit service are 7 AM to 5 PM. However, 3.0 percent of reported trips occurred between 5 AM and 7 AM and 14.0 percent of service occurred between 5 PM and 10 PM. The CRC operates over a large area and serves a significantly larger population. If true, this usage suggests that the incorporation of transit services at the regional level encourages more evening ridership.

Cook: Cook County has service hours from 7:30 AM to 5:30 PM, Monday through Friday. The software reported 5.0 percent of trips were reported between 6 AM and 7 AM, but few trips occurred in the evening, with service after 5 PM substantially trailing midday service. As with Crisp County, this suggests that early morning service is more urgent than evening service. Few weekend trips occurred. Cook County is located in the Southern Georgia Regional Commission (SGRC).

Dade: Dade County has stated service hours of 8 AM to 5 PM. However, 28.0 percent of its trips reported occurred between 6 AM and 8 AM. These numbers reflect the need for early morning service hours. Dade County is located in Northwest Georgia on the border of both Tennessee and Alabama.

Dooly: Dooly County is unique in offering 24-hour service and serving a small area. Early morning service occurred between 4 AM and 7 AM and on Saturdays. Almost no service occurred after 7 PM. While 6.0 percent of ridership occurred Saturdays, almost none occurred on Sundays. The Dooly County findings are consistent with many of the other counties. First, that early morning service is more useful than evening service. Second, that

Saturday service is more useful than Sunday service, and third, low evening ridership numbers further support the hypothesis that regionalization of service supports more evening ridership. Dooly County is located adjacent to Crisp County in the Three Rivers Regional Commission.

Haralson: Haralson County has stated service hours of 7 AM to 6 PM. The software reported virtually no ridership outside of its stated service hours, but demand may still exist. No rides were reported starting after 5 PM. Haralson County is located in the Northwest Georgia Regional Commission (NGRC) along the Alabama border.

Jefferson: Jefferson County has stated service hours of 6 AM to 6 PM, Monday through Friday. It displayed some potential for trips in the 5 AM to 6 PM time period, 2.5 percent of trips, but did not display the need for evening service.

Lowndes: Lowndes County has stated operating hours from 7:30 AM to 5:30 PM. It displayed the need for service beginning at 6 AM and ending at 8 PM. Some ridership occurred between 8 PM and 11 PM, with 5.0 percent of service taking place between 6 PM and 11 PM. Lowndes County is home to Valdosta, Georgia, the state's fourteenth largest city and is in an area significantly more populated than the other counties analyzed in this section (US Census Bureau 2017a). This suggests that larger counties have the potential to attract more evening ridership. Despite years of planning efforts to do so, the City of Valdosta does not provide fixed-route bus transit at this time, which is possibly leading to higher reliance on the rural system (WCTV-TV 2009).

LCRTA: The Lower Chattahoochee Regional Transit Authority provides 24-hour service. Its ridership patterns parallel the findings of other counties that early morning service is

more important than evening service. Whereas 10.0 percent of service occurred between 5 AM and 7 AM, less than 1.0 percent of service occurred between 6 PM and 4 AM. Also following the pattern in other counties, 4.75 percent of service occurred on Saturdays, while less than 0.5 percent occurred on Sundays.

Morgan: Morgan County's stated service hours are 6 AM to 5:15 PM. It showed no ridership outside its stated service hours and roughly even levels of ridership between 6 AM and 7 AM and between 4 PM and 5 PM. Morgan County is located in the NGRC.

Pierce: Pierce County has stated operating hours of 7:30 AM to 5:30 PM. Unlike other providers, it reported significant evening ridership. About 7.6 percent of ridership occurred between 5 PM and 9 PM. It is located in the SGRC.

SWGRC: The Southwest Georgia Regional Commission's stated hours are 6 AM to 8 PM on weekdays. The 1.3 percent of trips that occurred between 5 AM and 6 AM suggest that the agency could extend service to earlier in the morning. Few trips occurred after 8 PM, with evening ridership between 6 PM and 8 PM trailing ridership earlier in the day. However, 6.6 percent of ridership occurred on Saturdays. The SWGRC is the only regional commission in Georgia to have fully coordinated its transit providers at the regional level between GDOT and the DHS.

Wayne: Wayne County provides 24-hour service. While 3.0 percent of service occurred between 5 AM and 6 PM, an additional 3.0 percent occurred between 6 PM and midnight, with very little occurring after 8 PM. Wayne County is located in the Heart of Georgia Regional Commission (HGRC).

Whitfield: Whitfield County provides service between 6:30 AM and 6 PM. Steady ridership was observed from its opening until 5 PM, with virtually no ridership between 5 PM and its 6 PM closing. No weekend trips occurred. Whitfield County is located in Northwest Georgia and is home to the City of Dalton, which provides fixed-route transit service.

Wilcox: Wilcox County has stated service hours of 6 AM to 6 PM, Monday to Friday. However, trips were observed on the system as early as 4 AM and as late as 7 PM, and 11.5 percent of trips occurred on Saturdays. Wilcox County is located in the HGRC.

Rural Accessibility Index

An additional tool, the rural accessibility index, is intended to address gaps that occur in places that offer service, but where it may be inadequate. The tool creates an index for every census tract in the state based on the roadway travel times between destinations a user of the service is likely to visit. It does not rely on actual ridership data, as ridership reporting is inconsistent throughout the state.

Census Tract Transit Accessibility

The index is calculated using the Hansen method (Justino 2018, Comprehensive R Archive Network [CRAN] 2015). The method is what is referred to as a distance-decay function. As distances between destinations grow, their utility "decays." The formula for the Hansen method can be written as $A_i = \Sigma_j(B_j / d_{ij}^a)$, where A_i is the accessibility of a certain zone; B_j is the number of opportunities, in this case the number of potential destinations in each

zone, denoted as j; d_{ij} refers to the distance between zones; and a refers to the weight of *attractability* of two locations, here defined as the typical driving time between the two locations.

Factor Analysis

Once the totals for each destination type were found for each category, factor analysis was performed using SPSS software to calculate the effect each type of destination has on accessibility. The sets of destination types with the largest effect are then used to run the accessibility index. The factor process is defined using a method outlined by Dr. Patricia Mokhtarian of Georgia Tech, which is based on principal axis factoring (Mokhtarian et al. 2009).

As shown in table 9, the result is that 85 percent of the variance in accessibility is explained by one factor. As one would expect, this indicates that destination locations are highly correlated and tend to cluster in similar locations. Table 10 breaks this down per destination category, showing that one factor accounts for the majority of the variance on every factor. Thus, a single accessibility index with all potential destinations can explain accessibility statewide.

Table 9. Variance explained by certain factors.

Factor	% of Variance	Total	Cumulative %
1	85.448	12.817	85.448
2	4.557	0.684	90.006
3	2.794	0.419	92.800

Table 10. Load on each factor.

Trip Destination	Factor	
	1	2
Shopping	0.987	-
Employment	0.986	-
Adult Daycare/Senior Centers	0.976	-
Local Doctor's Offices	0.962	-
Child Care	0.954	-
Job Training	0.953	-
Education	0.936	-
Social Assistance	0.912	-
Rehab	0.907	-
Behavioral Health	0.906	-
Nursing Homes	0.869	-
Dialysis	0.860	-
Medical Centers and Hospitals	0.761	-
Federally Qualified Health Centers	0.749	0.358

Empty cells do not load on the factor.

Figure 14 shows a step-by-step flowchart of the entire accessibility methodology.

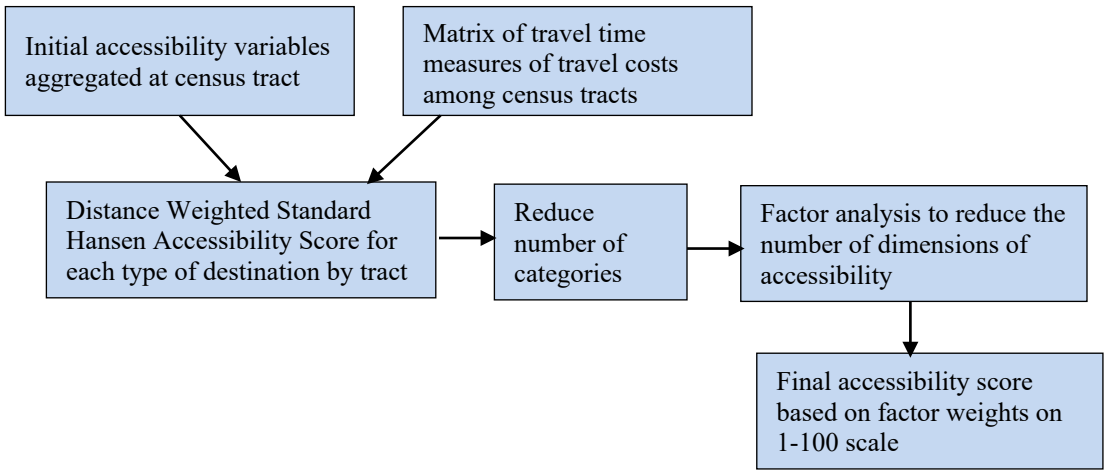


Figure 14. Flowchart. Rural accessibility index methodology.

Accessibility Score Results

Figure 15 shows the relative accessibility statewide by tract to the 10th, 20th, 30th, 40th, and 100th percentiles. Predictably, parts of the state with a higher density of commercial land use have higher accessibility. All places that offered urban-type service are located in census tracts in the 60th to 100th percentiles of accessibility. The lowest 40 percent of accessibility scores are subdivided by the 10th percentile to allow the viewer to more closely see patterns that form in the rural sections of the state.

In certain counties, every census tract fell in the lowest 10th percentile of accessibility. Clusters of low accessibility can be seen in the areas around Clinch and Echols Counties in South Georgia; Calhoun and Baker Counties in the southwest; and in the area around Treutlen, Johnson, Washington, and Emanuel Counties in the east. Two of these clusters lack any form of transit. Rural areas with higher accessibility tend to cluster along corridors, likely the result of interstate highways.

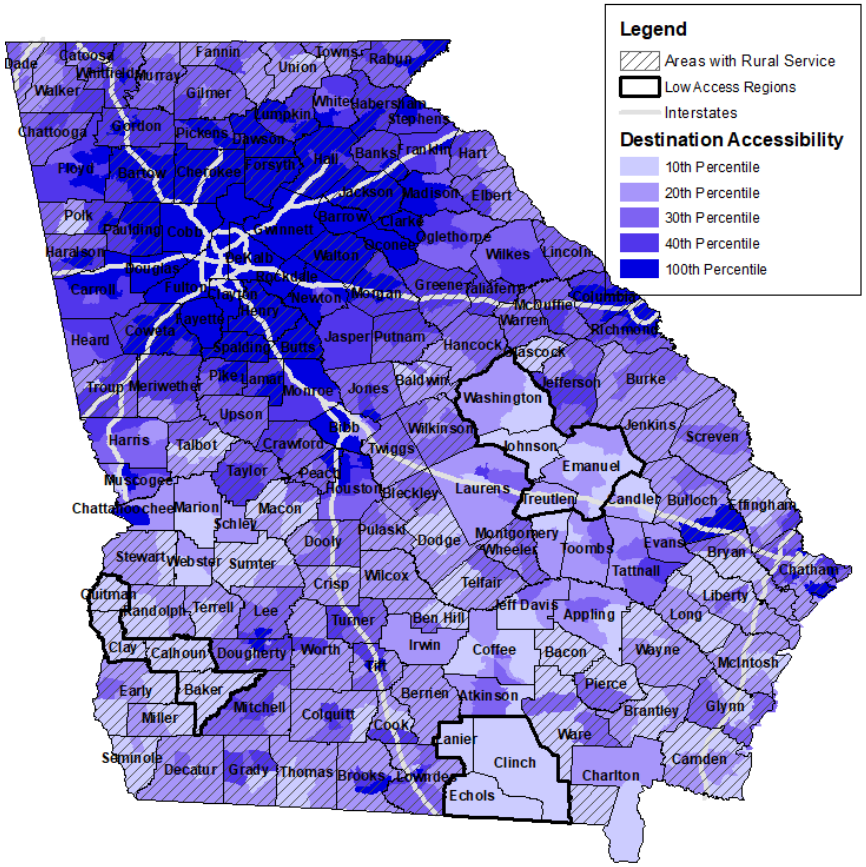


Figure 15. Map. Rural accessibility statewide.

An overlap exists between the places with the lowest accessibility and those with the highest levels of poverty and the lowest levels of automobile ownership. This leads to a sense of isolation for rural residents, especially seniors who can no longer drive.

Comparison of Trip Destination and Potential Destination Locations

Where reliable data are available, actual destination points can be paired with destination types used in the accessibility index to test the accuracy of the types of destinations used. Figure 16 shows downtown Bainbridge, Georgia, located in the SGRC. The white outlines in the diagram show two clusters of destination points. One is located along the city's main

arterial, Shotwell Street. Another is located around Memorial Hospital of Bainbridge and the doctor's offices surrounding the hospital. Memorial is defined as a rural general hospital, with 80 beds (Williams 2015).

The destination points in Bainbridge match closely with what the trip purposes suggest. Trips are serving low-wage job centers, low-wage groceries, and medical purposes. No cluster appears around the health center point to the southwest in figure 16 since it indicates an addiction center, which is not a trip generator.

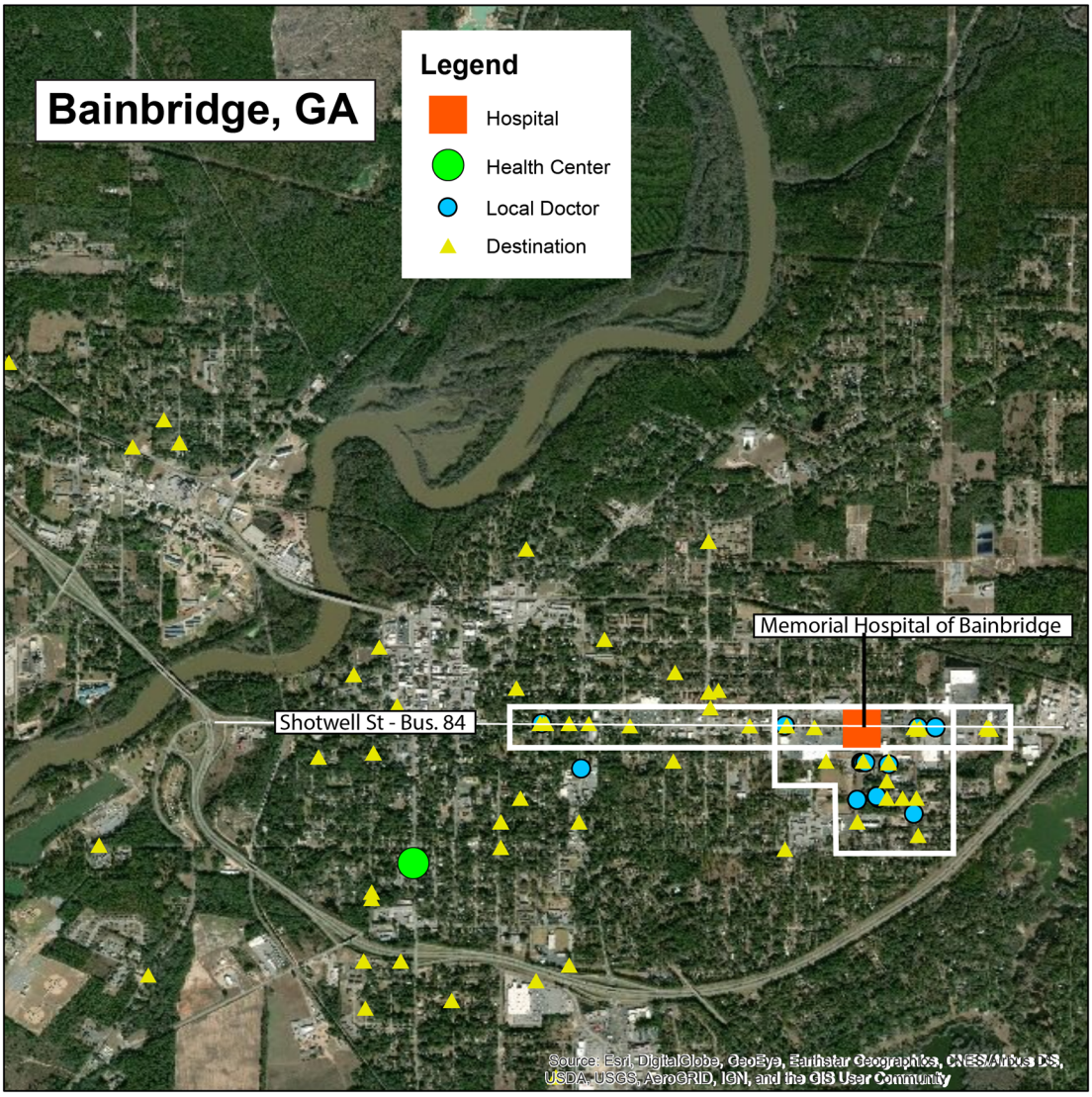


Figure 16. Satellite image. Local destinations in Bainbridge, GA.

Similar patterns appear throughout the state. In Albany, a larger city, clusters can be seen around doctor's offices and Phoebe Putney Memorial Hospital (figure 17).

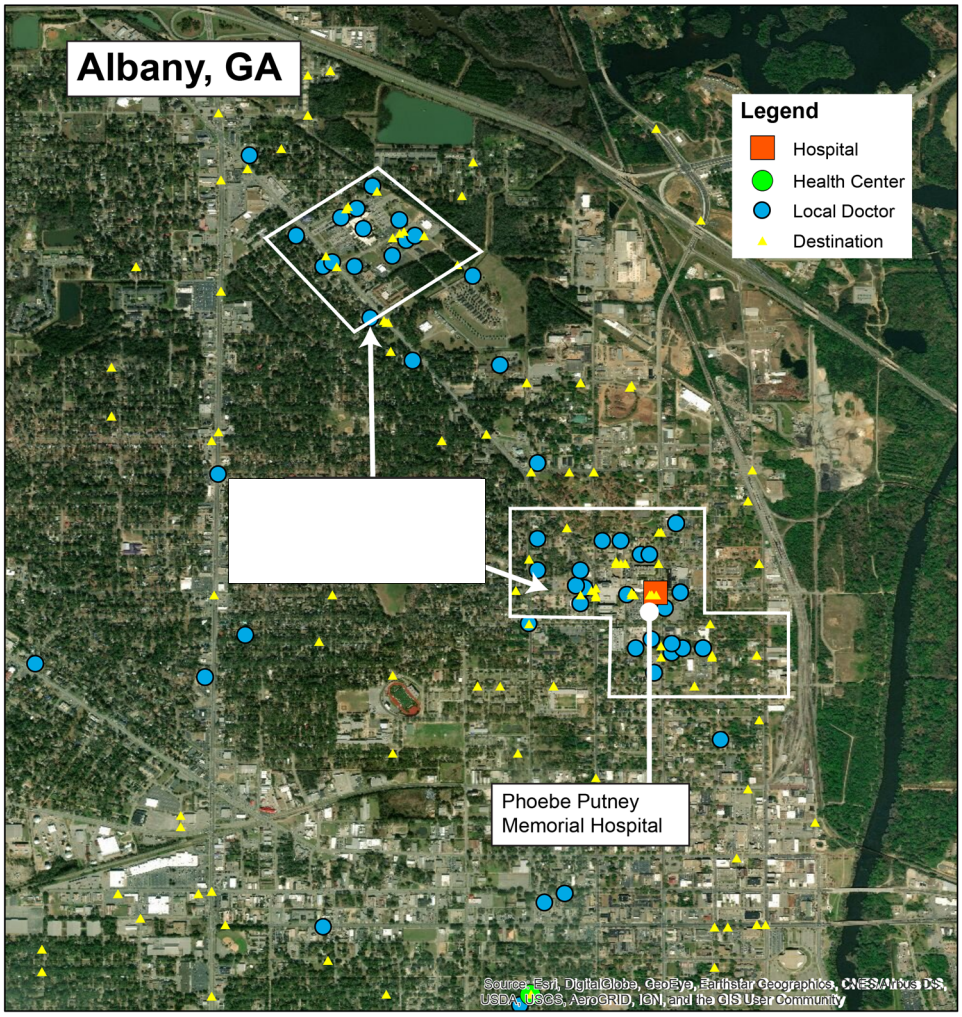


Figure 17. Satellite image. Local destinations in Albany, GA.

Strong ridership patterns still emerge despite issues with the data quality. Local patterns such as these can also be extremely informative for planning on the local level. They show local leaders what services tend to be most valued by an area's residents and allow city and county staff to collaborate with transit providers and healthcare providers to offer on-site amenities, such as enhanced waiting areas and staff support.

CHAPTER 6 RIDERSHIP ANALYSIS

This chapter will further explore ridership patterns—primarily origin and destination points—to explore how well the service is performing. *First*, it will look at trip destinations to confirm whether service is bringing riders toward places of opportunity. *Second*, it will look at trips that begin at a home address and see if the service is reaching users that live in remote areas. *Third*, it will look at the flow of trips between census tracts to see which destination pairs have the highest rates of travel.

Non–Home-Based Destinations

In rural areas, the most accessible census tracts range from the 40th to 60th percentile of statewide accessibility. Areas that fall in this range are often either the location of the county seat; home to local government services, such as courthouses and assistance programs; or are areas with more intense retail activity, such as grocery stores or commercial doctor's offices—places of importance for rural transit riders. Census tracts in the lowest range, up to the 40th percentile of accessibility, are the most remote. The goal of rural transit is to connect people from outlying places such as these into town centers and places of activity. The easier a rider can reach these areas, the more services and opportunities become available.

Statewide Results

Table 11 shows the breakdown of non-home destinations across the state by the accessibility of the census tract.

Table 11. Breakdown of non-home destinations statewide.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	29,731	36.5
20 to 40	29,494	36.3
40 to 60	19,286	23.7

A high number of non-home destinations (about 36 percent) fall in areas in the 20th percentile of accessibility. Important destinations exist in these low-accessibility areas, but if the share of destinations in higher accessibility areas were to increase, it would show that the service is connecting riders to more places of interest.

Provider Close-ups

The nine tables below (table 12, table 13table 13, table 14, table 15, table 16, table 17, table 18, table 19, and table 20) break down trip destination results for transit providers with at least a 60 percent reporting level. As shown, certain parts of the state have higher accessibility rates than others. Exact travel patterns vary based on each area's geography.

Table 12. Breakdown of non-home destinations in Crawford County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	161	5.9
20 to 40	2,015	74.4
40 to 60	369	13.6

Table 13. Breakdown of non-home destinations in CRC.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	69,211	73.5
20 to 40	23,785	25.3
40 to 60	863	0.9

Table 14. Breakdown of non-home destinations in Crisp County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	11,357	86.7
20 to 40	780	6.0
40 to 60	891	6.8

Table 15. Breakdown of non-home destinations in Dade County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	3,034	26.6
20 to 40	6,689	58.6
40 to 60	0	0.0
Out of State	1,696	14.8

Table 16. Breakdown of non-home destinations in Jones County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	225	5.7
20 to 40	3,472	87.4
40 to 60	253	6.4

Table 17. Breakdown of non-home destinations in Lowndes County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	8,136	22.7
20 to 40	18,248	50.8
40 to 60	7,388	20.6

Table 18. Breakdown of non-home destinations in Lumpkin County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	0	0.0
20 to 40	1,758	36.0
40 to 60	3,123	64.0

Table 19. Breakdown of non-home destinations in Pierce County.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	3,068	33.1
20 to 40	6,202	66.9
40 to 60	4	0.0

Table 20. Breakdown of non-home destinations in SWGRC.

Accessibility Percentile of Census Tract (%)	Number of Non-Home Destinations	Percentage of Non-Home Destinations (%)
0 to 20	58,792	43.0
20 to 40	56,614	41.4
40 to 60	16,773	12.3

In most cases, transit providers serve destinations in places of low accessibility. This includes both the CRC and SWGRC, the two largest transit providers in the state. For small transit providers, areas of high activity are often located in neighboring counties. If the number of higher accessibility destinations were to increase, it would show that people are reaching a more diverse array of destinations. Comparing annual changes in the types of destinations reached provides GDOT with a tool to track the system's effectiveness.

Home-based Origins

To assess the services' ability to reach homes, even in remote areas, the state is divided into population density percentiles. Statewide, a large portion of riders live in low population-density census tracts (see table 21).

Table 21. Population density percentile of home addresses statewide.

Number of Homes Served (Reported)	Percentage of Homes Served in Service Area (%)	Population Density Percentile (%)
27,585	46.7	0 to 20
16,030	27.1	20 to 40
9,960	16.9	40 to 60
6,717	11.4	60 to 80

Nearly 50 percent of users live in the least densely populated parts of the state. Although riders are not reaching a diverse set of destinations, the service does adequately reach people's homes in more remote areas. However, poverty rates are also higher in low-density parts of the state, as shown previously in **Error! Reference source not found.**, figure 10, and figure 11, which is likely a factor in the higher rate of trips.

Provider Close-ups

The provider-specific analysis was only possible in cases where the software accurately coded trips as a home-based pick-up, which includes the CRC, SWGRC, Crisp County, Dade County, and Jones County. The following two figures (figure 18 and figure 19) map out home-based trip origins in the CRC and the SWGRC.

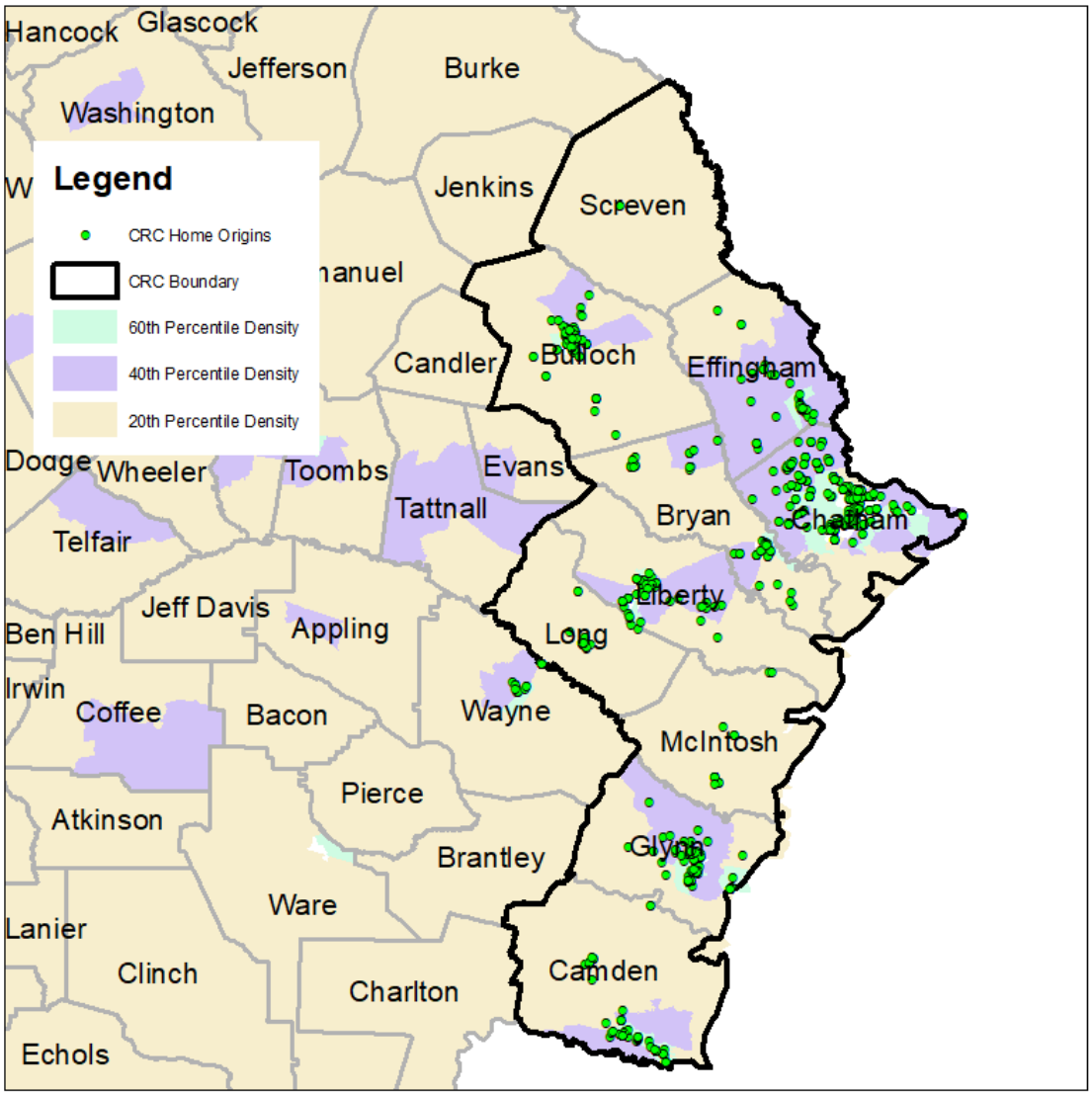


Figure 18. Map. Location of home-based trips for the CRC.

Clusters in the CRC can be seen close to major population centers, such as Savannah, Brunswick, and Statesboro. As shown in table 22, the majority of pick-ups occurred at homes in census tracts in the 20th to 40th percentile of population density. A total of 2,783 homes out of 14,059 homes served in the CRC, or 17 percent, are in the 20th percentile, and 6,056, or 36.7 percent, occurred in the 20th to 40th percentile. This rate is a significantly higher rate than statewide.

Table 22. Population density percentile of home addresses in the CRC.

Number of Homes Served	Percentage of Homes Served in Service Area (%)	Population Density Percentile (%)
2,783	16.9	0 to 20
6,056	36.7	20 to 40
3,991	24.3	40 to 60
1,229	7.5	60 to 80

Home pick-ups in the SWGRC are also centered close to major population centers, such as the cities of Albany and Moultrie.

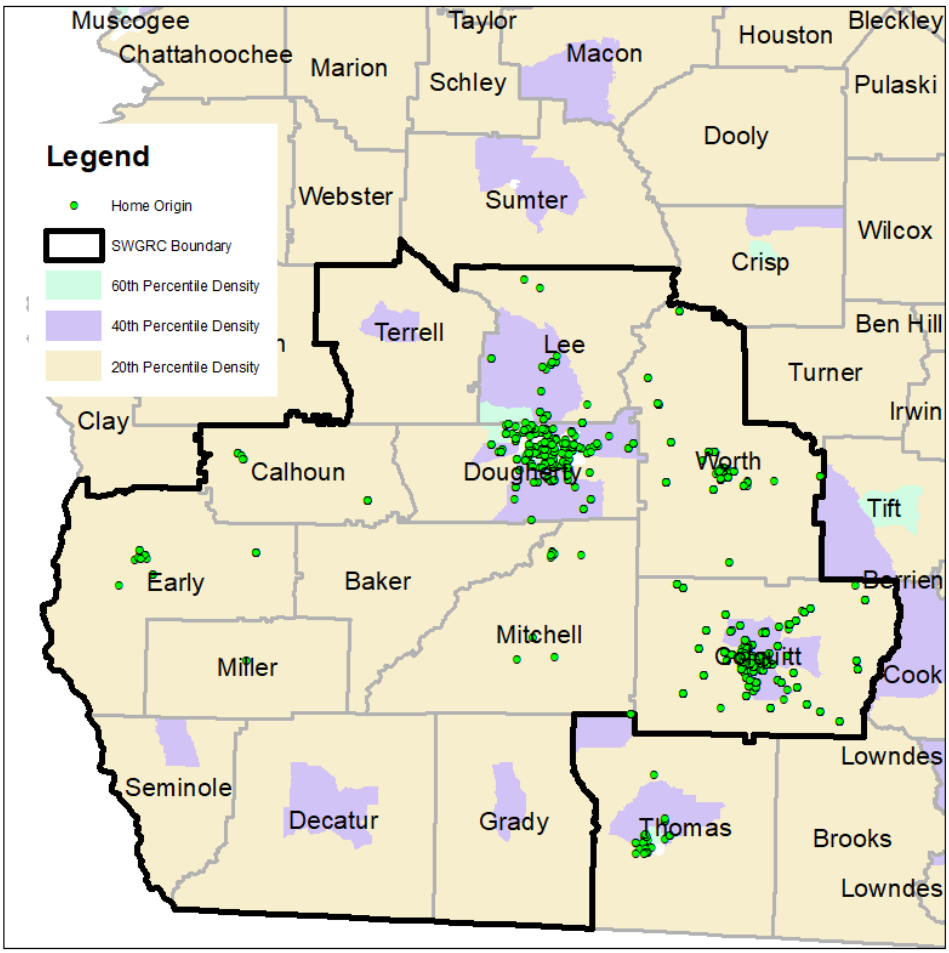


Figure 19. Map. Location of home-based trips for the SWGRC.

A total of 2,450 homes out of 6,579 served in the SWGRC, or 30 percent, are in the 20th percentile and 2,424, or 36.8 percent, are in the 20th to 40th percentile, as shown in table 23. This is important as it shows that despite pick-ups occurring in low-density areas, transit services still tend to provide more service in areas closer to major centers. These patterns will be further explored in the following section on travel flows.

Table 23. Population density percentile of home addresses in the SWGRC.

Number of Homes Served	Percentage of Homes Served in Service Area (%)	Population Density Percentile (%)
2,450	39.1	0 to 20
2,424	38.7	20 to 40
809	12.3	40 to 60
574	8.7	60 to 80

Samples are much smaller for Crisp, Dade, and Jones Counties. Their results are shown in table 24, table 25, and table 26, respectively. Sample sizes are generally too small to make any strong conclusions, but it appears to confirm that rural transit providers are serving low-density areas.

Table 24. Population density percentile of home addresses in Crisp County.

Number of Homes Served	Percentage of Homes Served in Service Area (%)	Population Density Percentile (%)
356	45.4	0 to 20
151	19.2	20 to 40
272	34.6	40 to 60
3	0.4	60 to 80

Table 25. Population density percentile of home addresses in Dade County.

Number of Homes Served	Percentage of Homes Served in Service Area (%)	Population Density Percentile (%)
2	8.7	0 to 20
18	78.3	20 to 40
1	4.4	40 to 60
0	0.0	60 to 80
2	8.7	Other

Table 26. Population density percentile of home addresses in Jones County.

Number of Homes Served	Percentage of Homes Served in Service Area (%)	Population Density Percentile (%)
5	35.7	0 to 20
8	57.1	20 to 40
0	0.0	40 to 60

Travel Flows

Trip flows are important indicators of the types of trips being served. As stated previously, many current origin points are close to major commercial centers. Few longer distance rides are occurring, even in places with regionalized service.

Service patterns can shift to serve these in-town areas. For example, if a high number of trips occur within a confined area, certain services can be pooled to provide faster response times and shorter reservation windows. Figure 20 and figure 21 below show the flow of trips between census tracts in Bulloch and Colquitt Counties. These counties are located in the CRC and SWGRC, respectively.

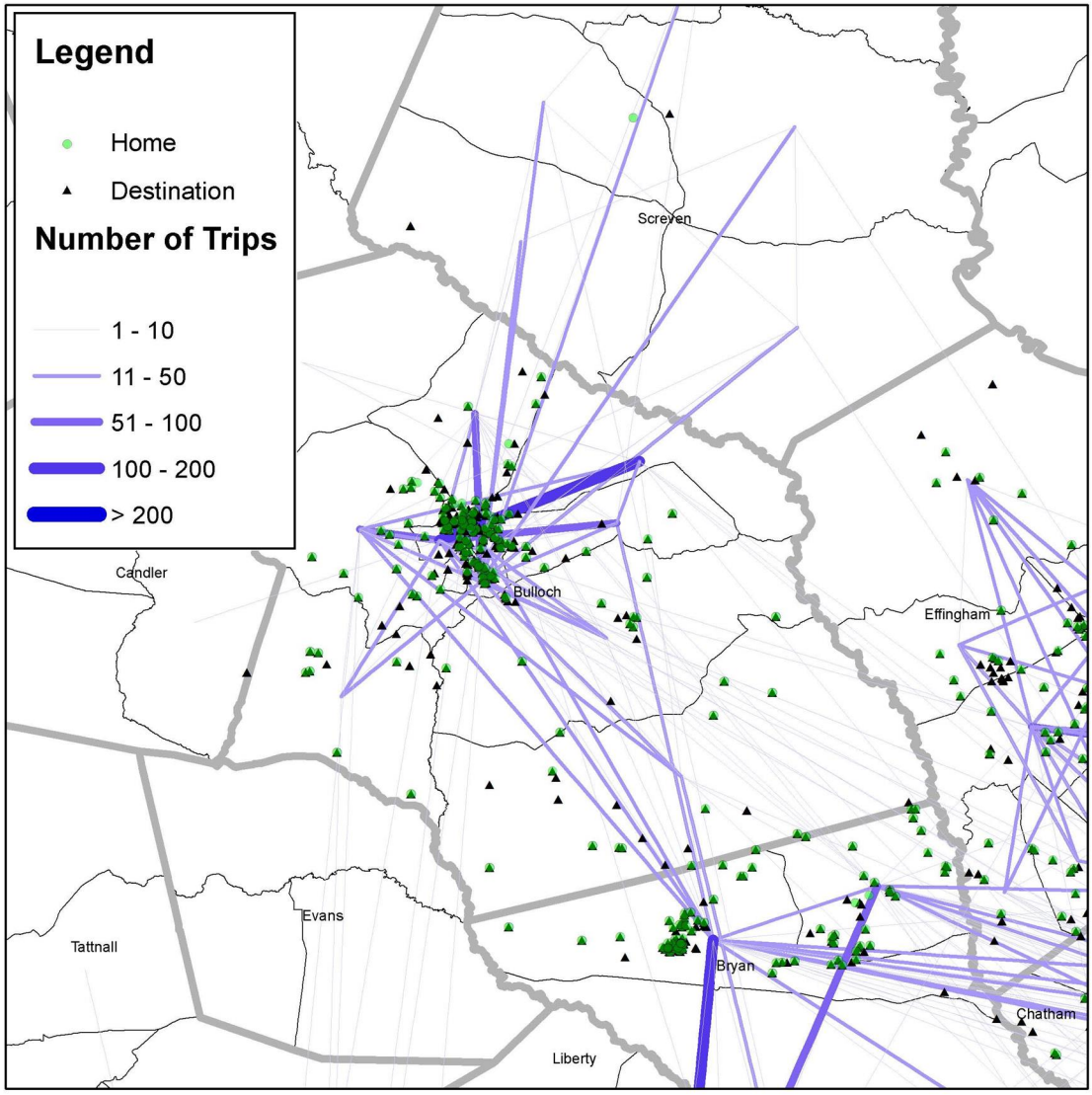


Figure 20. Map. Flow of trips in Bulloch County.

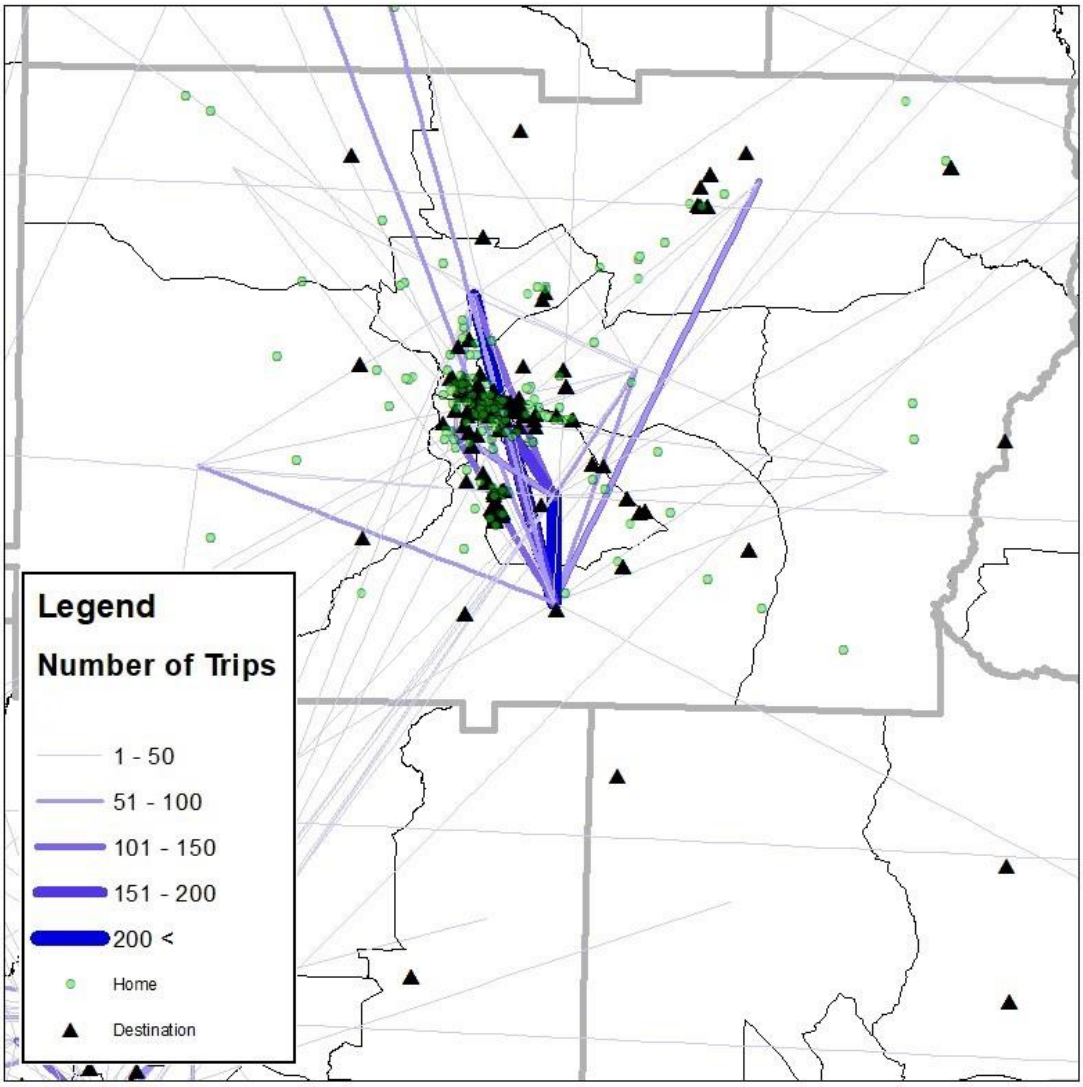


Figure 21. Map. Flow of trips in Colquitt County.

For Bulloch County (figure 20) one census tract pair accounts for the majority of ridership. A closer observation of the county, shown in figure 22, reveals the majorities of both home-based and non–home-based destinations are centered in the areas surrounding Downtown Statesboro, the shopping district on Route 80, and the East Georgia Regional Medical Center.

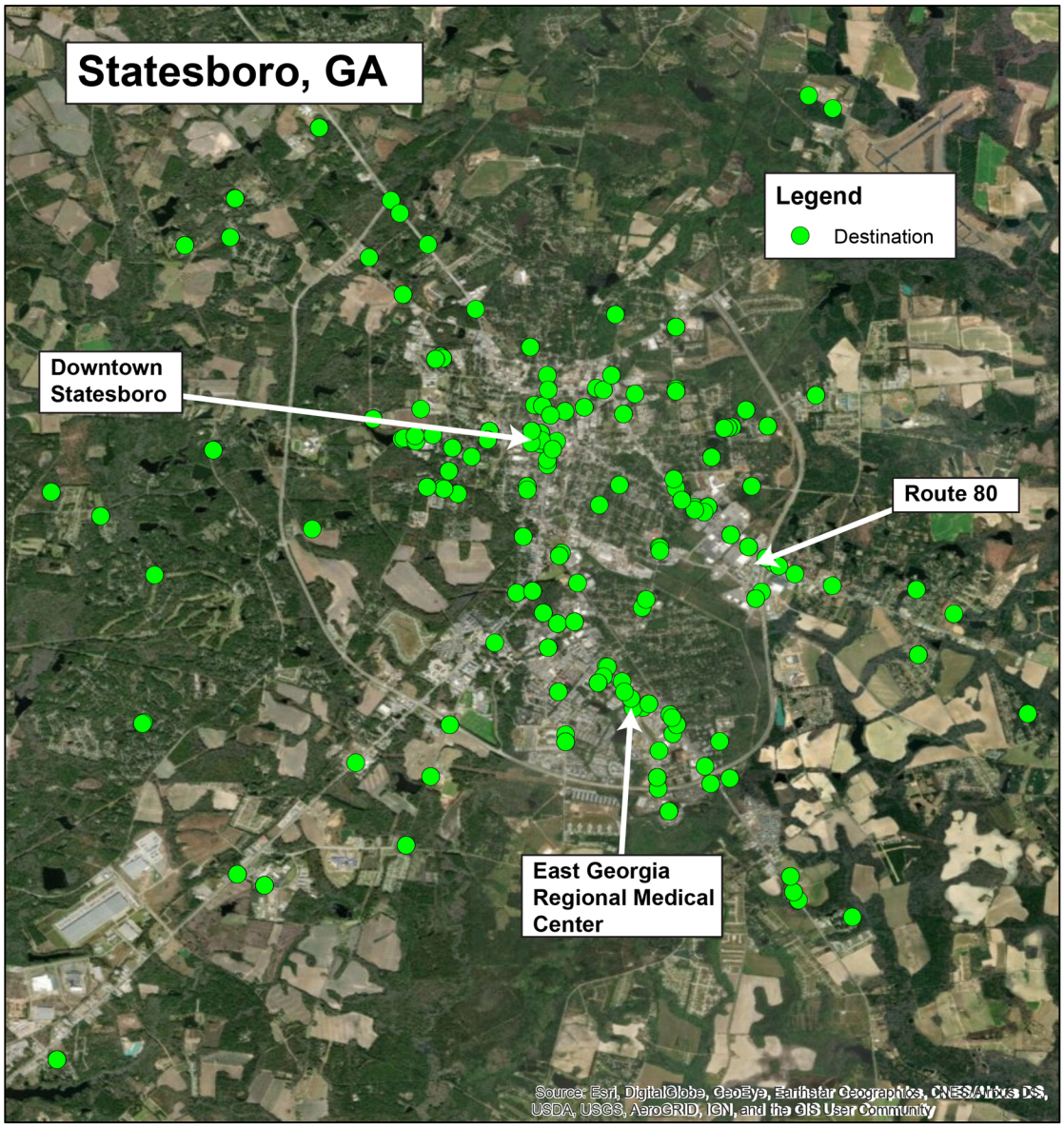


Figure 22. Satellite image. Route pooling potential in Statesboro, GA.

A very similar pattern can be seen for Colquitt County. In this case, only two census tract pairs had over 200 trips. All homes and destinations are centered close to the main population center, Moultrie, and the retail district to the east of town, as shown in figure 23.

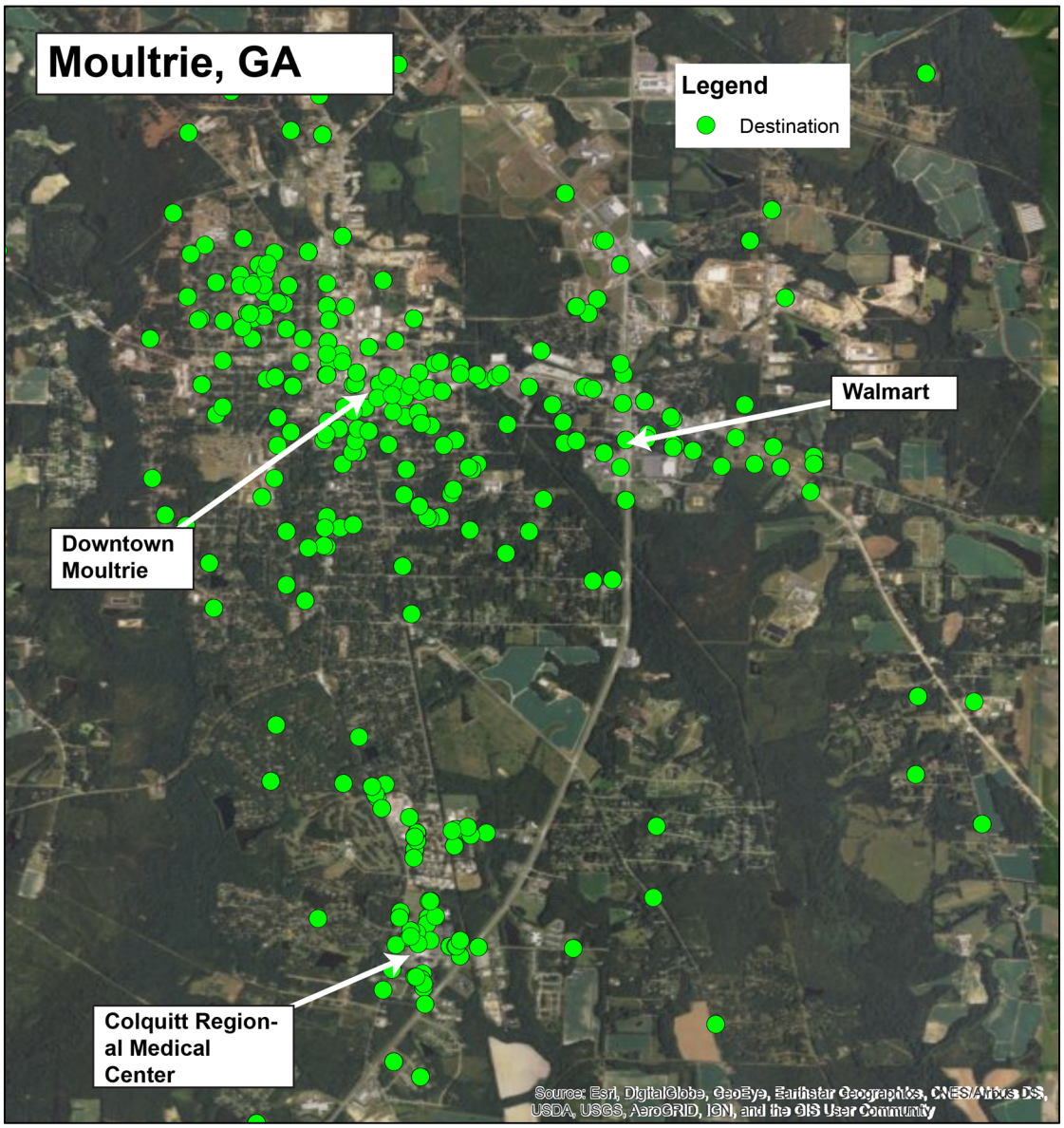


Figure 23. Satellite image. Route pooling potential in Moultrie, GA.

Summary

It is important to caution against using the existing ridership data for route planning purposes. Even among some of the more reported counties in the state, only about half of the trips taken are represented and many of the fields within these observations are missing.

The figures above are meant as a preliminary look into the patterns that may be emerging, and to display the power that route analysis can have with more accurate data.

Preliminarily, it appears that many of the trips occurring are highly concentrated in county seats and historic town centers. Three major types of destinations account for the majority of a rider's needs: (1) county offices, such as the district courthouse or the DFCS; (2) a large discount shopping area, such as Walmart; and (3) the area's regional medical center. More frequent service to and between these three destinations can provide the most benefit.

Low-density residential areas located close to population centers are served well, but residences in more remote parts of the county or those in less populated counties are not. While users are allowed to set destinations outside of their home provider's service area, rider misinformation, higher fares, or difficulty reserving a return trip may all affect their willingness to do so.

At the same time, patterns will vary from each jurisdiction, and local planners and staff will often have the familiarity to know what services are valued in their community. As GDOT's ridership software becomes more sophisticated, this can become a tool that local planners can use to make changes to service. Combined with community input and conversations with key stakeholders, it is possible to envision a rural transit assessment conducted for each county or regional commission in the state.

CHAPTER 7 FULFILLING SERVICE GAPS

Fulfilling service gaps statewide requires extending service to a minimum baseline of service from 6 AM to 4 PM, Monday to Saturday, and extending service to counties where it is not currently offered. An extension of service from 4 PM to 6 PM is strongly suggested for many counties as well, but exact travel patterns will vary.

Table 27 shows the breakdown of current service offerings. Only 31 counties meet the minimum hours of service for Monday through Friday, and even fewer include Saturday service.

Table 27. Counties with rural transit meeting service hour demands.

Service Criteria	Number of Counties
Meets weekday baseline demand of 6 AM – 4 PM M–F	31
Does not meet baseline demand	82
Has service on Saturday	7
Does not have service on Saturday	106
TOTAL number of counties with rural transit	113

Expanding Service in Counties that Currently Provide Service

Methodology

The methodology for calculating costs and ridership for extending service in counties that currently provide service is shown in figure 24. Each step in the methodology for counties that provide service (S) is described below.

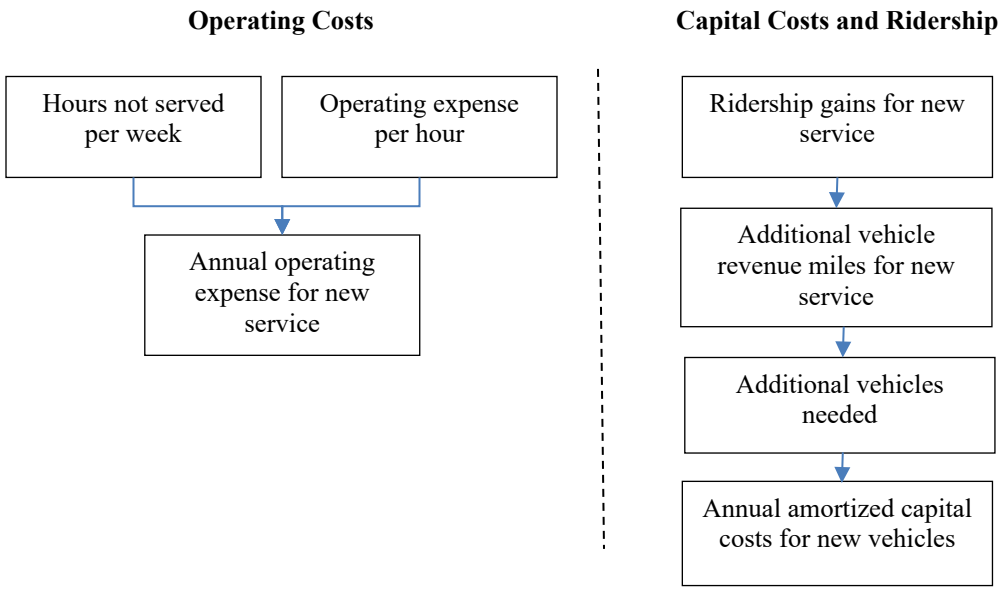


Figure 24. Flowcharts. Methodology for calculating operation, capital, and ridership of expanding service.

Step S-1: Calculate the number of hours not served per week

This number is simply the sum of the hours a subrecipient currently does not serve during the hours of 6 AM to 4 PM, Monday to Saturday.

Step S-2: Calculate the operating expense per hour

The operating expense per hour is calculated from NTD inputs for each subrecipient and is given as equation 1:

$$\text{Operating expenses per hour} = \text{Total operating costs} / \text{Total number of vehicle revenue hours} \quad (1)$$

Step S-3: Calculate the annual operating expenses associated with service expansion

The annual operating expenses associated with service expansion are calculated using equation 2, which assumes there are 10 holidays per year in which no service is offered:

Annual operating expenses = Operating expense per hour × Number of hours of service not offered per week × 52 weeks per year − Operating expense per hour × Hours of service per day (10) × Number of holidays per year with no service (10) (2)

Step S-4: Calculate ridership gains for new hours

Using the trip rates per hour (that are calculated for those systems that offer 24-hour service), the equations 3 and 4 can be written to show how ridership gains (reported as one-way passenger trips [OWPT] in NTD) will increase when new hours are offered on weekdays and weekends:

$$OWPT_{New} = OWPT_{Current} + 0.06 \times OWPT_{New} \text{ (if \# new between 6 AM and 7 AM)} + 0.11 \times OWPT_{New} \text{ (if new hours between 7 AM and 8 AM)} + 0.11 \times OWPT_{New} \text{ (if new hours between 8 AM and 9 AM)} + 0.08 \times OWPT_{New} \text{ (if new hours between 3 PM and 4 PM)} + 0.06 \times OWPT_{New} \text{ (if starts service on Saturday from 6 AM to 4 PM)} \quad (3)$$

$$OWPT_{Incremental} = OWPT_{New} - OWPT_{Current} \quad (4)$$

The trip rates are also summarized in table 28. These rates were calculated using the list of providers with at least 60 percent of the trips reported in GDOT's routing database that offered service during the hours listed in table 28. Note that 25 percent of all trips take place from 6 AM to 9 AM, 3 PM to 4 PM, and on Saturdays for these providers.

Table 28. Trip rates.

Hour of Service	Trip Rate (% of weekly ridership)
6:00 AM to 7:00 AM	6
7:00 AM to 8:00 AM	11
8:00 AM to 9:00 AM	11
3:00 PM to 4:00 PM	8
Saturdays	6
TOTAL	**25**

Step S-5: Calculate additional number of vehicle revenue miles

Because GDOT's vehicle replacement policy is based on age and distance criteria, the number of additional vehicles required to service the ridership demand is calculated as a function of vehicle revenue miles (VRM). Alternate criteria (such as not exceeding a certain load factor by the time of day) could be used if desired (and available). The additional VRM is given as in equation 5:

$$\text{Additional VRM} = \text{OWPT}_{\text{Incremental}} \times \text{Average miles per OWPT}_{\text{Current}} \quad (5)$$

Step S-6: Calculate additional number of vehicles required

The additional number of vehicles needed to service new trips is given as equation 6:

$$\text{Additional vehicles} = \text{Round}(\text{Additional VRM} / \text{Average miles per vehicle}) \quad (6)$$

The researchers assume when using the round function that a new vehicle is added if the additional trips are 50 percent or more of that currently served per vehicle.

Step S-7: Calculate annual vehicle costs

The annual vehicle cost per vehicle is assumed to be $9,000, which corresponds to an up-front cost of $45,000 paid over a 5-year amortization period with no discount rate applied.

$$\text{Annual vehicle cost} = \#\text{ additional vehicles} \times \$9{,}000 \quad (7)$$

Sample Calculation

This section provides a sample calculation for Crawford County (see table 29). Crawford County does not provide service from 6 AM to 7 AM or 3 PM to 4 PM on weekdays;

Crawford County also does not offer Saturday service. Per these calculations, it would cost approximately $32,426 annually for the county to extend service (reflecting $23,426 in operating costs and $9,000 in capital for one additional vehicle) and this extension would capture about 714 additional trips annually in the county.

Table 29. Relevant information for Crawford County.

2018 NTD Service Characteristics for Crawford	
Annual Unlinked Passenger Trips (OWPT)	2,855
Active Vehicles	3
Hours of Service	7:00 AM – 3:00 PM, Monday–Friday
Annual Operating Expenses	$123,760
Annual Vehicle Revenue Miles	62,633
Annual Vehicle Revenue Hours	4,966

Step S-1: Calculate the number of hours not served per week

Number of hours not served per week:

From 6 AM to 7 AM (M–F) =	5 hours
From 3 PM to 4 PM (M–F) =	5 hours
Saturday =	10 hours
TOTAL =	**20 hours**

Step S-2: Calculate the operating expense per hour (using equation 1)

$$\text{Operating expenses per hour} = \frac{\text{Operating costs}}{\text{Vehicle revenue hours}} = \frac{\$123{,}760}{4{,}966} = \mathbf{\$24.92}$$

Step S-3: Calculate the annual operating expenses associated with service expansion (using equation 2)

Annual operating expenses = Operating expense per hour × Number of hours of service not offered per week × 52 weeks per year – Operating expense per hour × Hours of service per day (10) × Number of holidays per year with no service (10)

Annual operating expenses = $24.92 × 20 × 52 − $24.92 × 10 × 10 = **$23,426**

Step S-4: Calculate ridership gains for new hours (using equations 3 and 4)

$OWPT_{New} = OWPT_{Current}$
+ $0.06 \times OWPT_{New}$ (if # new between 6 AM and 7 AM)
+ $0.11 \times OWPT_{New}$ (if new hours between 7 AM and 8 AM)
+ $0.11 \times OWPT_{New}$ (if new hours between 8 AM and 9 AM)
+ $0.08 \times OWPT_{New}$ (if new hours between 3 PM and 4 PM)
+ $0.06 \times OWPT_{New}$ (if starts service on Saturday from 6 AM to 4 PM)

$OWPT_{New} = 2{,}855 + 0.06 \times OWPT_{New} + 0.08 \times OWPT_{New} + 0.06 \times OWPT_{New}$

$2{,}855 = (1 - 0.06 - 0.08 - 0.06)OWPT_{New}$

$OWPT_{New} = 2{,}855 / 0.8 =$ **3,569 trips**

And,

$OWPT_{Incremental} = OWPT_{New} - OWPT_{Current}$

$OWPT_{Incremental} = 3{,}569 - 2{,}855 =$ **714 trips**

Step S-5: Calculate additional number of vehicle revenue miles (using equation 5)

Additional VRM = $OWPT_{Incremental} \times$ Average miles per $OWPT_{Current}$

Additional VRM = $714 \times 62{,}633 / 2{,}855 =$ **15,658 VRM**

Step S-6: Calculate additional number of vehicles required (using equation 6)

Additional vehicles = Round(Additional VRM / Average miles per vehicle, 0)

Additional vehicles = Round(15,658 / (62,633/3)) = Round(0.75) = **1 vehicle**

Step S-7: Calculate annual vehicle costs (using equation 7)

Annual vehicle cost = # additional vehicles × $9000

Annual vehicle cost = 1 × $9000 = **$9,000**

Expanding Service in Counties that Currently Do Not Provide Service

Methodology

The methodology for calculating costs and ridership for extending service in counties that currently do not provide service is shown in **Error! Reference source not found.**. To calculate operating costs, capital costs, and ridership, the researchers used the statewide average, shown in table 30. Note that the process is similar to that used previously for counties that do provide service, with the exception of the need to use statewide (versus subrecipient-specific) values.

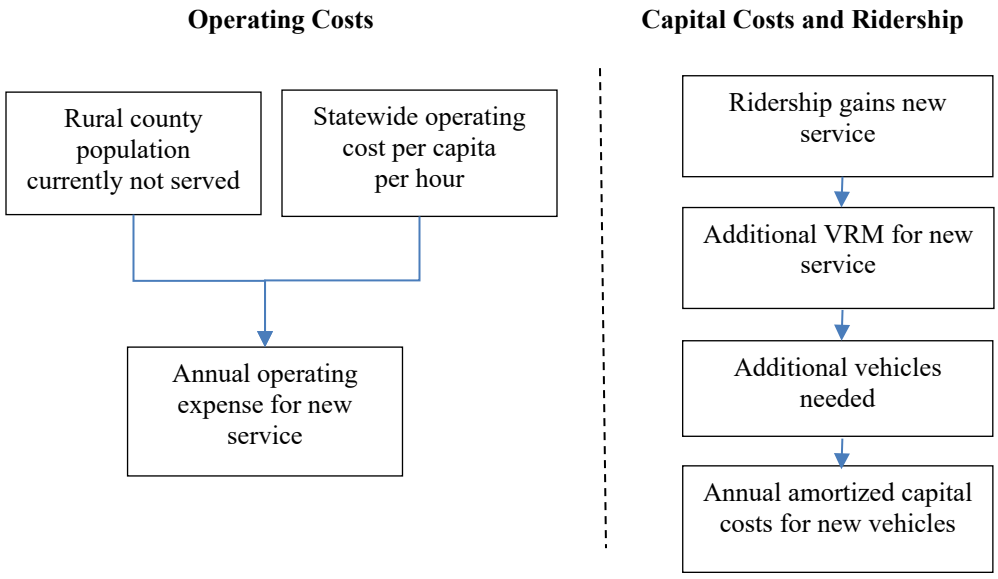


Figure 25. Flowchart. Methodology for calculating operation, capital, and ridership in counties without service.

Table 30. Statewide averages used for counties that do not currently provide service.

Statewide Rural Transit Averages	
Operating Costs per Capita	$6.14
Passenger Trips per Capita	0.29
Number of Miles per Vehicle	$25,393.00
Revenue Miles per Trip	9.88

Each step in the methodology for counties that do not currently provide service (NS) is described below.

Step NS-1: Calculate annual operating costs

$$\text{Annual operating costs} = \text{Per capita operating cost} \times \text{Rural population in the county currently not served} \quad (8)$$

Step NS-2: Calculate ridership gains for new service

Ridership is calculated as the per capita trip rate in counties that offer service multiplied by the population in the county currently not served, defined as $OWPT_{New}$, which is the same as $OWPT_{Incremental}$, or:

$$OWPT_{New} = OWPT_{Incremental} = \text{Per capita trip rate} \times \text{Population in the county currently not served} \quad (9)$$

Step NS-3: Calculate additional number of vehicle revenue miles

$$\text{Additional VRM} = OWPT_{Incremental} \times \text{Statewide average VRM per trip} \quad (10)$$

Step NS-4: Calculate additional number of vehicles required

The additional number of vehicles required to service new trips is given as in equation 11:

$$\text{Additional vehicles} = \text{Max}(1, \text{Round}(\text{Additional VRM} / \text{Average miles per vehicle})) \quad (11)$$

The researchers assume that at least one new vehicle is added for the new service and for areas that require more than one vehicle, that a new vehicle is added if the additional trips are 50 percent or more of that currently served per vehicle.

Step NS-5: Calculate annual vehicle costs (same as equation 7)

Annual vehicle cost = # additional vehicles × $9,000 (7)

Sample Calculation

Oconee County currently offers no service. The closest medical center is less than 15 miles away in Athens. The county's high accessibility score and its proximity to Athens suggest that it would be able to capture a high number of trips. The population in Oconee County is 35,972. Per these calculations, it would cost approximately $256,868 annually for the county to extend service (reflecting $220,868 in operating costs and $36,000 in capital for four additional vehicles) and this extension would capture about 10,432 additional trips annually in the county.

Step NS-1: Calculate annual operating costs (using equation 8)

Annual operating costs = Per capita operating cost × Rural population in the county currently not served

Annual operating cost = 6.14 × 35,972 = **$220,868**

Step NS-2: Calculate ridership gains for new service (using equation 9)

$OWPT_{New} = OWPT_{Incremental}$ = Per capita trip rate × Population in the county currently not served

$OWPT_{New} = OWPT_{Incremental}$ = 0.29 × 35,972 = **10,432 trips**

Step NS-3: Calculate additional number of vehicle revenue miles (using equation 10)

Additional VRM = $OWPT_{Incremental}$ × Statewide average VRM per trip

Additional VRM = 10,432 × 9.88 = **103,068 VRM**

Step NS-4: Calculate additional number of vehicles required (using equation 11)

Additional vehicles = Max(1, Round(Additional VRM / Average miles per vehicle))

Additional vehicles = Max (1, round (103,068 / 25,393 = 4.06))

Additional vehicles = **4 vehicles**

Step NS-5: Calculate annual vehicle costs (using equation 7)

Annual vehicle cost = # additional vehicles × $9,000

Annual vehicle cost = 4 × $9,000 = **$36,000**

Summary

The calculations presented are approximate, and true costs may vary depending on local factors. Statewide, the expansion of service to include hours from 6 AM to 4 PM Monday through Saturday could generate 560,790 new trips. Table 31 shows the overall costs and ridership gains statewide.

Table 31. Ridership and cost of extending service.

	Ridership Gains	Annual Cost (Operating)	Annual Cost (Vehicles)	Total Cost	New Vehicles Required
Extending current service to baseline level (6 AM to 4 PM Monday–Saturday)	136,559	$2,015,386	$837,000	$2,852,386	93
Initiating service in counties without service and counties providing service only to parts of the county	276,154	$5,846,849	$423,000	$6,269,849	47
Total	412,713	$7,862,235	$1,260,000	$9,122,235	140
FY 2018 Georgia levels	664,856	$30,229,545	$4,446,000	$34,675,545	494

Expansion of service at the proposed levels would increase ridership by about 38 percent and overall costs by 21 percent. These numbers should be viewed as high-level estimates, particularly given the uncertainties associated with calculating trip rates by times of the day for the routing database. It is also important to note that costs will vary by location. It is possible that costs could be distributed across multiple agencies, with some funding from local jurisdictions, and other aid coming from State sources. There may also be opportunities to reduce operating and capital costs through pooling of resources and service areas across counties.

CHAPTER 8 RECOMMENDATIONS

Each of the following six major service recommendations offered by this report are explained in detail in this chapter:

1. Regionalizing existing services.
2. Extending services into unserved areas.
3. Extending service hours, with an emphasis on serving more early morning trips.
4. Developing internal standards for performance analysis.
5. Contracting with transit agencies located across state lines.
6. Pooling existing services offered in areas of high activity.

These recommendations are meant to make transit services easier to use and comprehend, while also making the system more efficient to run.

Regionalization of Services

In 2011, the transportation planning firm HNTB Corporation prepared a comprehensive list of reforms for GDOT's rural transit system (HNTB 2011). Chapter 2.4 of the report, "Statewide Policy and Programmatic Recommendations," offers a clear framework for improved service. The recommendations include the establishment of a Rural and Human Services Transportation (RHST) office and a statewide mobility manager, along with increased regionalization of services.

In addition to increasing operating efficiencies and interdepartmental collaboration, regionalization of services can be directly tied to increased ridership. In the introduction,

this report outlined a common scenario in rural Georgia where most points of interest for a person are located outside of a resident's home county. Regionalized service increases the number of vehicles available to customers when that destination falls outside of their home county and reduces the distance a driver must travel to reach a customer. It also streamlines operating procedures and fare structures, making the system more intuitive for the rider.

SWGRC provides a regionalized system that other areas of the state can model. Service has been extended to every county within the regional commission, and the commission collaborates with both the Department of Community Health (DCH) and GDOT to integrate all of its offerings.

House Bill 511 in the Georgia State Legislature proposed funding a state *Mobility Manager* position, tasked with coordinating rural transit services and managing service improvements. (Georgia General Assembly 2019). This is a significant step in the right direction. At the same time, it is a process that will take and require due diligence, as few states have completed full integration of service offerings.

Extension of Service to Fill Gaps

If service were offered along regional commission lines, it would extend to counties not currently offering service. Such efforts are underway in the River Valley Regional Commission. Four counties in the regional commission currently coordinate Medicaid, DHS, and GDOT trips collectively, and the regional commission website tracks levels of coordination throughout the area. Regional commissions play a critical role in tracking services offered areawide and bringing them closer to one another.

Regionalization of services and improved communication would hopefully allow for longer-distance rides and provide more access to people in remote areas. Although the least densely populated counties in Georgia often have the least amount of people, residents of these areas tend to be poorer than their urban counterparts and are most prone to isolation. At least 10 percent of households do not own automobiles in the state's most rural counties, showing a clear need for the service to expand.

Extension of Service Hours

More early morning service is needed across the state, but in some areas, evening and weekend services are needed as well. Of the state's 83 providers, the latest opening time is 8 AM. The earliest closing time is 12 PM, noon. The findings in this study suggest that there is baseline demand statewide to start service at 6 AM and continue service until at least 4 PM, six days a week, Monday through Saturday. Where demand exists, providers may extend hours earlier and later in the day and to Sundays based on needs in that area.

To summarize, the four main service hour takeaways are:

1. Higher need for early morning ridership than early evening ridership.
2. Higher evening ridership evident for regionalized providers than smaller providers.
3. Higher evening ridership displayed in rural areas within metropolitan statistical areas (MSAs) than in services in more remote areas.
4. Higher potential for more ridership on Saturdays than Sundays.

Due to the quality of existing data, these findings are extremely rudimentary. Each of these four findings should be further investigated when more accurate ridership information is available.

Development of Internal Standards for Performance Analysis

Federal regulations (49 CFR 37.131) set numerous requirements for the on-time delivery of paratransit services. The Disability Rights Education & Defense Fund (DREDF 2010) outlines a series of best practices, many of which are more stringent than current federal requirements. Similarly, GDOT can work with others to set internal standards that meet the federal requirement, but offer more stringent internal standards. These include the following:

1. Establish a *latest possible arrival time* and *earliest possible departure time* with each rider. This must fall within the required one-hour pick-up window.
2. Establish agency-specific on-time windows that are stricter than the federal requirements. For example, internally set a pick-up window of 20 minutes as "on-time," whereas the federal minimum is 30 minutes.
3. Avoid early pick-ups. This is especially important in poor weather conditions as a rider may have to unnecessarily wait outside at their destination.
4. Provide will-call reservations. Will-call reservations allow riders to request a pick-up for their return trip for the same day when their departure time is uncertain. Although not required, such trips greatly improve rider convenience.
5. Track trip performance beyond the federal reporting requirements, including trips that are missed, declined, or canceled, and the reason for the change in the itinerary.

As noted previously, a close relationship with local transit providers is important. GDOT and others can use the upcoming statewide transit plan as an opportunity to conduct interviews with local staff. From this, GDOT can gain a better sense of current service hours and delve into how each service provider tracks on-time performance.

Cross-State Collaboration

Border communities pose a unique challenge to transit providers. In Vermont, the State contracts with service providers in neighboring states to provide transit in parts of the state that are tied economically to cities across the border. Services in the towns of Hartford and Norwich are offered by Advance Transit, a New Hampshire–based provider, and four towns in the state's south are served by a Massachusetts-based provider, Deerfield Valley Transit Association.

Such service could benefit parts of Dade, Walker, Catoosa, and Whitfield Counties in northern Georgia. The Chattanooga Area Regional Transit Authority (CARTA) currently runs fixed-route service up to the Tennessee–Georgia border. These services could be extended, or the State of Georgia could contract with CARTA to run demand-responsive service in Georgia counties along the state border, providing better access to major points of interest located in Chattanooga.

Route Pooling

As shown previously, a large percentage of transit trips often occur within a small area. The analysis in this study showed that in both Bulloch and Colquitt Counties, a single pair of census tracts accounted for the flow of most trips. Such services could be pooled to offer

more efficiency. In the case of Bulloch County, for example, a dedicated van could serve the Downtown Statesboro area, while other vehicles follow the current regional service model. Exact service patterns will depend on each provider's needs.

Possible benefits could include the ability for customers to book a ride within a shorter time window; reduced deadheading (i.e., time when a vehicle operates without passengers) for current vehicles; the ability to serve a higher number of passengers with a single driver; and the ability to attract new riders. A vanpool-type service could also allow a rider to visit multiple locations within a small area before reserving a final trip home.

The exact pattern of new services will vary from region to region. One option is to run a new service as a *flex route*, which runs on a fixed schedule but can deviate from its path when reserved. Another option is to introduce a new service, such as *immediate response dial-a-ride,* a reservation-type service with a one-hour window, instead of the typical 24-hour window. Counties can also choose to subsidize a transportation network company (TNC) service (i.e., Uber or Lyft) for qualified riders where it is offered, and if desired, only within certain areas or within certain hours. Dispatch services for TNCs can be made available to users both through the TNC's app and over the telephone. This has proven successful for multiple agencies, but requires a thorough examination of existing call center capabilities. Capital Metropolitan Area Transportation Authority in Austin, Texas, and Dallas Area Rapid Transit (DART) are examples where this proved successful (American Public Transportation Association [APTA] 2019).

Benefits

Despite the increased costs, the potential new services would provide a multitude of benefits and cost savings in other areas that would more than justify the investment. Project Action Consulting, an Americans with Disabilities Act (ADA) and paratransit advocacy group, highlights the following benefits for accessible transportation:

1. Ability to age in place.
2. Access to critical services, i.e., healthcare, dialysis treatment, and mental health treatment.
3. Reduction in medical costs and social service expenses.
4. Access to jobs and an expanded workforce.
5. Reduction in impaired driving.

CHAPTER 9 CONCLUSIONS

Georgia has the potential to revolutionize how it conducts transportation in rural communities. New legislation underway in the State Capitol recognizes that rural transit should not just serve as a last resort option for captive riders, but should be examined in the state's larger mobility picture. Rural transit services must always focus on the state's most poor residents, but growth in the system's attractiveness to new users will improve service for all.

At the same time, many rural communities are losing population. Working professionals and young families are leaving; older residents, however, are not. This will only increase the demand for rural mobility options. Meanwhile, if rural poverty rates continue to rise, transit will become increasingly important as services also become farther away. From 2014 to 2017 alone, seven hospitals in Georgia closed (Williams 2015). Jurisdictional cost savings from the closure of hospitals will result in increased transportation costs, both for State-run vehicles and for residents. A goal of this report is to help GDOT tackle this impending issue.

Unfortunately, much of the ridership information used for this report was unreliable. In 2019, GDOT entered into a new software contract. These new data will likely provide the opportunity for researchers to conduct an extremely thorough analysis of the system statewide. This information can be used to plan new routes and services, or better track how changes or improvements are affecting ridership trends. Local jurisdictions can use the information to provide additional amenities, such as bus shelters. As the new software takes effect, GDOT should coordinate with researchers to ensure that the data it is receiving

are formatted for the highest possible use, both for staff within GDOT and for its partners at Georgia Tech and other research institutions.

APPENDIX

Table 32. NTD-reported trips vs. software-reported trips by provider.

Name	NTD-Reported Unlinked Passenger Trips	Software-Reported Trips	%
Bacon County	4,458	546	12.25
Baldwin County Transit	10,601	4009	37.82
Banks County Transit	4,729	35	0.74
Bartow Transit	35,068	16676	47.55
Ben Hill County Transit		-	-
Berrien County	7,155	1432	20.01
Bleckley County Transit	6,809	-	0.00
Brantley County	-	-	-
Brooks County Transit	14,837	5101	34.38
Burke County Transit	18,283	6908	37.78
Catoosa County	24,619	9036	36.70
Chattooga County Transit	10,959	-	0.00
Cherokee County	-	-	-
City of Americus	19,805	-	0.00
City of Cedartown	4,247	-	0.00
Clay County	10,161	3690	36.32
Coastal Regional Commission	138,884	94197	67.82
Columbia County Commission Transit	51,356	8073	15.72
Cook County Transit	21,929	6412	29.24
Coweta County	23,301	-	0.00
Crawford County Transit	3,060	2709	88.53
Crisp County Transit	21,659	14945	69.00
Dade County Transit	16,945	11420	67.39
Dawson County Transit	9,683	427	4.41
Dodge County Transit	14,796	8681	58.67
Dooly County Transit	29,527	11484	38.89
Elbert County	7,898	14	0.18
Fannin County	14,439	7763	53.76
Forsyth County Public Transportation	18,119	-	0.00
Gilmer County Transit System	11,969	5217	43.59
Glascock County Transit	6,098	-	0.00
Gordon County Transit	11,688	3744	32.03
Greene County Commission Transit	18,221	-	0.00
Habersham County Transit	5,078	891	17.55

Hall County Transit		-	-
Hancock County Transit	15,171	-	0.00
Haralson County Transit	6,438	2965	46.05
Hart County Public Transit	8,843	-	0.00
Heard County Transit	5,291	-	0.00
Henry County Transit		-	-
Jackson County	13,530	2788	20.61
Jefferson County Transit	27,913	11647	41.73
Jenkins County Transit	3,946	459	11.63
Jones County Transit	6,556	3971	60.57
Lincoln County Transit	11,246	-	0.00
Lowndes County	37,463	36026	96.16
Lumpkin County	5,244	4886	93.17
Macon County Transit	7,934	760	9.58
McDuffie County Commission Transit	36,507	34	0.09
Meriwether County (TRRC)	5,165	925	17.91
Montgomery County Transit	1,539	-	0.00
Morgan County Transit	22,165	5189	23.41
Murray County Transportation System	24,026	6976	29.04
Paulding County	33,641	12866	38.24
Peach County Transit	11,328	22	0.19
Pickens County	18,852	5421	28.76
Pierce County Transit	14,228	9296	65.34
Pulaski County Transit	5,018	6	0.12
Putnam County Commission Transit	15,884	2	0.01
Rabun County	11,479	5	0.04
Richmond County		-	-
River Valley Regional Commission (LCRTA)	33,711	12687	37.63
Social Circle Area Transit	10,605	-	0.00
Southwest Georgia RC	262,722	161580	61.50
Talbot County Transit	12,412	-	0.00
Taliaferro County Board of Commissioners	5,978	2	0.03
Taylor County Transit	10,229	2	0.02
Telfair County Transit	9,774	5	0.05
Thomas County Transit	87,874	-	0.00
Three Rivers Regional Commission	62,316	9865	15.83
Tift Transit System	10,443	125	1.20
Towns County	2,197	-	0.00
Troup County Transit	25,936	-	0.00
Turner County	12,700	966	7.61
Twiggs County Transit	6,861	26	0.38

Union County Transit	4,552	-	0.00
Walker County	29,975	-	0.00
Ware County	13,569	23042	169.81
Warren County Commission Transit	4,684	287	6.13
Wayne County Transit	42,910	15138	35.28
Wheeler County Transit	4,121	1574	38.19
Whitfield County W.T.S.	40,265	12140	30.15
Wilcox County Transit	4,274	2514	58.82
Wilkes County Commission Transit	15,271	-	0.00
Wilkinson County Commission Transit	9,401	-	0.00

No data were available for blank cells.

Table 33. Full list of service hours by provider.

Provider Name	Mon	Tues	Wed	Thurs	Fri	Sat	SUN
Americus, City of	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	-
Bacon County	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Baldwin County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Banks County Transit	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Bartow Transit	7:00A–5:30P	7:00A–5:30P	7:00A–5:30P	7:00A–5:30P	7:00A–5:30P	-	-
Ben Hill County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Berrien County	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Bleckley County Transit	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Brantley County	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Brooks County Transit	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Burke County Transit	6:00A–6:00P	-	6:00A–6:00P	-	6:00A–6:00P	-	-
Catoosa County	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	-	-
Cedartown, City of	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	-	-
Chattooga County Transit	6:30A–4:30P	6:30A–4:30P	6:30A–4:30P	6:30A–4:30P	6:30A–4:30P	-	-
Cherokee County	6:30A–4:30P	6:30A–4:30P	6:30A–4:30P	6:30A–4:30P	6:30A–4:30P	-	-
Clay County	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Coastal Regional Commission	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	-	-
Columbia County Commission Transit	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	-	-
Cook County Transit	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Coweta County	8:00A – 5:00P	8:00A – 5:00P	8:00A – 5:00P	8:00A – 5:00P	8:00A – 5:00P	-	-
Crawford County Transit	7:00A–3:00P	7:00A–3:00P	7:00A–3:00P	7:00A–3:00P	7:00A–3:00P	-	-
Crisp County Transit	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Dade County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Dawson County Transit	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	-	-

Dodge County Transit	7:30A–4:30P	7:30A–4:30P	7:30A–4:30P	7:30A–4:30P	7:30A–4:30P	-	-
Dooly County	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	-
Elbert County	7:00A–3:30P	7:00A–3:30P	7:00A–3:30P	7:00A–3:30P	7:00A–3:30P	-	-
Fannin County	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Forsyth County Public Transportation	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Gilmer County Transit System	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Glascock County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Gordon County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Greene County Commission Transit	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	-	-
Habersham County Transit	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	-	-
Hall County Transit	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Hancock County Transit	4:00A–6:00P	4:00A–6:00P	4:00A–6:00P	4:00A–6:00P	4:00A–6:00P	4:00A–4:00P	-
Haralson County Transit	7:00A–6:00P	7:00A–6:00P	7:00A–6:00P	7:00A–6:00P	7:00A–6:00P	-	-
Hart County Public Transit	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Heard County Transit	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	-	-
Henry County Transit	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Jackson County	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	7:00A–4:00P	-	-
Jefferson County Transit	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Jenkins County Transit	8:00A–3:30P	8:00A–3:30P	8:00A–3:30P	8:00A–3:30P	8:00A–3:30P	-	-
Jones County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Lincoln County Transit	9:00A–5:00P	9:00A–5:00P	9:00A–5:00P	9:00A–5:00P	9:00A–5:00P	-	-
Lower Chattahoochee Regional Transit Authority	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	-
Lowndes County	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Lumpkin County	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-

Macon County Transit	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	-
McDuffie County Commission Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Morgan County Transit	6:00A–5:15P	6:00A–5:15P	6:00A–5:15P	6:00A–5:15P	6:00A–5:15P	-	-
Murray County Transportation System	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Paulding County	7:30A–4:30P	7:30A–4:30P	7:30A–4:30P	7:30A–4:30P	7:30A–4:30P	-	-
Peach County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Pickens County	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Pierce County Transit	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Pulaski County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Putnam County Commission Transit	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	8:00A–4:30P	-	-
Rabun County	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Richmond County	5:45A–5:45P	5:45A–5:45P	5:45A–5:45P	5:45A–5:45P	5:45A–5:45P	-	-
Social Circle Area Transit	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Southwest Georgia Regional Commission	6:00A–8:00P	6:00A–8:00P	6:00A–8:00P	6:00A–8:00P	6:00A–8:00P	-	-
Talbot County Transit	7:30A–2:30P	7:30A–2:30P	7:30A–2:30P	7:30A–2:30P	7:30A–2:30P	-	-
Taliaferro County Board of Commissioners	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Taylor County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Telfair County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Thomas County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Three Rivers Regional Commission	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Tift Transit System	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Towns County	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-

Troup County Transit	9:00A–3:00P	9:00A–3:00P	9:00A–3:00P	9:00A–3:00P	9:00A–3:00P	-	-
Turner County	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Twiggs County Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-
Union County Transit	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	8:00A–4:00P	-	-
Walker County	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Ware County	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	7:30A–5:30P	-	-
Warren County Commission Transit	4:00A–12:00P	8:00A–4:00P	4:00A–12:00P	8:00A–4:00P	4:00A–12:00P	-	-
Wayne County Transit	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours	24 hours
Wheeler County Transit	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	7:00A–5:00P	-	-
Whitfield County	6:30A–6:00P	6:30A–6:00P	6:30A–6:00P	6:30A–6:00P	6:30A–6:00P	-	-
Wilcox County Transit	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	6:00A–6:00P	-	-
Wilkes County Commission Transit	7:30A–4:00P	7:30A–4:00P	7:30A–4:00P	7:30A–4:00P	7:30A–4:00P	-	-
Wilkinson County Commission Transit	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	8:00A–5:00P	-	-

No service is offered for cells that are blank.

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REFERENCES

American Public Transportation Association (APTA). (2019). "Transit and TNC Partnerships." (website) Washington, DC. Available online: https://www.apta.com/research-technical-resources/mobility-innovation-hub/transit-and-tnc-partnerships/.

Comprehensive R Archive Network (CRAN). (2015). "Hansen: Hansen Accessibility." Regional Economic Analysis Toolbox (REAT). Available online: https://rdrr.io/cran/REAT/man/hansen.html.

Disability Rights Education & Defense Fund (DREDF). (2010). *Topic Guide Six: On-time Performance in ADA Paratransit*." Topic Guides on ADA Transportation, DREDF, Berkeley, CA.

Federal Transit Administration (FTA). (2014). *Formula Grants for Rural Areas: Program Guidance and Application Instructions*. Circular FTA C 9040.1G, U.S. Department of Transportation, Federal Transit Administration, Washington, DC, November 24. Available online: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Circular_9040_1Gwith_index_-_Final_Revised_-_vm_10-15-14%281%29.pdf.

Federal Transit Administration (FTA). (2018). *2017 National Transit Summary and Trends*. National Transit Database, Office of Budget and Policy, Washington, DC. Available online: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/ntd/130636/2017-national-transit-summaries-and-trends.pdf.

Garrow, L.A., Douthat, T.H., Yang, W., Nord, A., Rao, P., and Douglass, S. (2018). *Rural and Small Urban Transit Systems in Georgia*. Technical Report, Department of Civil & Environmental Engineering, Georgia Institute of Technology, Atlanta, GA. Available online: http://garrowlab.ce.gatech.edu/sites/default/files/201812%20Rural%20and%20Small%20Urban%20Transit%20in%20GA.pdf.

Georgia General Assembly. (2017). Legislation. "2017–2018 Regular Session – SB 386, Sales and Use Taxes; exception to the ceiling on local sales and use taxes; transit special purpose local option sales and use tax; provide; Atlanta-region Transit Link (ATL) Commission; create." Atlanta, GA. Available online: http://www.legis.ga.gov/legislation/en-US/Display/20172018/SB/386.

Georgia General Assembly. (2019). Legislation. "2019–2020 Regular Session – HB 511, Highways, bridges, and ferries; funding sources and a consolidated state entity for the planning and implementation of mobility and transit services; provisions." Atlanta, GA. Available online: http://www.legis.ga.gov/Legislation/en-US/display/20192020/HB/511.

Georgia Governor's Office of Planning and Budget. (2017). "County Population Estimates, 2017." Small Urban and Rural Transit Center, Atlanta, GA. Available online: https://opb.georgia.gov/population-estimates.

HNTB Corporation. (2011). *Rural and Human Services Transportation Study – Phase 1 Implementation Plan*. Georgia Department of Transportation, Transit Planning Services, Atlanta, GA, May.

Justino, T.S. (2018). "Measures of Accessibility 5.4.1 Hansen-type Measures." UP Commons, Universitat Politecnica De Catalunya, Barcelona, Spain. Available online: https://upcommons.upc.edu/bitstream/handle/2099.1/6327/03.pdf?sequence=4&isAllowed=y.

Kittelson & Associates, Inc. (2004). *Transit Capacity and Quality of Service Manual*. Second Edition, "Part 3 – Quality of Service." TCRP Report 100, Transportation Research Board of the National Academies, Transit Cooperative Research Program, Washington, DC.

Lester, T.W. (2014). "The State of Low-Wage Work in North Carolina." (website) Department of City & Regional Planning, University of North Carolina, Chapel Hill, NC. Available online: http://www.lowwagenc.org/

Mokhtarian, P.L., Ory, D.T., and Cao, X. (2009). "Shopping-Related Attitudes: A Factor and Cluster Analysis of Northern California Shoppers." *Environment & Planning B,* 36(2), pp. 204–228. doi:10.1068/b34015t. Included in *Cluster Analysis*, eds. David Byrne and Emma Uprichard, Sage Benchmarks in Social Research Methods, Sage Publications, 2011. ISBN 978-0-85702-128-1. January 1, 2009.

National Public Radio (NPR). (2018). "Report: Rural Poverty in America Is 'An Emergency'." Washington, DC, May 31, 2018.

National Transit Database (NTD). (2018a). NTD Data (Various Tables). Retrieved from: https://www.transit.dot.gov/ntd/ntd-data.

National Transit Database (NTD). (2018b). "Metropolitan Atlanta Rapid Transit Authority, 2017 Annual Agency Profile." U.S. Department of Transportation, Federal Transit Administration, Washington, DC, Sept 2018.

Smith, S.K., Tayman, J., and Swanson, D.A. (2013). "Extrapolation Methods." In: *A Practitioner's Guide to State and Local Population Projections*. Part of The Springer Series on Demographic Methods and Population Analysis, 37, pp. 185–213. Springer Dorrecht. Available online: https://link.springer.com/chapter/10.1007/978-94-007-7551-0_8.

U.S. Census Bureau. (2015). "Poverty Status in the Past Twelve Months." American Community Survey (ACS), 5-year estimates.

U.S. Census Bureau. (2017a). “Age and Sex.” American Community Survey (ACS), 5-year estimates.

U.S. Census Bureau. (2017b). *LEHD Origin–Destination Employment Statistics (LODES) Dataset Structure. Format Version 7.3*. Revised September 19, 2017. Available online: https://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.3.pdf.

U.S. Department of Agriculture (USDA). (2018). “Child poverty heavily concentrated in Rural Mississippi, even more so than before the Great Recession.” USDA, Economic Research Service, Washington, DC, July 2, 2018.

Vermont Agency of Transportation (VTrans). (2012). *Vermont Public Transit Policy Plan*. Final Report, KFH Group, Inc., VTrans, Barre, VT. Available online: https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Vermont%20Public%20Transit%20Policy%20Plan%202012%20webs.pdf

WCTV-TV. (2009). “Valdosta Plans Mass Transit System for Its City Streets.” Kim Carapucci, WCTV, Tallahassee, FL, January 7, 2009. Available online: https://www.wctv.tv/home/headlines/37248229.html.

Williams, M. (2015). “Code Red: The Decline of Georgia’s Rural Hospitals.” *Atlanta Journal Constitution*, January 3. Available online: https://www.ajc.com/georgia-rural-hospitals/.