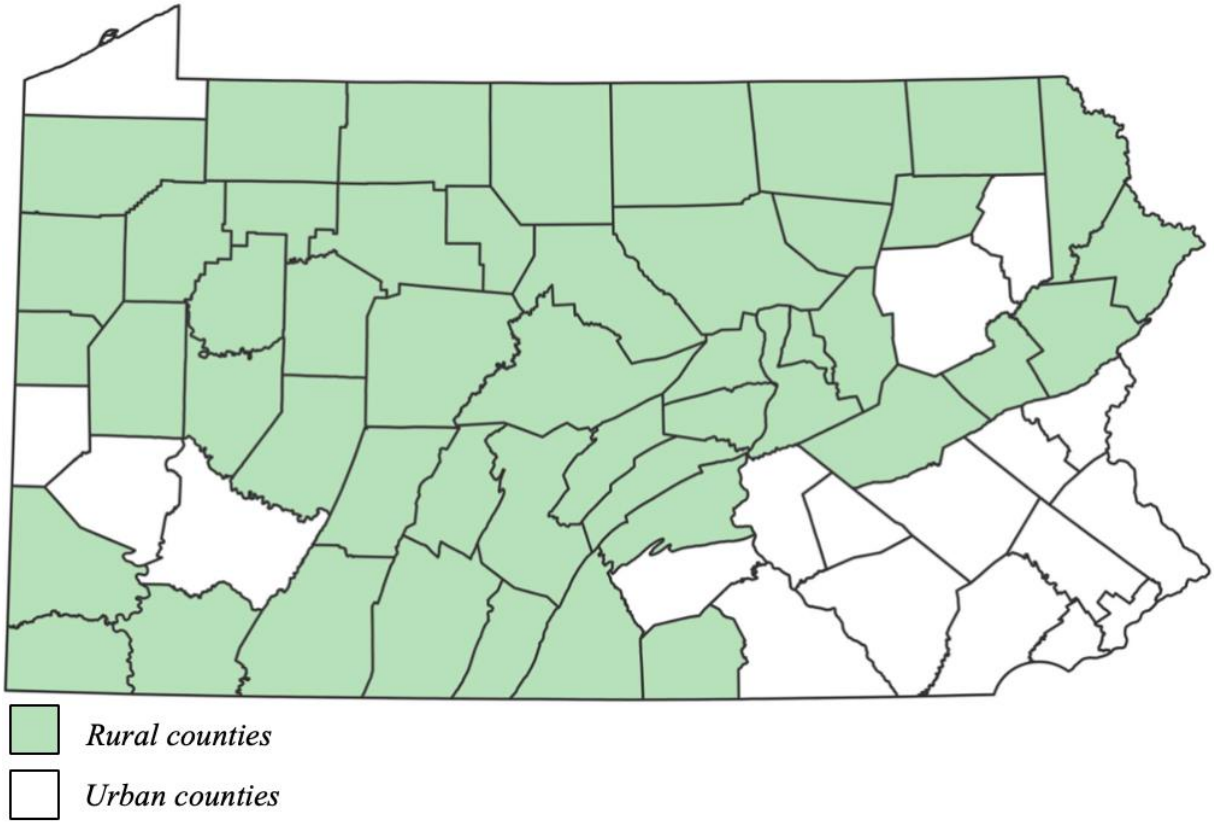
Mobility, Accessibility, and Connectivity: Assessments and Recommendations Concerning Rural Transportation Equity in Pennsylvania



Prepared by:

Ziyu Dai, Marcus Robinson, Erick Shiring, and Ye Tian

Heinz College of Information Systems and Public Policy
Carnegie Mellon University

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Executive Summary

There are systemic differences between Pennsylvania's rural and urban counties that need to be considered and understood in transportation planning and policymaking. Rural Pennsylvania is one of the glories of this Commonwealth. Its communities, farmlands, resources, and scenic beauty are significant economic engines that afford residents and visitors an inestimable lifestyle. However, there are structural, geographic, and socioeconomic disadvantages in these areas that demand different transportation solutions and strategies than those that commonly work in more populous areas. To increase transportation equity for rural residents on both physical and digital infrastructure, transportation policy should be tailored to boost mobility, access, and connectivity for rural residents.

From a review of Pennsylvania's relevant transportation services, PennDOT has made great progress on rural equity in transportation. Pennsylvania offers free public transportation services to citizens aged 65 and over. PennDOT's extensive planning and project evaluation processes have facilitated innovative approaches, such as enabling transit agencies like IndiGO in Indiana County to integrate with Disabled American Veterans to maximize transit options. PennDOT also offers ample opportunities for robust public and stakeholder input and program development to meet rural needs through its 12-Year Plan and Long Range Transportation Planning process.

This report has attempted to identify ways in which existing transportation policies and services could perhaps be strengthened or reshaped to better meet the particular needs of rural communities and residents in Pennsylvania.

Based on a review of the literature on national trends in rural equity, gaps in rural transportation services sometimes have a negative impact on health care, safety, information and service access, and education for rural communities. These trends apply in Pennsylvania. Based on an analysis of county level data, we quantify systemic differences in Pennsylvania counties on metrics including income growth, employment, poverty rate, and health signifers. A gap in these metrics between the rural and urban counties exists and continues to grow. There also exist differences in transportation services across urban and rural counties in terms of road safety, transit service proximity, and broadband access as measured by internet availability, up-to-date technology, and download speed.

PennDOT has a comprehensive planning structure that provides voice for rural transportation concerns; this structure includes federally-mandated Metropolitan Planning Organizations (MPOs) and Regional Planning Organizations (RPOs) carrying out PennDOT's Transportation Improvement Programs (TIPs) and the commonwealth's Twelve-Year Program (TYP) ("MPOs and RPO Contacts," 2020). In addition, the Bureau of Public Transportation offers valuable transit support administered by its Rural and Intercity Transit Division. These are complex

programs, and that complexity may itself inform the need for more focused rural stakeholder input.

Institutional decision-making and resource allocation by nature favors the status quo. New ideas may require a shift of resources, which is valuable because it requires thoughtful decision-making. This trend, however, also poses a challenge because existing demands may inhibit examining problems in new ways. Fiscal constraints, which are particularly acute in the transit sector, have not afforded a specific, systemic investigation into rural equity concerns. The question we have confronted is whether these existing mechanisms might better serve rural transportation if supplemented by a dedicated forum for rural stakeholders to voice their needs.

How might this objective be achieved? As a case study, we examined Michigan's Rural Task Force Program, which is widely cited as one state's approach to rural equity. The Michigan program is decentralized and project-based; that is, 22 county-level task forces offer projects intended to solve local issues. An advisory board oversees these 22 county-level task forces, which serves to allocate program-level funds and to organize implementation. Because of the Rural Task Force Program's focus on funding and project creation, it does not make research-based policy recommendations.

The paper concludes with a recommendation to enhance mobility, accessibility, and connectivity for PA's rural communities. Our findings suggest that rural stakeholders should have a mechanism to share concerns, explore policies, and research solutions concerning rural transportation equity. Therefore, we recommend a Rural Transportation Council made up of a broad representation of stakeholders. PennDOT should work to create an inclusive list of all essential stakeholders, including, but not limited to, representatives from the Department of Community and Economic Development, the Department of Human Services, the Center for Rural Pennsylvania, and the Department of Conservation and Natural Resources. The council should also include stakeholders with local interests such as farming, tourism, resource extraction, local government, academia, education and healthcare, workforce development, economic and community development, seniors, and people with disabilities. The council should collect research and recommend policies based on the problems identified in this paper. It may operate with a similar structure to existing PennDOT task forces, such as the Autonomous Vehicle Task Force, the Pedalcycle and Pedestrian Advisory Board, and the State Transportation Innovation Council.

The council we envision could work in partnership with and supplement the work done by the Center for Rural Pennsylvania, a policy and research agency serving the Pennsylvania General Assembly. Since its establishment in 1987 by the Rural Pennsylvania Revitalization Act, the Center has been an invaluable resource in its broad-based mission to work strategically for PA's rural communities. Its decades of advocacy and rich research agenda have made possible many

data-driven policy recommendations for rural equity, including the recommendations made in this paper. A Rural Transportation Council can gather stakeholders interested specifically in how transportation services can promote rural equity, and the council could be helpful in its partnership with the Center for Rural Pennsylvania.

The proposed Rural Transportation Council would build on past research and undertake new studies of rural transportation equity. The council should identify correlations between transportation services and economic conditions suggested by this paper that cannot be quantified by a single metric. It should study the impact of broadband services on a number of factors like work-from-home opportunities, access to information for transportation services or deliveries, and mobility for residents without a car. It should also conduct public attitude surveys to identify what residents prefer in terms of transit services and how service quality has impacted their experiences. Lastly, it should conduct thorough case studies of best practices and emerging mobility solutions to understand how innovative ride-sharing technologies or integration techniques across agencies might impact rural mobility, accessibility and connectivity.

Introduction

On a recent Monday, Erick, a member of this research team, drove to his sister's camp in rural Armstrong County. She has a stationary camper, five kayaks, and a half-finished fire ring along the Allegheny River. The camp is both inviting and private, though certainly not serene once Erick's four nieces arrive.

This was a classic Monday evening for the Shiring family -- Erick's mom made grilled chicken and cabbage casserole for her two daughters, their husbands, her four granddaughters, and himself. She likes to make dinner for her daughters' whole families on Mondays because it eases their transitions into new weeks of work and school. They ate, yelled, and enjoyed a just-warm-enough April day.

His mom, Patty, took her job at Aetna's Pittsburgh office in 2013, after working for UPMC for 5 years. They're a Kittanning family, so Patty commuted for about two hours each day before moving to Aetna. Thanks to reliable broadband access in the Kittanning area, Patty could work from home, and she has since 2013. Her virtual work experience afforded her the time and energy she needed to bring back Monday dinners for 12.

Consider the opportunities for connection that Patty's job has afforded her, and consider broadly the ways in which Pennsylvania's rural residents connect, travel, and learn. How do areas with weaker broadband access affect job opportunities or education? Are transportation services informing any of the socioeconomic gaps between Pennsylvania's growing rural and urban communities? And, ultimately, does there exist a specific, directed group that is making research-based policy recommendations for these communities? The pursuit of these questions motivated this paper.

The paper's structure is as follows. We begin with an overview of Pennsylvania's relevant transportation services, including information on funding and existing rural initiatives. We then offer a review of the literature on how transportation needs differ in rural communities nationally. From there, we conduct a county-level analysis of socioeconomic data and transportation services available to PA residents. Notably, our analysis demonstrates a clear, growing divide between rural and urban counties. Then, we examine a case study of Michigan's Rural Task Force Program, a project-directed, decentralized initiative. We conclude the paper with our recommendations to address rural transportation equity and further research questions.

Background: An overview of Pennsylvania's relevant transportation services

In this section, we discuss the transit services and public input channels available to Pennsylvania's rural residents and the commendable work that PennDOT has done thus far on rural equity. We then provide an overview of the federal funding, state funding, revenue uses, and primary actors relevant to Pennsylvania's transportation generally.

Rural transportation services in PA

PennDOT is already actively engaged in this issue using various initiatives working with multiple agencies. From PennDOT's website, public transit services available across the state include:

- Free public transit for all residents over age 65,
- Fixed-route transit service in 22 rural areas,
- 44 systems offering shared-ride services in all Pennsylvania counties,
- 13 intercity bus routes,
- Keystone corridor Amtrak service, and
- 66 counties with rural transportation for persons with disabilities (PennDOT "Public Transit Options," 2020).

Efforts to increase accessibility for senior citizens and residents with disabilities are highly relevant to the issue of rural equity, as we will note in the literature review. Several rural counties' transit services have integrated with other human services agencies like the Area Agency on Aging or Disabled American Veterans to boost accessibility and coverage for residents.

Shared-ride services are also highly valuable for rural areas, as populations there by definition are less sparse. These services are demand-responsive, curb-to-curb, or door-to-door transportation, and they operate on a non-fixed route basis. Various programs such as the Senior Shared-Ride Program, the Persons with Disabilities (PwD) Program, and the Medical Assistance Transportation Program (MATP) purchase shared-ride trips for individuals registered for their programs. Shared-ride providers will also often provide demand-responsive transportation to human service programs that go beyond the operating times or service areas expected of the public shared-ride service.

It is helpful to consider how rural stakeholders contribute to the development of these programs, because demand for public transit options by rural residents has risen considerably in recent decades (Jeffrey, 2004). Further research is necessary to characterize the precise trends of this

demand. PennDOT offers ample channels for public input and program development that rural communities may utilize to express their concerns for rural transportation services. These include the Twelve-Year Program, featuring the Transportation Improvement Program under MPOs and RPOs. As such, stakeholders can voice concerns or propose new transportation service programs in rural areas. These programs, however, are financially constrained by federal mandate. Specific, stakeholder input would be helpful to understand how these inequities interact with transportation services.

Federal funding sources for rural transportation projects

Financial support for transportation projects in Pennsylvania stems from several key state and federal funds (Pennsylvania Transportation Advisory Committee, 2019). The main federal fund is the Highway Trust Fund (HTF), which offers federal grants for state and local governments to improve surface transportation (Tax Policy Center, 2018). The HTF supports mass transit, bridge, and highway projects through two major sub-funds, the Highway Account and the Mass Transit Account (Peter G. Peterson Foundation, 2018). The "gas tax" on motor fuel is the primary source of income for the HTF, in addition to taxation of tires and heavy vehicles.

However, the HTF has experienced financial jeopardy starting in 2008 (Kirk & Mallett, 2019). The gas tax has decreased with declining annual vehicle miles traveled (VMT), and higher usage of vehicles with alternative or hybrid energy sources and efficient fuel economy. The resulting budget shortfall from insufficient HTF revenue sources casts doubt on the state's ability to use grants from the HTF. Through the next five years, the budget shortfall is expected to reach $19 billion per year.

State funding sources for rural transportation projects

There are four main state funding sources in Pennsylvania. A majority of the revenue sources for the funds derive from gas taxes and vehicle fees, which underwent a significant overhaul in 2013 through Act 89 (Alexandersen, 2015). Act 89 adapted many of the revenue sources for modern policy needs and established dedicated revenue streams to improve Pennsylvania's transportation infrastructure (PennDOT, 2017). Table 1 below summarizes the key financial sources for each fund along with their main uses.

Transportation funding in Pennsylvania is a complex structure.

Revenue Sources	Fund	Uses
• Liquid Fuels Tax • Fuels Use Tax • Alternative Fuels Tax • Motor Carriers Road Tax • Motor Licenses and Fees • Vehicle Code Fines • Miscellaneous DOT Permits and Fees	Motor License Fund (MLF)	• Highway and Safety Improvements • Highway Capital Projects • Rural Commercial Routes • Municipal Roads and Bridge Improvements • Highway Maintenance • Driver and Vehicle Services • Municipal Traffic Signals • County Bridge Maintenance and Construction • PSP Operations
• Pennsylvania Turnpike Commission • Sales and Use Tax • Transfer from Lottery Fund • Motor Vehicle Fees • Vehicle Code Fines	Public Transportation Trust Fund (PTTF)	• Mass Transit Operating Expenses • Public Transit Asset Improvement • Programs of Statewide Significance • Transit Administration and Oversight
• PTC Payments • Motor Vehicle Fees • Oil Company Franchise Tax	Multimodal Transportation Fund (MTF)	• Aviation Grants • Rail Freight Grants • Passenger Rail Grants • Bicycle/Pedestrian Facilities Grants • Statewide Program Grants • Multimodal Administration and Oversight • Transfers to Commonwealth Financing Authority (CFA) • PennPORTS Debt Service
• Tire Fee • Vehicle Rental Fee • Vehicle Lease Tax • Sales and Use Tax	Public Transportation Assistance Fund (PTAF)	• Transit Capital and Asset Management Projects • Transit Operating Expenses

Table 1. Source: Transportation Infrastructure Task Force (2019).

The Motor License Fund (MLF) is designated for building and maintaining public highway and bridge infrastructure (Pennsylvania Department of the Auditor General, 2019). The MLF serves as the foundation of Pennsylvania transportation funding due to the constitutional provision restricting its use to highway and bridge expenditures. In 2018, the MLF provided the highest amount of funding for transportation projects, with the next highest fund contributing only 20% to transportation projects (Pennsylvania Transportation Advisory Committee, 2019). Previously, a portion of the MLF was diverted to State Police, reaching over $4.25 billion from 2012 to 2019 (Pennsylvania Department of the Auditor General, 2019). Going forward, a limit was placed on this transfer amount and a gradual decrease in the amount.

The Public Transportation Trust Fund (PTTF) contributes 15% of the state's transportation budget to the management and operations of public transportation (Hughes, 2019). The PTTF supports public transportation through programs such as the Welfare to Work Transportation Program, which sponsors activities facilitating access to child care services and transportation to work for low-income individuals (National Conference of State Legislatures, 2015). The PTTF also has concerns for its long-term viability; the Pennsylvania Turnpike Commission's payments to the PTTF will lower from $400 to $50 million, which already far exceeds their financial capacity due to long-term debt (Pennsylvania Turnpike, 2020).

The Public Transportation Assistance Fund (PTAF) also supports public transportation operations in Pennsylvania. The PTAF is also specifically targeted for public transportation, but its impact is restricted due to its revenue sources (Port Authority of Allegheny County, 2016).

The Multimodal Transportation Fund (MTF) earmarks funds to facilitate investments in transportation assets that improve communities, pedestrian and cyclist safety, and transit (PennDOT, 2019). MTF grants are intended to involve land use strategies to encourage equitable economic development in local communities (AASHTO, 2019). The MTF has a stronger financial outlook than the other funds, with a reserve level of $190 million as of 2017 (Benefield, 2017).

Revenue uses

Table 2 below depicts the highest five recipients of PennDOT revenue from 2017-2018 (PennDOT, 2018). Highway-related revenue uses were the largest use category totalling $5,938,066,000, with majority directed to highway and bridge improvement. Highway-related expenditures are a necessity due to Pennsylvania having the fourth largest highway system in the United States, and a lack of federal funds available to address deteriorating infrastructure (Pennsylvania Transportation Infrastructure Task Force, 2019).

Major categories of PennDOT spending

Recipient	Monetary Amount	Use Category
Highway & Bridge Improvement	$2,858,597,000	Highway Related
Mass Transit	$1,767,465,000	Multimodal Related
Highway & Bridge Maintenance	$1,746,638,000	Highway Related
Payments to Local Government	$950,153,000	Highway Related
Pennsylvania State Police	$748,900,000	Debt Service & Other Agencies

Table 2. Highest Revenue Uses by PennDOT from 2017-2018. Source: 2018 PennDOT Annual Report

Primary actors in state transportation

Before surveying the actors in state transportation, we recognize that there are significant local government transportation programs, especially in rural areas. This analysis focuses on the state structures, but we recognize that the local organizations are critical and need to be further analyzed.

The Pennsylvania Departments of Conservation and Natural Resources (DCNR) and Community and Economic Development (DCED) assist PennDOT in managing Pennsylvania's transportation systems and infrastructure. DCNR supports trail and park roadway development through Recreational Trails Funding, which supports the construction and maintenance of recreational trails and associated facilities (DCNR).

DCED and PennDOT jointly manage another Multimodal Transportation Fund by directing grants to support economic development through the creation or improvement of transportation assets (DCED). DCED also administers the Greenways, Trails, and Recreation Program (GTRP), which provides grants to create, maintain, or improve public parks, recreation areas, greenways, trails and river conservation (DCED). The Community Development Block Grants (CDBG) are another source of funding managed by DCED that is not dedicated for transportation but can be used for the purpose. CDBG grants can fund infrastructure improvements such as sidewalks and streets, in addition to their other uses for local community needs (DCED, 2018).

Literature Review: Assessing national trends in rural transportation

A literature review was conducted to assess the nature and extent of transportation inequities in rural communities nationally. Rural communities face unique transportation needs due to their demographic characteristics, funding sources, and local economies. This study uses a comprehensive approach to identify the contributing factors to rural transportation gaps and the related, diverse impacts on rural communities.

The literature review has three main stages. The first stage establishes the working definition of rural communities and the framework used to analyze rural transportation inequities. The second stage provides an overview of rural transportation systems and the critical users reliant upon their services. The final stage describes the identified, systemic impacts of transportation inequities on rural communities.

A wide range of academic and professional sources was used to inform the literature review. The review began with a core set of topics to investigate and expanded and developed as more evidence emerged. The scope of the study was repeatedly refined upon stakeholder input and emerging research trends.

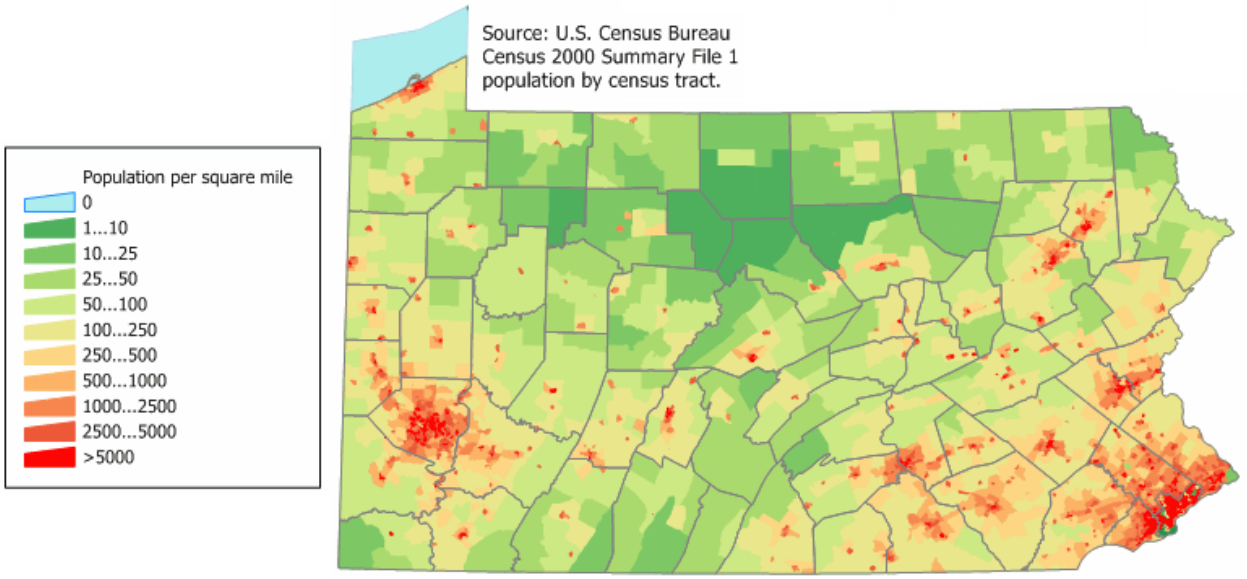
Part 1: Approach to studying transportation in rural communities

Defining "rural" communities

Rural communities are defined differently based on various criteria used by state and federal governments. At the federal level, rural communities are defined in opposition to urban communities (*HRSA*, 2018). The U.S. Census Bureau and the Office of Management and Budget (OMB) provide the two main federal definitions, using population density to classify areas. The U.S. Census defines urban areas as meeting population criteria, and rural areas as all areas failing to meet that criteria. The OMB classifies areas as Metropolitan, Micropolitan, or Neither, with rural areas being any non-Metropolitan area.

Throughout the paper, we will use the designations of "rural" and "urban" counties used by the Center for Rural Pennsylvania. From their website, "A county... is rural when the number of persons per square mile within the county or school district is less than 284. Counties and school districts that have 284 persons or more per square mile are considered urban" (*The Center for Rural Pennsylvania,* 2019). As the state of Pennsylvania's bipartisan, bicameral legislative agency, The Center is tasked with monitoring and supporting rural communities through research initiatives, reports, and forums. We included a reference of rural/urban designation by county in the Appendix.

Pennsylvania population density



Source: U.S. Census Bureau

Rural definitions based on population criteria present challenges for rural communities to obtain critical resources (Crampton, 2019). Rural communities have experienced demographic changes, making it difficult to maintain rural classifications. According to the Census, from 2000 to 2010 the rural US population decreased from 21% to 19.3%, yet over 95% of the land area remained rural. However, rural communities have more individuals living in poverty (18%) compared to urban communities (15%) (McIntire, 2015).

Without these rural classifications, rural communities lose access to critical funding for projects. The recent CARES Act illustrates how population-based eligibility criteria disproportionately affects rural communities. The CARES Act directed thirty million dollars to localities with population levels of at least 500,000 and only $150 billion to states (Ajilore, 2020). This exclusion places additional stress on rural governments struggling to serve with limited monetary resources. Rural governments have low tax bases due to their small populations, which also restricts the ability to dedicate staff to obtaining grants and alternative funding sources.

Analyzing transportation systems and infrastructure

Mobility, accessibility, and connectivity are three interconnected approaches to assessing transportation (Litman, 2020). Mobility refers to the ability to travel physically using transportation modes, and it is evaluated using the quantity and quality of the transportation mode(s) available. Transportation provides more than mobility, however; it provides access to critical resources, such as employment, education, health care, recreation, and community. Accessibility considers the ability to reach needed resources, and how factors such as mobility, land use, and transportation planning affect access.

An approach using accessibility provides stronger evidence of transportation inequities. Transportation equity analyses examine the fairness of the distribution of impacts from transportation planning, specifically whether certain communities experience a greater burden of the harms or a smaller share of the benefits. Accessibility prioritizes the role of transportation in connecting communities to resources, allowing for transportation equity analyses to evaluate transportation systems based on their connectivity, safety, planning, and multimodal qualities

The last term, connectivity, is the bridge between accessibility and mobility. Transportation links goods and communities to resources, allowing for critical access using established transportation options (USDOT, 2015). Connectivity can be analyzed among the types of transportation modes prioritized, locations linked, and the safety of that connection. Improvements to the connectivity of communities and goods is the main mechanism by which transportation supports economic growth and community development.

Connectivity is undergoing a significant transformation, powered by technological innovation. Technology innovations have improved internet availability and connectivity, lowered costs, and expanded smartphone access, creating an extensive environment of interconnected technologies known as the Internet of Things (IoT) (Morgan, 2014). The IoT revolutionizes transportation, allowing for: vehicle-to-vehicle communications, a prerequisite for autonomous vehicles; mobility on demand services, such as ridesharing operations and transit schedules; and dynamic transportation route planning, responding to real-time traffic information (ICF, 2016).

These developments improve the accessibility of critical resources in addition to the mobility options for individuals. Residents can virtually access resources with the IoT, including health care, education, and employment (Manyika et. al., 2015). This is a significant opportunity for rural communities typically without access to these resources, such as specialized medical professionals, advanced education opportunities, or quickly growing industries. Improved connectivity also allows for safer physical transportation through dynamic traffic management and vehicle communication with emergency services (Fishman, 2012).

The rapid development of technological connectivity raises concerns for its safety and impacts. The security and privacy of devices and data collected continues to emerge as telemedicine and retail operations are conducted (Business Insider, 2020). Additionally, rural communities may not share in the expanded connectivity due to inequitable broadband access. Further research is needed to monitor the privacy, security, and equitable access with IoT-driven connectivity.

Part 2: Rural transportation system characteristics

General features of rural transportation systems

Rural transportation systems have seven primary modes available for residents: buses, passenger train service, passenger air service, personal vehicles, walking, bicycling, and boats (*Rural Health Information Hub*, 2015). Buses form the backbone of most rural public transportation systems, including both local systems, such as shuttles and circulators, and intercity operations, such as Greyhound and Megabus. Passenger train services, such as Amtrak, predominantly serve urban and suburban communities rather than rural communities.

Rural public transportation systems have historically served disadvantaged communities (*USDOT*, 2019). Elders, persons with disabilities, and low-income individuals are a few of the groups that critically use rural public transportation systems to access health care, employment, and other resources. Rural public transportation systems utilize several structures, ranging from demand-response public transportation, traditional and deviated fixed route services, vanpool, and reimbursement programs. However, public transportation systems are severely limited by funding, costs, frequency, and travel times -- a key limitation for the disadvantaged communities they serve.

Automobiles are the primary form of transportation in rural communities due to the low population density and limited public transportation. Rural public transportation systems have limited services and significant travel times, hindering their ability to reliably serve rural residents. The low-density transit service and large travel distances contribute to automobiles being a more cost-efficient mobility option for rural residents. As a result, rural residents rely upon cars to travel, with nearly 90% of passenger trips in rural areas involving automobiles. This establishes cars as a cost-effective solution for rural residents

The prevalence of cars also has unintended side effects. High concentrations of automobiles create unsafe conditions for pedestrians and cyclists, making active transportation more difficult. Additionally, transportation design prioritizing cars widens the accessibility gap between automobile users and cyclists, pedestrians, and other road users unable to use cars.

Key economic impacts of transportation

Transportation economic impacts can be classified according to categories of impact and importance (Rodrigue & Notteboom, 2020). There are three main categories of impact for transportation: 1) core, the quantity and cost of the transportation system to move individuals and goods using the related mobility option, 2) operational, the speed and reliability of the associated mobility option, and 3) geographical, the access to markets and the transportation system’s impact on land use and value.

Tourism is an important beneficiary of transportation's geographical economic impacts. Over 200 million domestic and international tourists spent $43.3 billion in Pennsylvania during 2017, creating $4.5 billion in state and local tax revenue (Tourism Economics, 2017). Tourism provides a critical source of employment and economic activity for governments.

Rural tourism relies upon transportation networks to provide access to tourist destinations, and creates jobs, tax revenue, and wages. In 2017, the highest share of Pennsylvania traveler dollars was from transportation, composing nearly a third of tourists' budget (Tourism Economics, 2017). Encouraging multimodal transportation options further improves the accessibility of tourism to underserved communities. Sixty percent of households without private car ownership identify as low-income or non-white, identifying a need to provide transit, cycling, or pedestrian infrastructure to improve their access to tourism for both economic and social opportunities (Quinton & National Journal, 2014).

Multimodal transportation planning also facilitates equitable economic development. Underserved communities, such as low-income individuals and retirees, have positive economic impacts with access to opportunities through transportation (Mjelde et. al., 2017). When reliable mobility options are provided, rural retirees have positive financial and regional economic impacts regardless of age and income (Shields et al., 2003). Additionally, rural low-income individuals have higher job access and retention with more mobility options (Fletcher et al, 2010).

Improving underserved communities' access to active transportation has direct and indirect effects. Public transit, cycling, or pedestrian infrastructure facilitates higher regional incomes, larger labor markets, and tax revenue from greater economic activity (Litman, 2020). Mobility alternatives to automobiles also lower parking costs, allowing rural communities to plan denser downtowns, main streets, and other institutions. Further, active transportation indirectly increases economic activity by reducing health care costs, improving air quality, and lowering transportation costs with cheaper, environmentally friendly mobility options and physical activity (Simmons, 2015).

Changing connectivity needs

Rural communities are also re-evaluating the connectivity of their transportation systems as they address changes in their regional industries, demographic characteristics, and safety for non-automobile mobility options (FHA, 2001). In the 20th century, rural transportation infrastructure heavily served the transportation of goods to urban areas using rail infrastructure (Lockwood, 2004). The rapid expansion of ecommerce and just-in-time delivery has led to dramatic growth of freight facilities like warehouses and distribution centers that add stresses to an already deteriorating highway infrastructure and financially restricted local governments. Often these

are in rural or semi-rural sites due to the lower land and development costs they offer, combined with their relative proximity to urban markets.

With declining populations and shifting industry needs, rural communities are now forced to modify their transportation infrastructure for different industries and scales of transportation. To compete with urban areas, transportation systems must efficiently provide access to growing industries, such as information technology and service, and modern amenities, while balancing limited funding and infrastructure investments. Technologies such as broadband connectivity will assist rural transportation systems in adapting their connectivity to modern demands.

Key users of rural transportation

Rural communities have varying levels of need for transportation systems in their areas (Litmand & Hughes-Cromwick, 2017). Public transit is a critical need for rural residents unable to use personal automobiles, contributing to significant accessibility gaps for these residents. Elder residents are a key member of this group, due to decreasing driving capabilities after 75 years of age. This is of concern as rural communities increasingly contain older and aging populations, presenting a transportation issue for these areas. Since 2006, the percentage of rural residents who are 65 years or older increased from 13 to nearly 18%.

Rural residents with disabilities and veterans are also heavily reliant upon public transit (Litmand & Hughes-Cromwick, 2017). Rural residents with disabilities travel by public transit 50% more than residents without disabilities. Rural veterans have a sizable overlap with the population of rural residents with disabilities and require public transit to access Veteran Affairs (VA) health care institutions. Some studies suggest that nearly half of rural veterans registered with the VA have at least one service-connected condition (Litmand & Hughes-Cromwick, 2017).

Rural youth are another demographic group in need of alternative transportation options to automobiles. In the U.S., young adults have increasingly lower rates of car ownership and driver’s licenses in the past three decades, resulting in challenges to access education, employment, and social opportunities (Litmand & Hughes-Cromwick, 2017). For rural youth, this increases the need for public transit and other transportation alternatives.

Lastly, immigrant or LGBTQIA+ communities or other communities of color face significant transportation needs due to discrimination and other structural barriers (Ajilore & Willingham, 2019). Due to their sociocultural identities, these groups can experience discrimination from employment or health care institutions, requiring them to travel further in order to receive needed resources. Additionally, immigrants also struggle to access education due to language barriers or restrictive enrollment policies. All of these structural barriers become more magnified when

considering the intersectionality of underserved identities and how their lower rates of private vehicle ownership hinder access to vital resources.

Part 3: Measuring the effects of rural transportation inequities

National health care trends for rural communities

Transportation plays a large role in the public health of rural residents (Hening-Smith, 2017). Transportation systems provide access to hospitals, mental health providers, clinics, and other health care facilities important for overall well-being. In addition, active transportation allows road users to engage in physical activity (American Public Health Association, 2017). Active transportation describes any non-motorized transportation option, typically pedestrian or cycling activities.

Health care access is limited in rural areas due to their low population density and large geographies. For every 100,000 residents, there are only 55.1 primary care physicians in rural areas compared to 79.3 in urban areas (Warshaw, 2017). The access gap widens for specialist care, with only thirty specialists for every 100,000 residents in rural areas compared to 263 in urban areas.

Access to health care facilities is also restricted due to transportation inequities that rural communities face. Disadvantaged rural communities such as individuals with low-incomes have lower rates of private vehicle ownership, making them reliant upon public transportation systems (Bliss, 2019). Rural public transportation systems are subject to volatile funding sources, limited service schedules, lower ridership densities, and longer travel times, reducing the accessibility of health care institutions to these communities.

Transportation services are crucial for rural veterans to access Veteran Affairs (VA) hospitals. There are three main types of medical transportation services available to rural veterans (Center, 2011). The first involves the nonprofit Disabled American Veterans (DAV) offering vans and drivers to mobile veterans in the Veteran Affairs Medical Centers (VAMC) service delivery area. The second involves county or community-based transportation service (or ambulance service) providing a med van for veterans with mobility devices. The last type involves VAMCs offering bus services to veterans requiring services from other VA facilities.

Transportation services for rural veterans face several significant constraints. Generally, there may be few transportation resources present, such as drivers, transit vehicles, or management staff. Public and private funding are needed to maintain services and can often face funding gaps from year to year depending on their availability. Additionally, transportation services have a

limited capacity to train and recruit driver volunteers. Further, the availability of local hospitals with sufficient medical services may not align with the areas served by public transportation.

Rural communities also face barriers to use active transportation due to the predominance of cars and lack of dedicated infrastructure. Active transportation is a more equitable transportation option for all resident and addresses the crisis of physical inactivity. However, the ubiquity of automobiles creates a perception of danger for pedestrians and cyclists, in addition to highways, large streets, inadequate pedestrian and cycling infrastructure, and high-speed limits.

Multimodal transportation can be encouraged through infrastructure investments such as bicycle lanes and sidewalks and connecting these developments to public transportation. Strategic land-use planning efforts, such as zoning reform and active transportation prioritization, supports the development of this infrastructure. With nearly a third of Pennsylvania's rural population not under a zoning ordinance, this is an opportunity to invest in long-term, strategic land use policies (DCED, 2015).

National broadband trends for rural communities

Broadband offers the potential to reframe and transform how we access vital goods and services, as the "information highway." Broadband consists of high-speed Internet access through advanced transmission technologies that allow it to occur much quicker than dial-up access (FCC, 2014). Broadband connection enhances transportation connectivity by rapidly analyzing data and facilitating more efficient communication between parties.

Broadband connection offers the possibility to expand accessibility drastically both physically and virtually. With broadband, individuals can use ridesharing and other mobility on demand services (ITF, 2016). Additionally, broadband allows vehicles to communicate with one another and outside services, creating the potential for autonomous vehicles and real-time traffic management. Individuals can also enjoy safer access to resources with dynamic information about traffic conditions, and quicker responses from emergency services to traffic accidents.

The ability to telecommute or telework also increases the accessibility of resources not present in areas of residence. Telemedicine allows rural communities to access specialized health care resources, especially residents with disabilities that have difficulty traveling to medical institutions (Centers for Disease Control and Prevention, 2019). Individuals can also access a larger pool of employment opportunities with teleworking, providing entrance to new and emerging industries (Design Nine, 2013). Broadband facilitates more efficient logistics and shipping, with individuals and organizations able to order, send, and receive goods directly.

Educational opportunities also significantly grow with broadband connection. Students can complete homework remotely, preventing education deficits when physical instruction is disrupted, such as during the coronavirus pandemic (Hecht, 2020). Students can also obtain training in Internet-based skills, necessary for teleworking careers and survival as society increasingly uses the Internet (Design Nine, 2013). This extends to students accessing advanced educational institutions, without incurring the significant costs of higher education.

Potential solutions to rural broadband inequity

Broadband infrastructure in rural communities can be bolstered through government strategic planning and public-private partnerships. States such as Ohio are including broadband infrastructure with highway rights-of-way (AASHTO, 2019). State governments can also make resource sharing agreements to improve their transportation management while allowing private investments to improve broadband infrastructure (USDOT, 2013). Importantly, Governor Wolf recently introduced the Pennsylvania Broadband investment program to boost broadband access in currently underserved regions of the commonwealth ("Governor Wolf Announces... , 2018).

National safety trends for rural communities

Rural communities disproportionately face traffic safety concerns compared to urban areas. Nearly half of highway fatalities occur on rural roads, despite only a fifth of Americans living in rural areas (USDOT, 2018). Also, the fatality rate per 100 million VMT for rural roads is twice the rate of urban roads. This occurs despite lower miles driven in rural areas; in 2007, urban roads had twice the number of miles driven compared to rural roads (USDOT, 2012).

The disparities in road safety for rural communities primarily stem from rural geography and traffic engineering. Rural road designs increase the likelihood of traffic fatalities through narrow lanes, higher speed limits, limited shoulders, sharp curves, steep slopes, and limited clear zones (TRIP, 2019). Additionally, the uncoordinated maintenance of rural roads leads to incompatible design features ranging from lane dimensions to clearance zones. Further, 86% of rural non-freeway arterial roads are two lane routes, with 23% of rural collector and arterial roads below the recommended eleven feet lane width.

The sprawl and low-population density of rural geography also lower traffic safety. The sparseness of geography leads to difficulty for emergency medical services to identify and reach traffic accidents (Lane County Public Works, 2017). Longer driving periods also lead to higher rates of traffic incidents due to driver fatigue, distraction, or speeding (TRIP, 2019). Low-income groups in rural communities also tend to live in areas with less pedestrian and cycling infrastructure, leading to higher fatalities for these communities when using these transportation

modes (Lane County Public Works, 2017). The lack of trauma centers in rural communities generally also increases the likelihood of fatalities in these areas.

Potential transportation interventions

Multimodal transportation and modern traffic engineering interventions can improve traffic safety in rural communities. Expansions to cycling and pedestrian infrastructure can allow these transportation users to more safely use these transportation modes. The implementation of road signage, turn lanes, barriers, and median barriers also reduce unsafe driving conditions (Council of State Governments, 2011).

Intelligent Transportation Systems (ITS) technologies are an emerging option to improve the quality and flow of transportation systems. ITS technologies can coordinate traffic signals, inform road users of relevant environmental conditions, and aid emergency medical services in reaching traffic accidents. The US DOT is assisting rural communities in piloting this technology, and larger-scale implementation will require coordination with broadband investments in rural areas.

Most importantly, significant transportation funding investments can ensure equitable implementation of these improvements in rural and urban communities. U.S. transportation infrastructure requires a $146 billion investment in roadway safety improvements (AAA Foundation for Traffic Safety, 2017), that would prevent 63,700 traffic deaths and reduce serious traffic fatalities by 350,000 during the next two decades. Additionally, 21% of rural pavements in Pennsylvania are in poor condition, placing it among the top fifteen nationally (TRIP, 2019). Large-cost road improvements such as widening lanes, reducing curve angles, and adding roundabouts, can more significantly improve the safety of rural roads.

National education transportation trends in rural communities

High transportation costs and limited mobility options restrict rural students' abilities to access a high-quality education. Rural areas tend to have lower population densities and larger geographic areas, requiring school districts to balance limited funding with complex, lengthy school routes (Rao, 2015). This results in very costly transportation costs for rural school districts. For example, in Pennsylvania only $8.26 for instructional expenditures is available with each dollar spent on transportation costs per pupil, compared to a national average of $10.81 (Rural School, 2019).

School districts also face barriers in providing school buses to transport students. Rural districts struggle to find qualified drivers with Commercial Driver's Licenses to operate school buses, preventing them from offering enough buses to transport students (National RTAP, 2020).

Additionally, because school bus operations are so limited, rural students can struggle to reach bus stops due to the distance or early schedule times (Sparks, 2019). The lack of adequate school transportation, along with limited public transportation in rural areas, contributes to chronic absenteeism, poor academic performance, and other educational indicators. This is especially of concern for the near quarter of rural students who live in poverty and likely have limited access to private transportation.

Potential solutions to rural education transportation inequity

The provision of more effective school bus routes addresses the transportation inequities affecting educational outcomes. A U.C. Santa Barbara study found that rural students riding the school bus attended school more frequently with lower likelihood of chronic absenteeism (U.C.S.B., 2019). Additionally, school districts can partner with PennDOT and community organizations to train residents to obtain CDLs needed to operate school buses.

National trends in rural planning

Many of the transportation inequities in rural communities stem from a lack of long-term plans or smart growth plans to encourage alternative transportation modes and efficient land use (*Transportation for America*). Highways, changing populations, green spaces, and historical character are several of the key features rural communities have to plan around. One way to manage these different concerns and improve rural access to resources is through long-term planning. Master plans can consider the interplay between these different factors and prioritize more equitable policies such as active transportation, denser housing, and main street developments. These developments allow rural communities improved access to opportunities, especially for underserved communities reliant upon public transit.

Effective community engagement strategies can also assist in rural planning efforts. Stakeholder analysis should focus on identifying underserved users affected by the project, such as residents with lower-incomes, disabilities, or other demographic identities (Zeilinger, 2016). Throughout the project, community meetings can be held explaining the project and soliciting input and feedback. These activities include roundtables, forums, sample budgets, and other interactive tools that actively involve participants (Center for Rural Pennsylvania, 2008). Community planners should address potential barriers that prevent participation by these groups, such as transportation, childcare, or employment.

National trends in rural public transportation

Public transportation is a lifeline for rural communities' most vulnerable residents. Low-income residents, communities of color, immigrants, or individuals with disabilities, have lower rates of

private transportation available and rely upon public transportation to access critical resources. Public transportation improves public health by increasing access to healthy food and medical institutions (Public Health Law Center, 2019), and it improves the social inclusion of underserved communities to their rural areas.

Rural communities face significant challenges to funding public transportation, however. The high transportation costs due to low-density areas in need of service are an issue because of the smaller taxpayer base in rural communities (Rural Health Information Hub, 2018). Further, the HTF unpredictability due to declining gas tax revenue impacts federal, state, county, or municipal funding for public transportation (Kirk & Mallett, 2019). This impairs the ability for public transportation agencies to continuously operate (Brown & Stommes, 2004).

Improvements to public transportation with greater coordination and flexible service can address some of these challenges rural public transportation faces. Broadband connections can allow rural public transportation to respond to rural residents' transportation needs on demand, and dynamically operate with fewer static routes (Shoup & Homa, 2010). Transportation networks can be planned with multimodal connections using first- or last-mile connections bridging gaps in transit service (APTA, 2020). Ridesharing partnerships between public transportation agencies and private organizations, such as vanpooling or carpooling, also provide more flexible and smaller-scale services that are feasible for rural governments (USDOT, 2015).

Analysis: Assessing rural equity as a systemic concern in Pennsylvania

Pennsylvania's rural counties have always offered distinct advantages to their residents and to the state as a whole. The commonwealth is all the more environmentally, culturally, and economically rich because of iconic small towns like Jim Thorpe or Punxsutawney and treasured natural resources like Cook Forest or the Poconos. However, the literature review established that inequities exist for rural communities on the national scale. With this analysis, we considered these inequities in Pennsylvania, and we quantified socioeconomic and transportation gaps that have recently grown between Pennsylvania's rural and urban counties.

First, we will quantify the rural/urban divide in PA across a host of socioeconomic metrics. Then, we point out where PA's transportation services could enhance rural residents' mobility, accessibility, and connectivity.

PA's socioeconomic rural/urban divide exists and continues to grow

Rural communities deserve transportation services tailored to the specific needs of rural living. In the literature review, we emphasized that rural counties differ on economic, social, and health metrics on a national level. We will quantify systematic differences across Pennsylvania's counties by examining income, employment, housing, broadband, population demographics, healthcare, and mortality.

Methodologically, we gathered data from the decennial Census, the American Community Survey, the U.S. Bureau of Economic Analysis, the Penn State Data Center, the Pennsylvania Department of Transportation, and the Appalachian Regional Commission. We obtained the raw county-level data and categorized the counties based on the Center for Rural Pennsylvania's classifications of rural and urban. Then, we compared the rural and urban counties across measures of economics, demographics, and health.

Income growth lags for Pennsylvania's rural regions. Chart 1 depicts a longitudinal analysis of the average change in residents' per capita income by county. In the 1970s, urban residents gained about $1,000 more income than rural residents. By the 2010s, that growth disparity nearly doubled. Note also in figure 1 that the 2000s was the only recent decade when income growth was comparable, which is likely due to the Great Recession. Median household income also reflects this trend, as seen below in Table 1. Over the 2010s, the median disparity in household income between urban and rural counties has grown from $10,500 to $11,033. The data was supplied by the U.S. Bureau of Economic Analysis.

Families in PA rural counties had $10,000 less income and $500 less income growth this decade.

	2010	2018
Rural Counties	41,220	51,245
Urban Counties	51,740	62,278

Table 3: PA Median Household Income
Data source: U.S. Bureau of Economic Analysis

PA's rural/urban disparity in income growth has grown by over $1,000 since the 1970s.

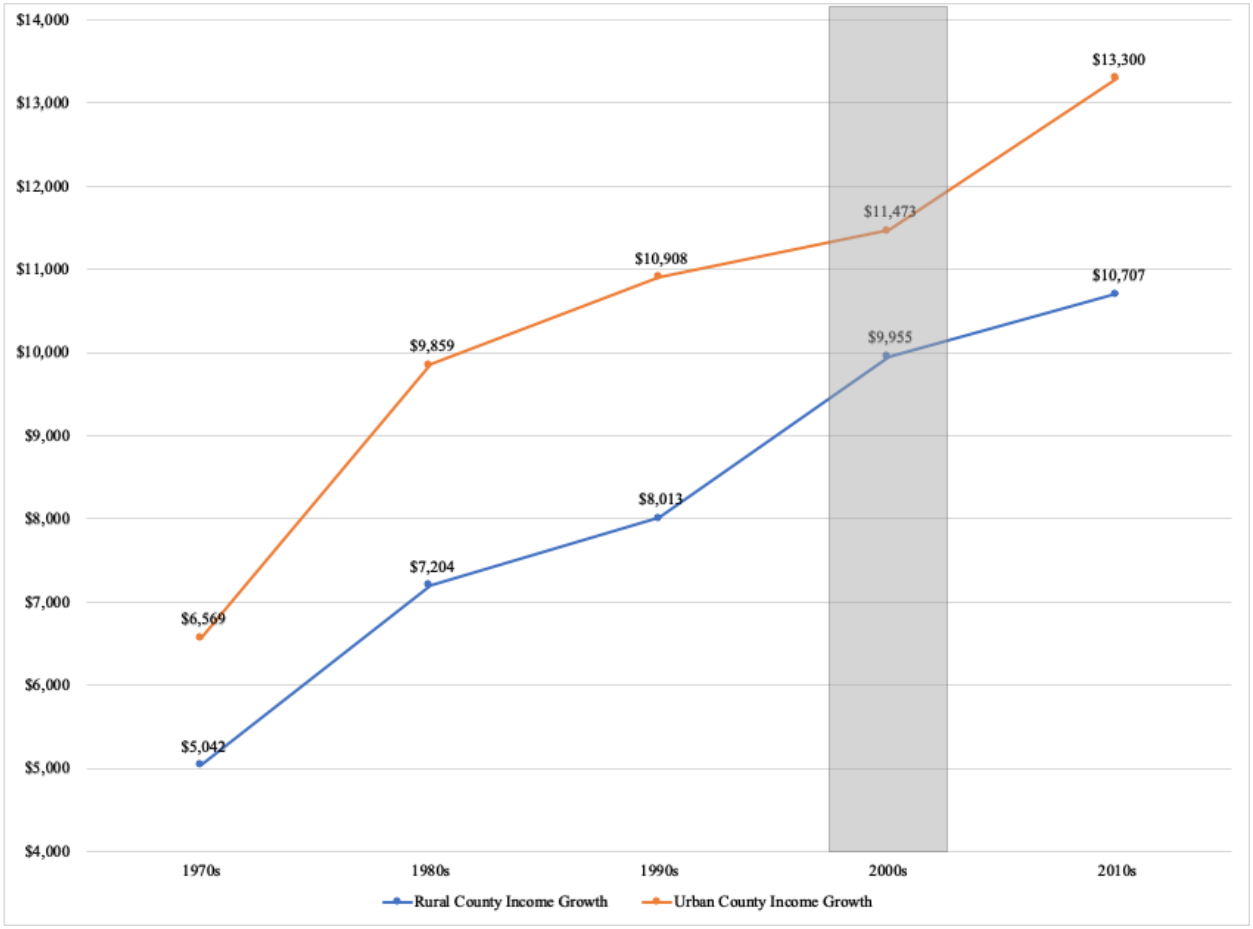


Chart 1: Average Change in PA Per Capita Income
Data source: The U.S. Bureau of Economic Analysis

Rural equity is a concern for unemployment and poverty rates. The median unemployment rate for PA's rural counties was 4.77% in 2018, compared to 4.61% among the urban counties. Likewise, median labor force participation among rural counties in 2018 was 58.75%, compared to 64.70% in the urban counties. Rural counties in PA present a higher poverty rate. The statewide poverty rate in 2017 was 13.3%, and the mean of the rural counties' poverty rates was

14.0%, while the mean of the urban counties' poverty rates was 10.5%. The poverty rate data was supplied by the Appalachian Regional Committee and the U.S. Census.

Housing metrics also reflect rural inequity. Chart 2 demonstrates that housing vacancy rates in rural counties more than doubled those of urban counties. Likewise, if we accept that owning one's home is a signal of economic stability, then rural and urban counties would have similar rates of home ownership if their populations were equally economically stable. However, in PA's rural counties, 2.83 residents rent their home for every 1 homeowner. For urban counties 2.12 residents rent their home for every 1 homeowner. The housing data was supplied by the Penn State Data Center.

PA's rural housing units are emptying.

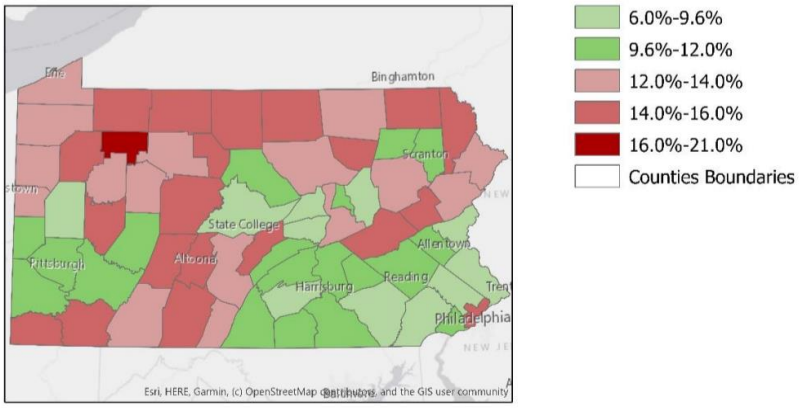
	Mean Vacant Housing Units	**Median Vacant Housing Units**
Rural Counties	15.4%	18.8%
Urban Counties	6.4%	7.2%

Table 4: PA Rates of Housing Vacancy
Data source: 2010 Census

Demographic differences between PA's rural and urban areas

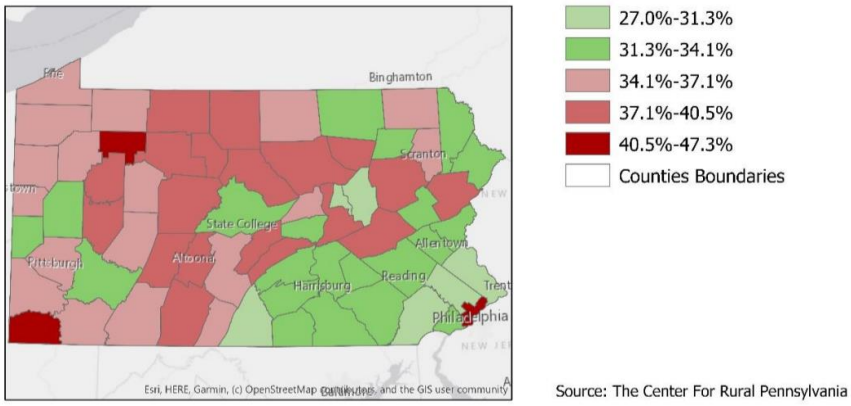
Among the rural counties, there is a median of 17.77% of residents over age 65, while the median among PA's urban counties is 14.97%. Rural counties also have higher rates of residents with disabilities. Maps 1 and 2 below show that PA's rural counties tend to have the highest rates of disabled residents over and under 64. Additionally, rural county residents are more likely to be veterans. Among the rural counties, a median 4.95% of the populations are veterans between the ages of 18 and 65, while that figure is 4.10% among the urban counties. Recall from the literature review, that these residents tend to rely more on public transportation, as elderly residents rely on public transportation because of decreased driving abilities after age 75, residents with disabilities are 50% more likely to rely on public transportation services, veteran populations often overlap with residents with disabilities and rely on transit to reach Veteran Affairs health care institution. The demographic data was supplied by the Penn State Data Center.

Rural counties tend to have higher rates of residents with disabilities, who often rely on public transit.



Map 1: Percent of Residents with Disabilities age 18 to 64
Data Source: The Center for Rural Pennsylvania

Rural counties have older populaces with different transportation needs.

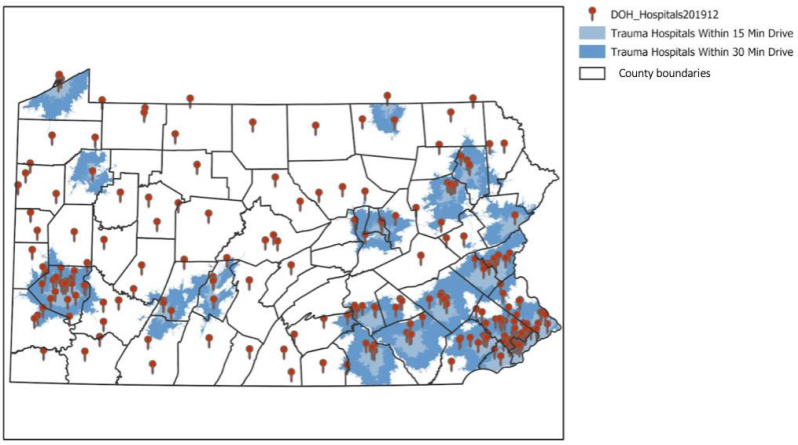


Map 2: Percent of Residents with Disabilities age 64+
Data Source: The Center for Rural Pennsylvania

Health differences for PA's rural counties

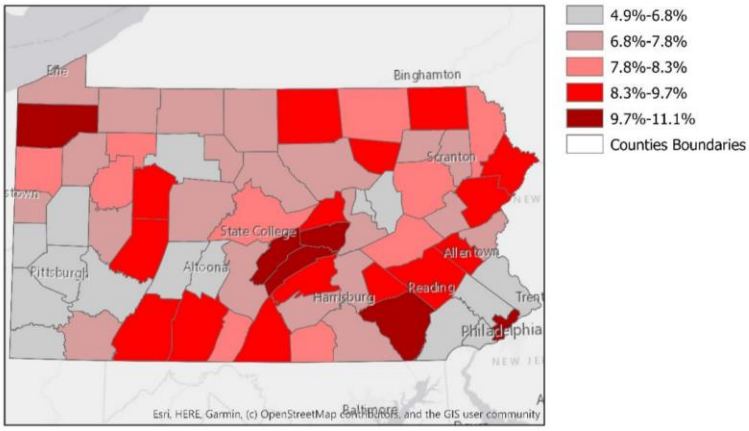
We also see differences between rural and urban counties on health measurements. Maps 3, 4, and 5 below illustrate these points. Per map 3, note that the counties with mortality rates over 11.7% in 2016 are nearly exclusively rural. Likewise, rural counties often had greater than 6.8% of uninsured residents in 2016, and hospitals are much sparser for rural residents.

Hospitals and trauma centers are much farther from many rural residents.



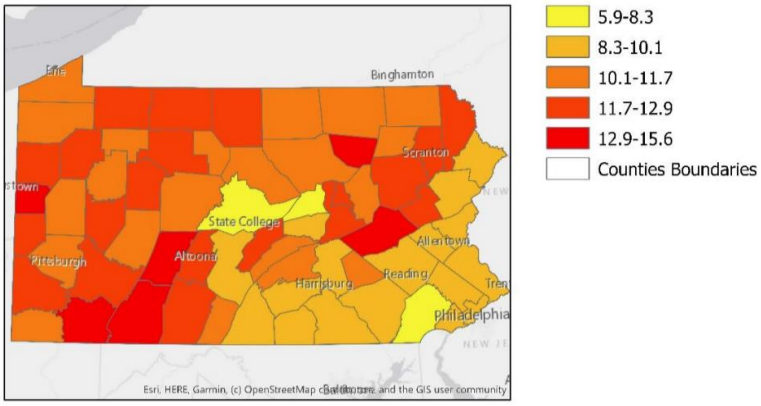
Map 3: Hospital locations throughout PA with boundaries around trauma hospitals
Data source: PA Department of Health

Rural PA residents are insured at lower rates.



Map 4: 2015 Percentage of Population Without Insurance
Data source: The Center for Rural Pennsylvania

Mortality rates are often higher in rural counties.



Map 5: 2016 Mortality per 100,000 Residents
Data Source: The Center for Rural Pennsylvania

This analysis focuses on the metrics where rural counties could strengthen, just as there are metrics where urban and suburban communities could strengthen. These systemic differences may interact with transportation services -- changes to transportation services may help to narrow these socioeconomic gaps between rural and urban residents. We will consider how the transportation experience differs for PA residents in terms of safety, broadband, and transportation services.

Safety in PA's rural counties

We established the general trends of rural counties' road safety in the literature review, and this trend applies in Pennsylvania. The number of crashes per thousand residents between PA's rural and urban counties are quite comparable, but those crashes in rural counties are more deadly. In 2014, urban counties had a median of 8 deaths per thousand crashes, while in rural counties there were 16 deaths per thousand crashes. Likewise, in 2018, urban counties had 9 deaths per thousand crashes while rural counties had 14 (PennDOT "Crash Facts," 2018). We established that PA's rural counties have relative disadvantages in terms of health and access to medical care, which may contribute to the higher fatality rates.

Broadband Access in PA's rural counties

Broadband access is a form of transportation, and inadequate broadband services reinforce existing rural inequities. Broadband enables mobility services, such as access to shared ride services, accessing information for services, or coordinating deliveries. Access to the information highway is important for economic opportunities, including the ability to work from home or applications and interviews for jobs. As the demands of the virtual world expand, so too expand the needs for robust broadband access.

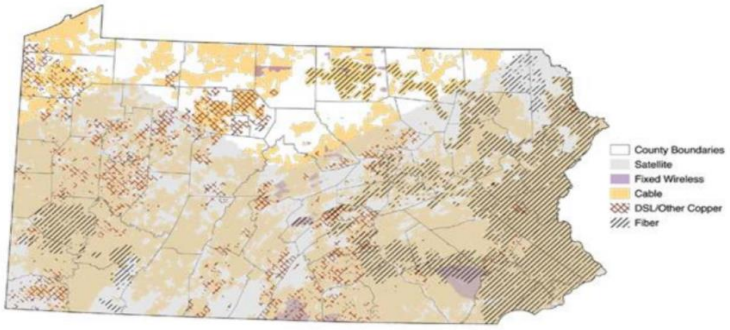
As noted in the literature review, rural communities have a much more limited access to broadband infrastructure than urban communities (The Center, 2019). Connectivity speeds are lower in PA's rural counties compared to urban counties, with median broadband speeds in PA failing to meet the FCC standard of 25 mbps for broadband connection. Additionally, the gap between ISP's self-reported broadband availability in FCC broadband maps and the speed test has widened since 2014. Lower quality broadband infrastructure prevents rural communities from benefiting from the improved flow and access to goods, communities, employment, health care, and other critical resources.

Consider the maps below. Pennsylvania's rural regions fall behind the rural areas in terms of types of internet service availability, download speed, and technology type availability. View Map 9; large stretches of Pennsylvania's rural regions do not have DSL or fiber optic coverage. Northern regions have limited access to these plus satellite coverage. Maps 7 and 8 emphasize a similar disparity for download speed and internet coverage. Residents in these regions may not have access to similar job opportunities as residents with better coverage. Likewise, residents in these regions may have a more difficult time accessing online information for transit services. More recommendations on how broadband should be studied to improve access and mobility is detailed in the suggestions for further research.

For the most part, only Pittsburgh and Philadelphia's metropolitan statistical areas have download speeds higher than 10 Mbps.

Map 7: 2015 Download Speeds by County
Source: FCC Form 477

Many rural counties are not covered by top-tier broadband technology types like DSL or fiber.



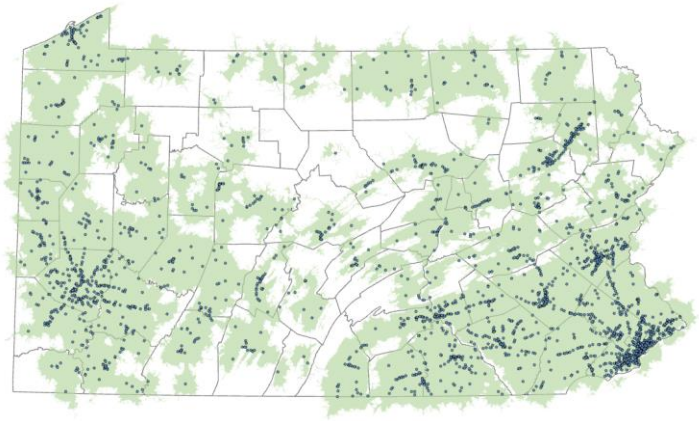
Map 9: 2016 Broadband by Type of Technology
Source: FCC Form 477

Transportation services in PA's rural counties

Transportation options in Pennsylvania are robust, but there are opportunities to boost that accessibility for rural residents. Every Pennsylvania county has a public transit system, 66 of the counties have rural transportation systems for disabled residents, and public transportation is free to senior citizens throughout the commonwealth (PennDOT "Public Transit Options," 2020). However, the implementation of these programs have left gaps in meeting rural areas' needs (Jeffrey, 2004).

By nature of the relative population densities, rural residents have more limited access to certain transportation services. Map 10 illustrates the sparseness of Driver License Centers within rural counties. Note in Map 10 that many rural residents must drive more than 30 minutes to access a Driver License Center.

PennDOT's Driver License Centers are often more than a 15-minute drive from rural residents



Map 10: 2017 Driver License Centers / Driver Vehicle Service Centers
Data source: PennDOT

Summary: A systemic problem requires a systemic solution

The analysis establishes systemic differences between rural and urban counties. This points to a fundamental need for a systemic strategy that studies how rural equity relates to transportation services. Pennsylvania's rural counties are advantageous in their aesthetic, economic, and cultural resources, and they also face challenges regarding certain socioeconomic metrics and transportation services.

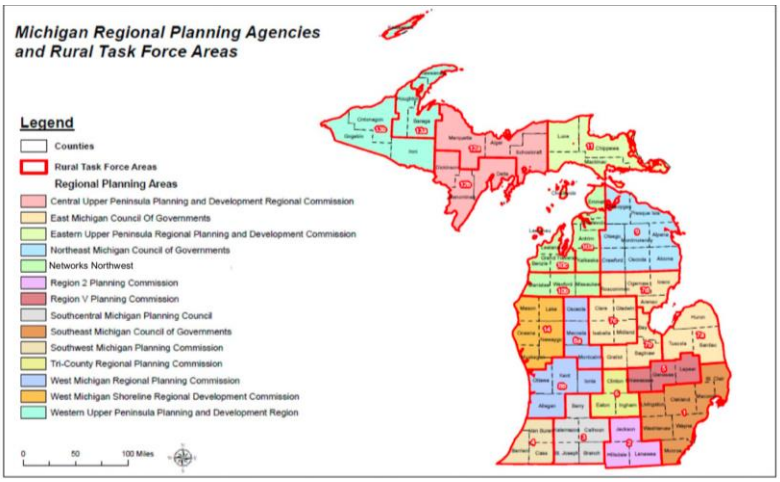
Certain socioeconomic gaps exist by nature of population densities, but we have demonstrated that many of these gaps have grown in recent years. We can view transportation services as opportunities to narrow these gaps. Specific, stakeholder input would be helpful to understand how transportation, health, economics, and demographics in rural areas interact.

Given that the differences exist between PA's counties, it is helpful to look to other states that have implemented programs to address rural transportation equity. We turn to a case study of Michigan's Rural Task Force Program.

Case Study: Michigan's Rural Task Force Program offers a project-based approach

Michigan is an appropriate policy peer state to Pennsylvania with large cities, post-industrial towns, and large rural populations. Given this, we examined the structure of its rural transportation initiative as a case study. Based on state legislation passed in 1987, Michigan created a decentralized Rural Task Force program meant to solicit projects for rural transportation equity county-by-county (MDOT "Projects and Programs," 2020). The Rural Task Force Program is not a policy-based initiative, it rather seeks to identify specific needs for programs at the local level.

Michigan's Rural Task Force program offers a decentralized, program-based model for rural transportation efforts.



Map 11: Michigan Rural Task Force Areas
Source: 2019 RTF Guidelines

The Rural Task Force Program's mission, responsibilities, and oversight

Michigan's Rural Task Force Program (RTF) administers and funds rural transportation projects in counties with a population of 400,000 or less (MDOT "Event Materials," 2020). The program operates in 78 out of 83 counties. Today, there are 22 individual task forces within the RTF that cover the entire geographic area of Michigan (MDOT "Event Materials," 2020).

RTF is charged with assisting MDOT in implementing the federally mandated 3-C multimodal transportation planning process in rural areas of the state. Each of the 22 task forces conduct rural consultations with locally-elected or appointed officials, county engineers, transit providers, and other stakeholders in developing and implementing the aforementioned planning process (MDOT "Projects and Programs," 2020).

On August 1st of each year, MDOT assesses the status of the entire Rural Task Force Program with an evaluative report (MDOT "Projects and Program," 2020).

RTF funding and implementation

The two primary funding sources for RTF are: 1) the Federal Surface Transportation Block Grant Program (STP), and 2) the State Transportation Economic Development Fund-Category D Program (State D) (MDOT "Michigan Rural Task Force 1st Annual Conference," 2020).

To discuss these sources in turn, the STP funds are for federally-aided highways and transit capital projects. These provide 80% federal funds with a 20% local match. The STP Program funds projects that preserve and improve the conditions of federal-aid highway and transit capital projects, including terminals and facilities. RTF tracks the funds, and it anticipates that MDOT will provide approximately $48 million in STP allocation annually to the Rural Task through 2023 (MDOT "Michigan Rural Task Force 1st Annual Conference," 2020).

The State D Program serves economic development by establishing and integrating a local secondary all-season road system with the state trunkline system. The relevant counties track these funds.

Michigan's Comprehensive Transportation Fund is a major funding source for the RTF.

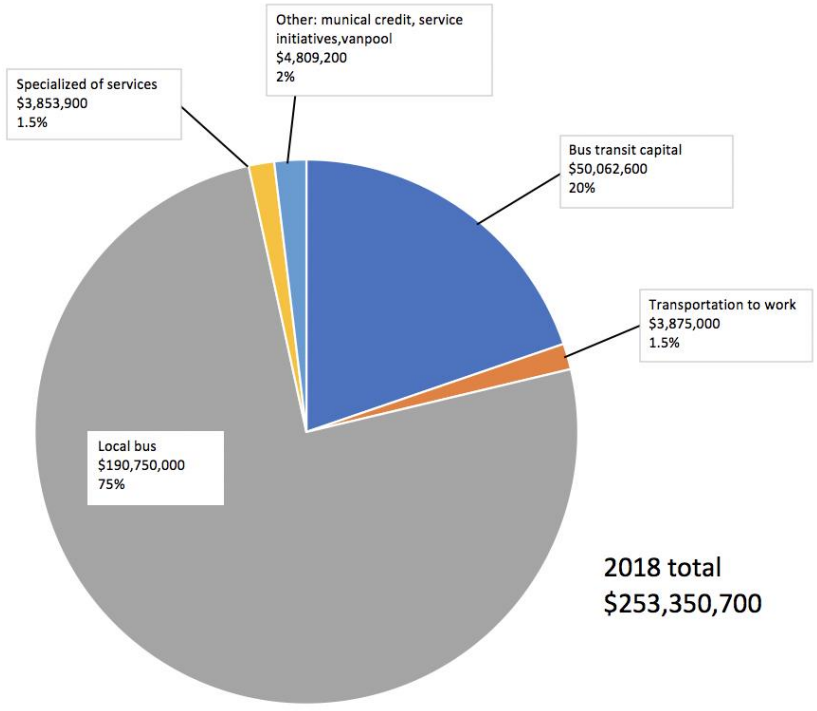


Chart 4. 2018 Comprehensive Transportation Fund (CTF) allocation by sectors
Source: 2018 Rural Task Force Workshop

RTF membership guidelines

Each rural task force must contain at least: 1) a representative of each county's road commission within its region, 2) an equal number of representatives from incorporated cities and villages with a population of 5,000 or less with the represented region, and 3) a representative from each rural transit provider (MDOT "Michigan Rural Task Force 1st Annual Conference," 2020).

Figure 3 outlines RTF's organization and processes relative to MDOT. These five bodies in the program orchestrate funding, implementation, and project review. Notably, none of the structures do proactive research or recommend policy for rural equity. While there is an Advisory Board, this serves for funding allocation and management. The program's structure only allows for local project selection and funding.

Michigan's RTF focuses on local program funding. It does not work on research or policy recommendations.

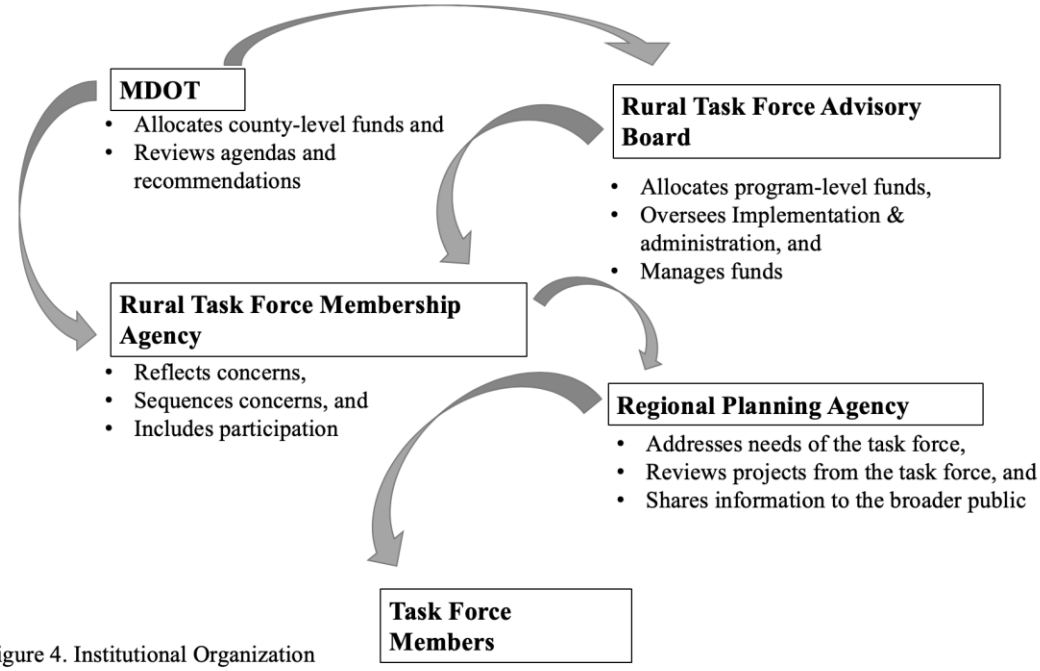


Figure 4. Institutional Organization

Data Source: MDOT

RTF's program selection

Projects in rural counties must be evaluated and selected by the Rural Task Force and based on either established project selection criteria developed through the Task Force or on the needs of the region. Each Rural Task Force selects projects cooperatively with all cities and villages under 5,000 population, county road commissions, rural transit providers, and MDOT (for State D funded projects), in accordance with funding targets established by MDOT. Projects will also be

reviewed for eligibility and consistency with the criteria established for the state's Transportation Economic Development Fund Program and the Federal Surface Transportation Program. Figure 5 outlines the project selection process (Wresinski, 2018).

Local task forces select projects in the RTF.

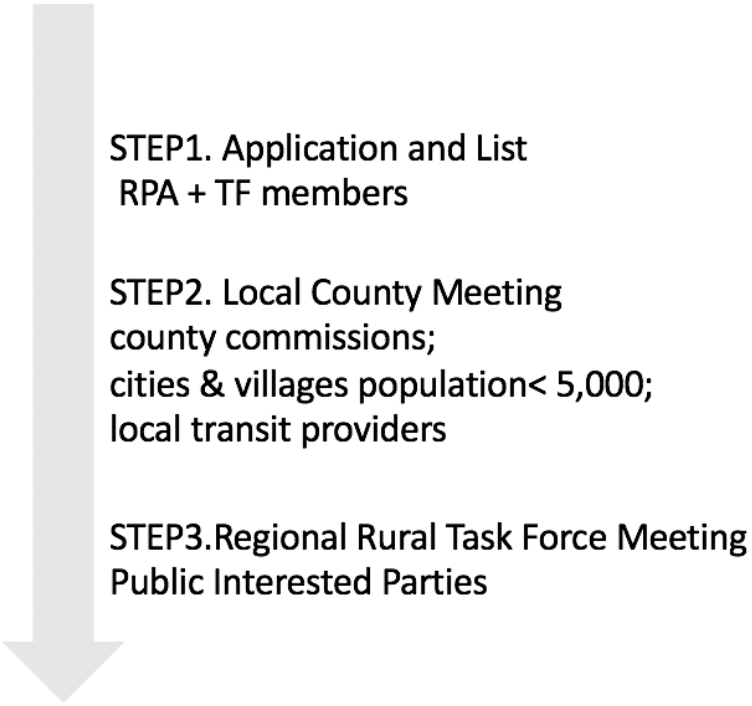


Chart 5: Project selection process
Source: July RTF Guidelines

The Rural Task Force's annual timeline begins with a call for projects from the local RTF members. The RTF members then send their plans to the Regional Planning Administration, which then decides whether to forward the plans to MDOT in February. MDOT then decides whether to approve the program and submits for its approval from the USDOT.

Michigan's Rural Task Force Program is project-based and decentralized. It is helpful to understand that Michigan has succeeded in implementing a collection of local task forces to pinpoint specific projects, but it is not a policy-based or centralized solution. Michigan's RTF is a good example of how a peer-state to Pennsylvania worked to address rural needs. However, PennDOT already has an extensive planning system with ample opportunity for new rural policy programs. For PA a centralized, policy stakeholder group is recommended for below.

We have not been able to identify RTF's most successful projects to date, which would be helpful for future research

Recommendation: A Rural Transportation Council

Based on a review of the literature on national trends for rural counties and a county-level analysis in Pennsylvania, we have shown systemic socioeconomic differences between rural and urban counties that require specialized attention when making transportation policies. In order to use transportation services to enhance these communities' mobility and access, there is a need for informed stakeholders to recommend research-based policies for rural transportation equity. Due to their financial constraints, PennDOT's existing channels for program planning and public input could use support to conduct the research and make the recommendations on the subject of rural equity. While Michigan offers a project-based, decentralized Rural Task Force Program, this would not approach the problem systemically. Therefore, we recommend a Rural Transportation Council made of stakeholders with specialized insights from relevant departments, agencies, and universities.

A Rural Transportation Council could provide a centralized voice for rural transportation policy recommendations. We recommend that PennDOT develop a comprehensive and inclusive list of public, private, civic interests for the council's membership. Some examples of those stakeholders include representatives from the Center for Rural Pennsylvania, the Department of Conservation and Natural Resources, the Department of Health, the Department of Human Services, and the Department of Community and Economic Development. It should also include stakeholders representing farming, tourism, local elected officials, academia, education and healthcare, workforce development, economic and community development, seniors, and people with disabilities.

A centralized council would address the fundamental need we identified in this paper: an advisory board that works proactively to strengthen rural equity. That board would supplement PennDOT's federally mandated, robust, but fiscally-constrained planning mechanisms. There exist ample opportunities for stakeholders to propose transportation programs through PennDOT's public input channels. The Twelve-Year Program (TWP), the Statewide Transportation Improvement Program (STIP), and regional Transportation Improvement Programs (TIPs) all offer online meetings, surveys, and other forums through which rural community advocates could call attention to these issues (PennDOT "District 12," 2019).

PennDOT has already made great progress in the field of rural equity, such as offering free public transit to all residents age 65 and older. County transit services have assisted in the specific needs of rural residents, including Indiana's IndiGO, which partners with the Disabled American Veteran and the Carbon County Community Transit System, which partners with the Area's Agency on Aging (Jeffrey, 2004). A Rural Transportation Council, however, could engage in research, make policy recommendations, and conduct outreach to other states. More

broadly, the current channels for public input are not intended to address the specific concerns of rural transportation, while a Rural Transportation Council could serve this purpose.

This recommended council would be similar in structure to existing PennDOT Task Forces including Pennsylvania's Autonomous Vehicle Task Force, the Pedalcycle and Pedestrian Advisory Board, and the State Transportation Innovation Council. Consider the AV task force specifically. From PennDOT's website, the AV Task Force "is made up of a diverse and comprehensive set of stakeholders, including representatives from federal, state and local government, law enforcement, technology companies, higher education, manufacturers, motorists and trucking groups, and academic research institutions." (PennDOT "AV Task Force," 2020) A robust set of stakeholders should make up the Rural Transportation Council. The AV Task Force's mission is "to explore, discuss and recommend policies for the safe testing of HAVs on the Commonwealth's public roadways." (PennDOT "Automated Vehicle Program Summary," 2017). Similarly, the Rural Transportation Council should explore, discuss, and recommend policies for the socioeconomic equity of rural counties. In each case, stakeholders are ready to address the specific, policy concerns on these topics.

Further Research: Investigate the relationships between rural socioeconomic trends and transportation services, the impact of broadband access on mobility, and public opinion

To establish the council, stakeholder interviews should be conducted with potential council members. The interviews should inform the council's exact functions, membership structure, and research and policy prioritizations.

The council would have no shortage of research topics. The following is a non-exhaustive list of examples, expanded upon by the prose below. The council should continue the work of this paper by:

- Broadly, characterizing specific relationships between rural transit services and the socioeconomic gaps between rural and urban areas identified in this paper,
- Investigating how broadband access relates to job growth, income levels, and employment,
- Studying how policy could support innovative ride sharing services,
- Surveying rural residents' relative demand for transit options,
- Preparing thorough, comparable case studies on county-level transit services, and
- Promoting better data collection to track demographic tendencies in rural transit use.

We will expand on each of these points. Our paper places the socioeconomic gaps between rural and urban counties in conversation with transportation services, and those relationships cannot be quantified by a single metric. This systemic nature of the problem is a key motivation for the Rural Transportation Council. The council could investigate potential correlations including: migration in and out of rural counties versus access to broadband, ride-share service use versus internet speed and availability, commuting time versus job interviews attended, or crash lethality as it relates to overall mortality.

The council should investigate how broadband access impedes economic factors like job growth, income levels, and unemployment. Likewise, it should investigate how broadband access limits rural residents' use of transportation options, including shared ride services and deliveries. Prof. Sean Qian with Carnegie Mellon University is currently pursuing a project titled with Waynesburg University, Greene County, and 412 Food Rescue called "Holistic and Energy-efficient Rural County Mobility Platform RAMP," with a $1 million grant from the Department of Energy (FOA, 2019). Therein, Prof. Qian studies how opportunities for dispatching, ride sharing, and dynamic rerouting intersect with rural mobility and access in Greene County. A Rural Transportation Council could call for this sort of research looking forward to the ways in which new technologies and wider broadband access will improve rural mobility.

The council should also investigate how policies can assist innovative ride-sharing services like Pittsburgh's start-up RubyRide in reaching rural residents living without a car (Hacke, 2019). The program offers rides on a membership basis through a pilot program in Pittsburgh's South Hills. Are there ways in which rural equity efforts could spatially expand these ride-sharing efforts so that they can sustainably reach residents in sparsely populated areas?

There is not sufficient research on PA rural residents' demand for public transit. We know that demand has grown in recent decades, but more research done on specific interests in transportation services (Jeffrey, 2004). Public attitude surveys would be helpful to identify which transit services are most demanded county-by-county. Likewise, it would be helpful to know why residents choose to use or not use specific transit services: in cases where demand decreases, is this because residents no longer needed the service, or was it an issue with the quality of service?

Finally, thorough case studies on each county's transit services would be helpful to assess how needs of rural communities are being met. Several rural transit services have integrated with other agencies to maximize availability, like Indiana and Carbon's aforementioned partnerships. The council could supplement the Center for Rural Pennsylvania's efforts on this topic by investigating how integration efforts can work in other counties (Jeffrey, 2004).

Simply put, rural and urban counties have different needs. If we seek to improve mobility and economic prospects for residents without cars in rural areas, then we should examine how innovative ride-sharing services can work in populationally sparse regions. If residents without cars in rural areas want to use innovative ride-sharing services, then we should examine how broadband coverage affects their access to information on those services. If we want to promote a better work-life balance for rural residents, then we should ask how to boost internet connections that support working from home, so that rural parents can make Monday dinners for 12. These specialized needs require a centralized, proactive body of stakeholder interest. Therefore, PennDOT should implement a Rural Transportation Council.

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Appendix

PA county rural/urban designations by the Center for Rural Pennsylvania

County	Urban/Rural
Adams, PA	Rural
Allegheny, PA	Urban
Armstrong, PA	Rural
Beaver, PA	Urban
Bedford, PA	Rural
Berks, PA	Urban
Blair, PA	Rural
Bradford, PA	Rural
Bucks, PA	Urban
Butler, PA	Rural
Cambria, PA	Rural
Cameron, PA	Rural
Carbon, PA	Rural
Centre, PA	Rural
Chester, PA	Urban
Clarion, PA	Rural
Clearfield, PA	Rural
Clinton, PA	Rural
Columbia, PA	Rural
Crawford, PA	Rural
Cumberland, PA	Urban
Dauphin, PA	Urban

Delaware, PA	Urban
Elk, PA	Rural
Erie, PA	Urban
Fayette, PA	Rural
Forest, PA	Rural
Franklin, PA	Rural
Fulton, PA	Rural
Greene, PA	Rural
Huntingdon, PA	Rural
Indiana, PA	Rural
Jefferson, PA	Rural
Juniata, PA	Rural
Lackawanna, PA	Urban
Lancaster, PA	Urban
Lawrence, PA	Rural
Lebanon, PA	Urban
Lehigh, PA	Urban
Luzerne, PA	Urban
Lycoming, PA	Rural
McKean, PA	Rural
Mercer, PA	Rural
Mifflin, PA	Rural
Monroe, PA	Rural
Montgomery, PA	Urban
Montour, PA	Rural
Northampton, PA	Urban

Northumberland, PA	Rural
Perry, PA	Rural
Philadelphia, PA	Urban
Pike, PA	Rural
Potter, PA	Rural
Schuylkill, PA	Rural
Snyder, PA	Rural
Somerset, PA	Rural
Sullivan, PA	Rural
Susquehanna, PA	Rural
Tioga, PA	Rural
Union, PA	Rural
Venango, PA	Rural
Warren, PA	Rural
Washington, PA	Rural
Wayne, PA	Rural
Westmoreland, PA	Urban
Wyoming, PA	Rural
York, PA	Urban