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16. Abstract Economic research focused on enhancing the mobility of the elderly and disadvantaged individuals is insufficient. To address this insufficiency, a multidisciplinary team of researchers convened as part of the 2016 National Conference on Rural Public and Intercity Bus Transportation (RIBTC) in Asheville, North Carolina. The team's objective is to provide research recommendations that may be used to enhance, if appropriate or applicable, the provision of rural transportation options that improve quality of life for the rural elderly and other socially and transportation disadvantaged populations. Research recommendations focus on five general areas: theoretical issues, innovative solutions, rural socioeconomic considerations, economic assessment and evaluation of rural transit, and information technology solutions.			
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Economics of Transportation Research Needs for Rural Elderly and Transportation Disadvantaged Populations

*White Paper Submitted to United States Department of Agriculture (USDA)
National Institute of Food and Agriculture*

Economics of Transportation Research Needs for Rural Elderly and Transportation Disadvantaged Populations

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Executive Summary

As with all social issues, numerous disciplines examine mobility issues for the elderly and other transportation disadvantaged individuals. Lacking, however, are studies directly addressing the *economics of rural transportation* for elderly and disadvantaged individuals; economic research focused on enhancing mobility for this group is insufficient. Collaborations among economists, transportation researchers, sociologists, health care providers, service providers, and other stakeholders, while currently limited, are crucial to improving the efficiency of rural transportation services.

To address this insufficiency, a multidisciplinary team of researchers convened as part of the 2016 National Conference on Rural Public and Intercity Bus Transportation (RIBTC) in Asheville, North Carolina. The team's objective is to provide research recommendations that may be used to enhance, if appropriate or applicable, the provision of rural transportation options that improve quality of life for the rural elderly and other socially and transportation disadvantaged populations. This white paper is the outcome of this meeting and pre- and post-conference communications. At the RIBTC, the team held an open discussion with RIBTC attendees and surveyed conference participants. This white paper provides the background material, ideas, and concerns raised during the open discussion, survey results, and recommendations.



Background

A review of previous research from numerous disciplines suggests mobility increases the quality of life and livability of a region, the elderly and transportation disadvantaged have a need for improved transportation options, the demand for mobility is increasing as baby boomers age, and innovative practices are emerging in the transport sector toward promoting mobility. The private vehicle, however, still remains the most popular form of transportation throughout one's life, including during retirement, because private vehicles remain the most efficient manner to fulfill everyday mobility needs. The reason for the prolonged use of private vehicles is the benefits of use (independence, freedom, flexibility, convenience, etc.) outweigh the costs (ownership costs, safety, driving ability, lack of alternatives, etc.). Few transportation alternatives exist to meet the needs of the rural elderly and transportation disadvantaged.



Literature directly addressing the economics of rural transportation for the elderly and disadvantaged is sparse. While urban transit literature provides insights on rural transit issues, rural systems operate at different scales to meet the demands of their passengers. Few studies explore how rural transit providers can operate more efficiently. Furthermore, it appears that rural transportation issues are being analyzed by individuals that do not fully understand economic theory or methods. This is especially true of studies attempting to estimate the benefits relative to the costs of rural transit systems.

The terms *elderly*, *rural*, and *disadvantaged* have numerous definitions. Studies need to provide the definition they use.

RIBTC Open Discussion

A wide range of people involved in rural transportation attended an open discussion forum facilitating the exchange of ideas and concerns based on the RIBTC participants' experiences. Participants stated they greatly appreciated the forum and the opportunity to present their views. The consensus was that the attendees hoped Federal and State agencies would listen to their concerns.

There is no one-size-fits-all set of problems or solutions, and there is no single type of rural or transit provider.

Although RIBTC participants who were transit providers tended to face some of the same problems, individual providers face problems unique to their location, size, and objectives. Several participants felt innovations such as automated vehicles and new financing schemes in rural transit would enhance their operations, while others felt these innovations would have little impact on their organizations. Some rural elderly and transportation disadvantaged, by the nature of their mobility problems, require human assistance to use transportation alternatives. Regardless of their position on the future of transit, providers named issues across multiple dimensions such as management, funding, and day-to-day operations as the most pressing issues.

Survey Highlights

Attendees of the RIBTC were given the opportunity to provide their opinions on rural transit issues, including issues associated with the elderly and transportation disadvantaged. Researchers provided 380 questionnaires to RIBTC attendees, who returned 81 questionnaires, giving a response rate of 21 percent. The following summarizes overall opinions, but individual opinions varied greatly.

- Respondents generally felt the demand for transportation services for the elderly has increased and will continue to increase.
- Transportation services for the elderly in 20 years will be different than present services.



- Respondents generally felt the government (State, local, and national) should play a large role in providing rural transit for elderly and disadvantaged individuals but believed the political influence of the elderly will not increase in the future.
- Most respondents felt government is not adequately funding infrastructure, institutions, and services to meet the future needs of the elderly and disadvantaged.
- Respondents felt more funding should come from the public sector than the private sector to cover the next generation of rural transit elderly and disadvantaged needs.

Less than 10 percent of respondents felt elderly transport is a high political agenda item.

- Perhaps recognizing political reality, most respondents agreed rural residents bear a personal responsibility to ensure they are able to meet their transportation needs as they age.
- Respondents generally agreed that transit innovations have resulted in

mobility improvements but felt innovations for the elderly have helped the general population more than innovations for the general populations have helped the elderly. Respondents tended to be ambivalent about potential future innovations to their industry.

- The majority of respondents did not agree rural areas are employing creative land uses to improve the mobility of the elderly and transportation disadvantaged.
- Only public-private partnerships and the elderly's increasing acceptance of technology had more respondents answering "noticeable" or "major changes" than no or little change to improving transit systems.



Research Recommendations

Recommended research topics help answer the fundamental questions of whether society should provide rural transportation for the elderly and transportation disadvantaged, and if so, at what level as government budgets tighten and private substitutes emerge. These questions are not only economic issues but encompass multiple disciplines.

Research Recommendations

The research and policy recommendations fall into five highly interrelated categories:

1. **Theoretical issues**—Applied economic studies can lead to improved basic theoretical understanding while addressing the needs of rural transit.
2. **Innovative solutions**—Rural transit is faced with increasing demand and limited funds; as such, innovative solutions are being proposed. The influence adoption of these solutions will have on rural areas should be determined.
3. **Rural socioeconomic considerations**—The availability of rural transit influences the lives of those that rely on it. How individual needs translate into broader community issues including livability and sustainability of rural communities needs to be determined.
4. **Economic assessment and evaluation of rural transit**—Rural transit has been subject to economic assessment studies, but because many studies rely on incorrect methods and assumptions, correct usage of economic and social assessments is necessary.
5. **Information technology solutions**—Usage of technological advancements, including data collection, may improve the coordination and management of rural transit systems and needs to be addressed.

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Subconference Team

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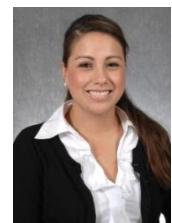
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V. Dimitra Pyrialakou

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Introduction

With the percentage of the elderly rural population growing and the younger rural population diminishing, the elderly are left to depend more on themselves, people of the same age, their community, and government services for their well-being (Gombeski and Smolensky, 1980; Grant and Rice, 1983; McGhee, 1983; Alsnih and Hensher, 2003; Kim and Ulfarsson, 2004; Rosenbloom, 2004, 2009). Availability of reliable transportation contributes to one's well-being; however, the elderly often see the lack of transportation as one of the most important issues they face (Grant and Rice, 1983; Glasgow and Blakely, 2000). Not only the rural elderly, but also rural socially disadvantaged people face lack of reliable transportation (referred to as transportation disadvantaged). The aging baby boomer generation is expected to increase the need for rural transportation help as people age in place and move to rural communities (Rosenbloom, 2004; Kusmin, 2015). While transportation is a critical need for all, the needs of transportation disadvantaged people, especially the elderly, may be somewhat specialized.

Although there is a need for transportation, many studies tend to miss the basic economic principle that all choices have benefits and costs. By choosing to live in rural areas, people are making the choice to live with benefits such as open space and less congestion. These benefits, however, are realized with costs such as decreased transportation options. There may be a need for transportation services, but at what cost to society?

As with all social issues, many disciplines are involved in issues concerning mobility for the rural elderly and other rural transportation disadvantaged people. Research on the economics of public transportation targeting these groups, however, is insufficient. Collaborations among economists, transportation researchers, sociologists, service providers, and other stakeholders, while currently limited, are crucial to improving the efficiency of rural transportation services. To this end, this white paper was developed to create and publicize materials describing opportunities for economic research on rural transportation that can be used to help obtain research funding and establish the topic as a relevant area of applied economics, along with providing the U.S. Department of Agriculture (USDA) with guidance on rural issues. Many studies outside of economics claiming to address economic issues may have two intertwined effects. First, the economic methodology and theory included are ad hoc at best; the studies may not use appropriate economic methods. Second, it appears that transportation economics are being analyzed by people in the industry who do not fully understand economic theory or methods. Beyond these effects, it is not clear why economists are generally not involved in the analysis.

To address these shortcomings, an interested team of researchers from various disciplines and stages of career development was convened as a subconference of the 2016 National Conference on Rural Public and Intercity Bus Transportation (RIBTC) held in Asheville, North Carolina, October 3-5, 2016. Recommendations, partially based on this subconference, are provided in this white paper. In developing these recommendations, subconference team members interactively developed and disseminated background material before the conference. At the RIBTC, a survey of RIBTC attendees was conducted along with an open discussion section. Team members met formally twice during the subconference. Recommendations are an outcome of all these

interactions. This white paper provides the background material, survey results, and recommendations.

Specifically, the objective of this white paper is to provide research recommendations that may be used to enhance, if appropriate or applicable, the provision of rural transportation options that improve quality of life for the rural elderly and other socially and transportation disadvantaged populations. It is hoped this white paper will motivate economic theory, techniques, and research along with helping to build relationships within and among disciplines in using economic techniques to better respond to rural transit needs.

Rural, Elderly, Disadvantaged, Mobility, and Accessibility

Although widely used, the terms *rural*, *elderly*, and *disadvantaged* have no universally accepted definitions. Miller (2010) emphasizes the need for a clear understanding of the definitions used; different definitions may lead to pronounced differences in studies' conclusions and recommendations.

Rural

The term *rural* conjures up images of farms, small towns, and open spaces (Cromartie and Bucholtz, 2008). *Rural*, however, is most often defined not in terms of these images but rather as non-urban status (U.S. Health Resources & Services Administration [HRSA], 2017; USDA, 2003a). Cromartie and Parker (2016) state:

...the existence of multiple rural definitions reflects the reality that rural and urban are multidimensional concepts. Sometimes population density is the defining concern, in other cases it is geographic isolation. Small population size typically characterizes a rural place, but how small is rural? Population thresholds used to differentiate rural and urban communities range from 2,500 up to 50,000, depending on the definition.

In the United States, definitions for rural put forth by the U.S. Census Bureau, Office of Management and Budget (OMB), and USDA are the most commonly used definitions (HRSA, 2017), although for transportation purposes, the U.S. Department of Transportation's (USDOT's) definition is also relevant. These definitions are summarized in Table 1.

U.S. Census Bureau

The Census Bureau does not explicitly define *rural*. Rather, it defines *urban*, and *rural* is whatever is not considered urban (HRSA, 2017). Two types of urban areas are defined that must meet minimum density and population requirements (U.S. Census Bureau, 2015a):

- Urbanized areas of 50,000 people or more.
- Urban clusters of at least 2,500 and less than 50,000 people.

In addition, minimum population density and land area requirements must be met (Rural Health Information Hub, 2015). Rural covers the population and territories not included in the Census Bureau urban definitions. The Census Bureau definition is based on census blocks or tracts. Using the Census Bureau definition, urbanized areas and clusters and percent population residing in urban areas are presented in Figure 1 and Figure 2 (U.S. Census Bureau, 2015b). Because the Census Bureau definitions do not follow city or county boundaries it is sometimes difficult to sometimes determine if an area is urban or rural (HRSA, 2017). Under this definition a large proportion of the U.S. land is Nonmetropolitan (95 percent in 2010), yet only about 20 percent of the population lives in these areas (HRSA, 2017).

Table 1. Summary of Various Rural Definitions by Agency.

Agency	Definition	Geographical Unit
U.S. Census Bureau	<ul style="list-style-type: none"> Urbanized areas are geographic areas of 50,000 or more people Urban clusters have at least 2,500 and less than 50,000 people <i>Rural</i> is defined as the areas not covered by the above two definitions 	Census blocks and tracts
OMB	<ul style="list-style-type: none"> Any county not in a metropolitan statistical area is considered rural A metropolitan statistical area contains a core urban area of 50,000 or more population 	County
USDA Economic Research Service	<ul style="list-style-type: none"> Four definitions of rural used for eligibility for various programs are based on: <ul style="list-style-type: none"> Rural-urban continuum codes Urban-influence codes Typology codes Natural amenities scale 	County to Subcounty
USDOT Federal Highway Administration	<ul style="list-style-type: none"> For highway functional classification, rural is an area with a population of less than 5,000 For planning purposes, rural is an area outside of metropolitan areas of 50,000 or more in population 	Subcounty to County

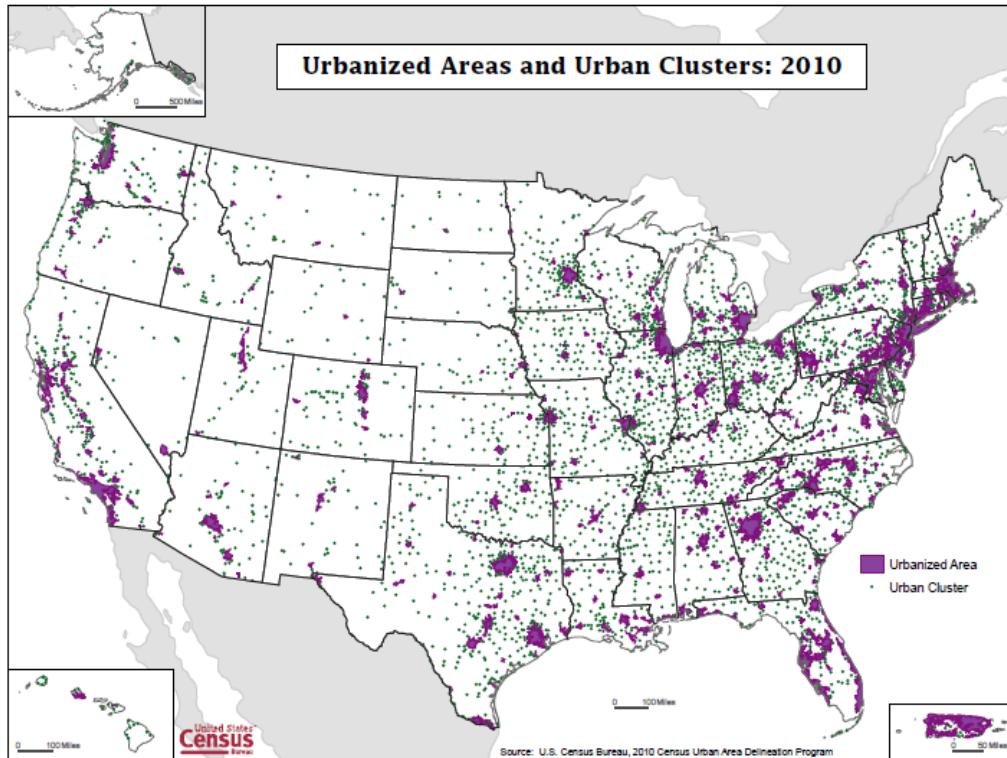


Figure 1. Urbanized Areas and Urban Clusters in 2010.

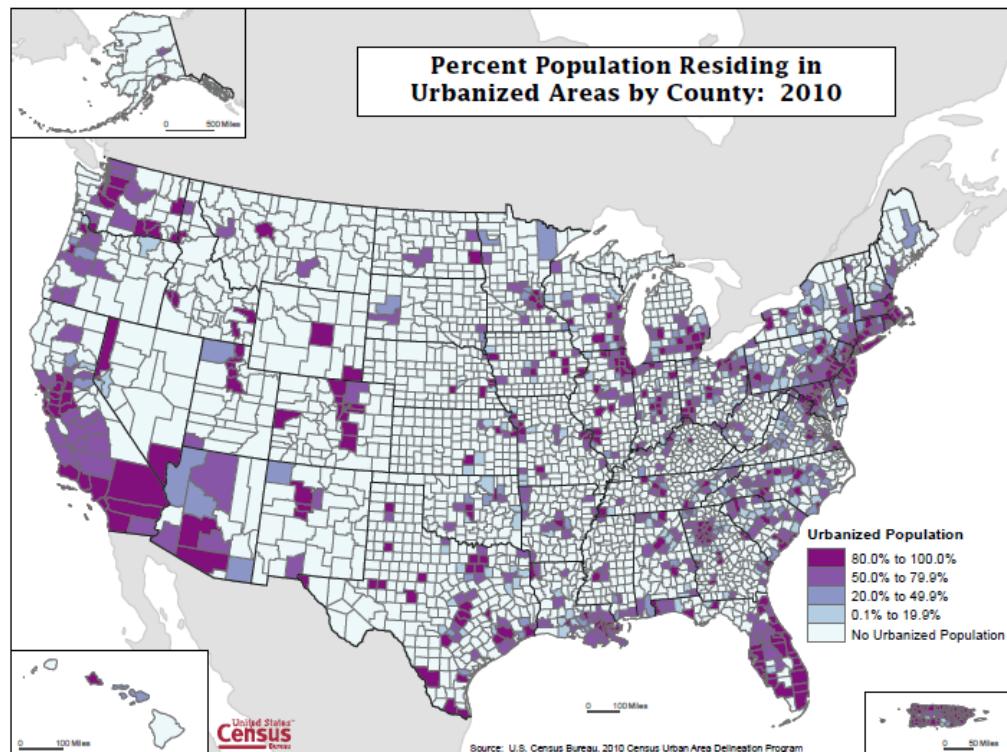


Figure 2. Percent of the Population Residing in Urbanized Areas by County in 2010.

Office of Management and Budget

Metropolitan statistical areas form the basis for OMB's definition of *rural*. The intention of OMB's statistical area classification is to provide nationally consistent definitions for collecting, tabulating, and publishing Federal statistics for a set of geographic areas (Donovan, 2015). A metropolitan statistical area contains a core urban area of 50,000 or more people (U.S. Census Bureau, 2016). The Rural Health Information Hub (2015) clarifies this definition:

...central or core counties with one or more urbanized areas, and outlying counties that are economically tied to the core counties as measured by work commuting. Outlying counties are included in a metropolitan statistical area if 25 percent of workers living in the county commute to the central counties, or if 25 percent of the employment in the county consists of workers coming out from the central counties - the so-called "reverse" commuting pattern.

These regions generally have metropolitan planning organizations that receive and distribute transportation funds from the Federal Government.

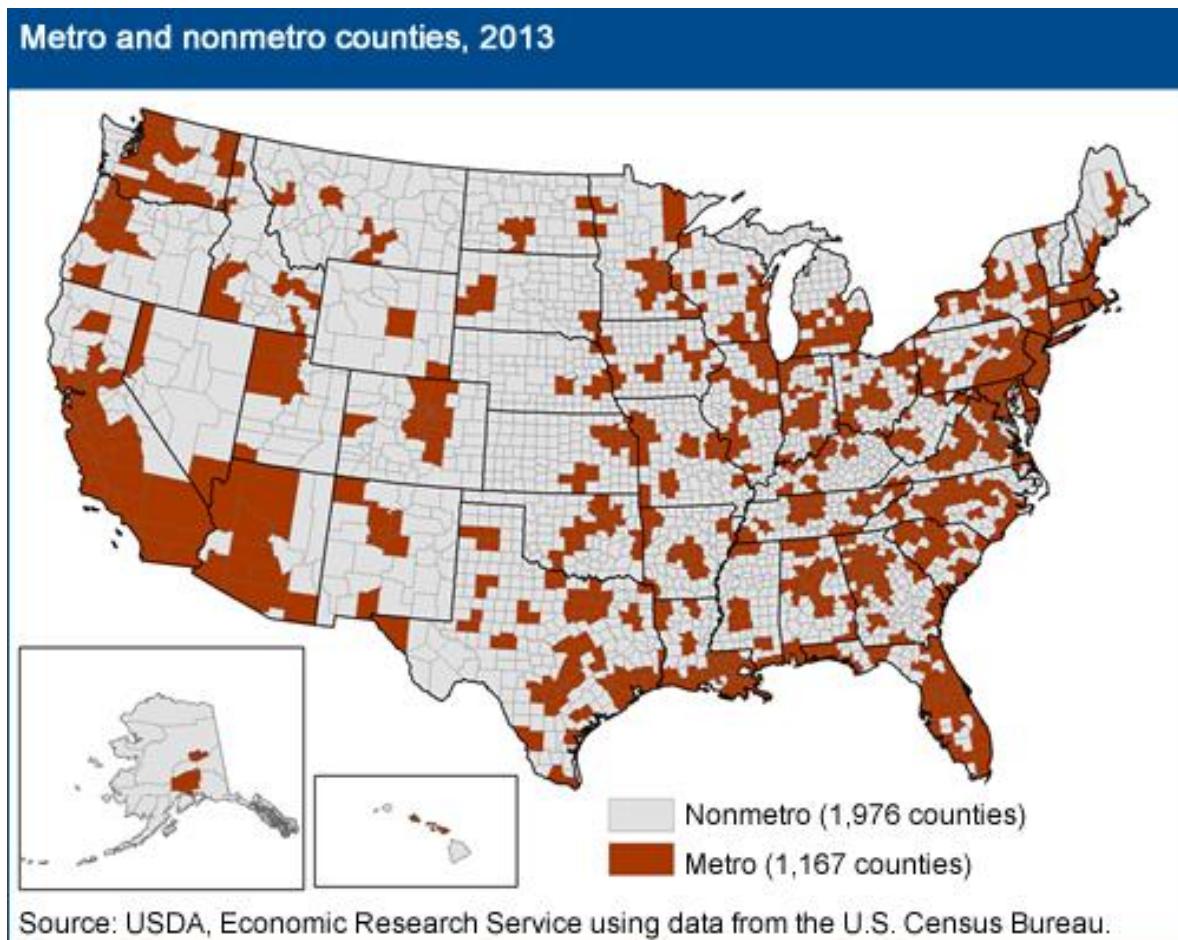
Any county not in a metropolitan statistical area is considered a rural or nonmetropolitan county (HRSA, 2017). Micropolitan population counties have an urban core of at least 10,000 but less than 50,000 people (HRSA, 2017). These areas generally have regional planning organizations to which Federal funds are redistributed through State agencies. In contrast to the Census Bureau, OMB's definition is based on counties. Metro- and micropolitan areas are shown in Figure 3.

U.S. Department of Agriculture

Cromartie and Parker (2016) note that nonmetropolitan counties include some combination of open countryside, rural towns (places with fewer than 2,500 people), and urban areas with populations ranging from 2,500 to 49,999 that are not part of larger labor market areas (metropolitan areas). Additional classification schemes, however, may be necessary to provide more details on rurality and economic and social diversity of nonmetropolitan counties (Cromartie and Parker, 2016). USDA, therefore, has developed definitions of *rural* to differentiate different levels of rurality for program eligibility based on rural-urban continuum codes, urban-influence codes, natural amenities scales, and typology codes. Further differentiation occurs by including sub-county classifications, rural-urban commuting areas, and frontier and remote area codes (Cromartie and Parker, 2016).

Rural-urban continuum codes have nine classification codes (Table 2) to distinguish metropolitan counties by the population size of their metropolitan and nonmetropolitan areas (counties by degree of urbanization and adjacency to a metropolitan area) (USDA, 2016a).

Nonmetropolitan counties (six of the nine classifications) range from completely rural or less than 2,500 in urban population not adjacent to a metropolitan area urban to an area with an urban population of 20,000 or more and adjacent to a metropolitan area.



Source: Cromarte and Parker (2016)

Figure 3. Metropolitan and Nonmetropolitan Counties in the United States in 2013.

Table 2. 2013 Rural-Urban Continuum Codes.

Code	Description
Metropolitan Counties	
1	Counties in metropolitan areas of 1 million population or more
2	Counties in metropolitan areas of 250,000 to 1 million population
3	Counties in metropolitan areas of fewer than 250,000 population
Nonmetropolitan Counties	
4	Urban population of 20,000 or more, adjacent to a metropolitan area
5	Urban population of 20,000 or more, not adjacent to a metropolitan area
6	Urban population of 2,500 to 19,999, adjacent to a metropolitan area
7	Urban population of 2,500 to 19,999, not adjacent to a metropolitan area
8	Completely rural or less than 2,500 urban population, adjacent to a metropolitan area
9	Completely rural or less than 2,500 urban population, not adjacent to a metropolitan area

Source: USDA (2016c)

Applying the concepts of metro- and micropolitan areas, population density, urbanization, and daily commuting to census tracts instead of counties, the rural-urban commuting area (RUCA) codes provide a more detailed geographical pattern of urban and rural use (Cromartie, 2016). The RUCA codes include secondary codes, based on the size and direction of the second largest commuting flows (Table 3 and Table 4). The Federal Office of Rural Health Policy's definition of rural is based on the RUCA codes (HRSA, 2017).

Other measures such as the urban-influence and USDA typology codes classify counties based on economic and policy types (USDA, 2016b). Economic characteristics include farming, mining, manufacturing, Federal/State government, recreation, and nonspecialized counties. Policy types are low education, low employment, persistent poverty, persistent child poverty, population loss, and retirement destination (USDA, 2016b). Other measures are based on natural amenities of a county area that define the location as a place to live (USDA, 2016b). Differences in classification between various definitions are illustrated in Figure 4.

Table 3. Primary Rural-Urban Commuting Area Codes in 2010.

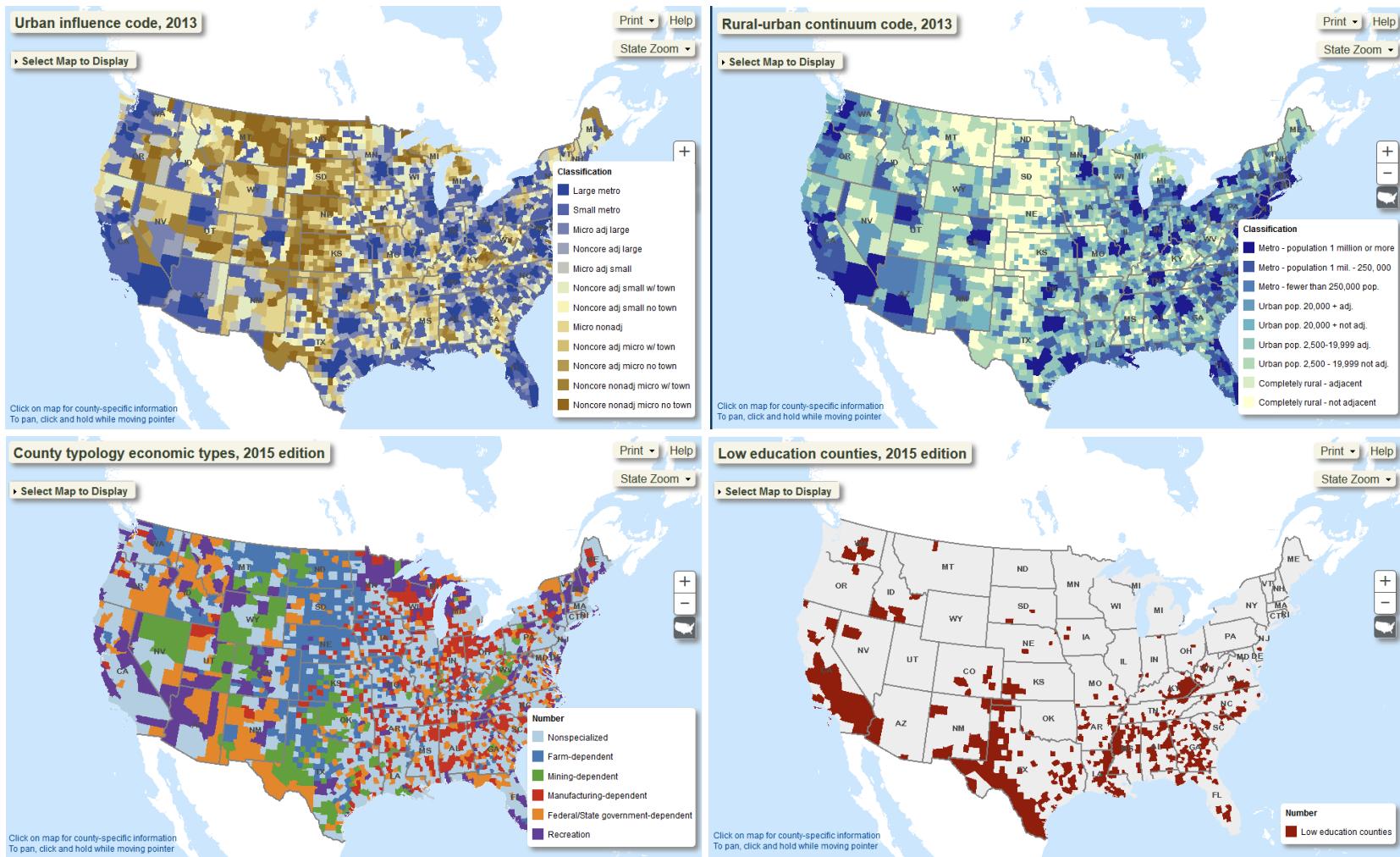
Code	Classification Description
1	Metropolitan area core: primary flow within an urbanized area (UA)
2	Metropolitan area high commuting: primary flow 30% or more to a UA
3	Metropolitan area low commuting: primary flow 10% to 30% to a UA
4	Micropolitan area core: primary flow within an urban cluster (UC) of 10,000 to 49,999 (large UC)
5	Micropolitan high commuting: primary flow 30% or more to a large UC
6	Micropolitan low commuting: primary flow 10% to 30% to a large UC
7	Small town core: primary flow within a UC of 2,500 to 9,999 (small UC)
8	Small town high commuting: primary flow 30% or more to a small UC
9	Small town low commuting: primary flow 10% to 30% to a small UC
10	Rural areas: primary flow to a tract outside a UA or UC
99	Not coded: census tract has zero population and no rural-urban identifier information

Source: USDA (2016c)

Table 4. Secondary Rural-Urban Commuting Area Codes in 2010.

Code	Classification Description
1	Metropolitan area core: primary flow within a UA
1.0	No additional code
1.1	Secondary flow 30% to 50% to a larger UA
2	Metropolitan area high commuting: primary flow 30% or more to a UA
2.0	No additional code
2.1	Secondary flow 30% to 50% to a larger UA
3	Metropolitan area low commuting: primary flow 10% to 30% to a UA
3.0	No additional code
4	Micropolitan area core: primary flow within a UC of 10,000 to 49,999 (large UC)
4.0	No additional code
4.1	Secondary flow 30% to 50% to a UA
5	Micropolitan high commuting: primary flow 30% or more to a large UC
5.0	No additional code
5.1	Secondary flow 30% to 50% to a UA
6	Micropolitan low commuting: primary flow 10% to 30% to a large UC
6.0	No additional code
7	Small town core: primary flow within a UC of 2,500 to 9,999 (small UC)
7.0	No additional code
7.1	Secondary flow 30% to 50% to a UA
7.2	Secondary flow 30% to 50% to a large UC
8	Small town high commuting: primary flow 30% or more to a small UC
8.0	No additional code
8.1	Secondary flow 30% to 50% to a UA
8.2	Secondary flow 30% to 50% to a large UC
9	Small town low commuting: primary flow 10% to 30% to a small UC
9.0	No additional code
10	Rural areas: primary flow to a tract outside a UA or UC
10.0	No additional code
10.1	Secondary flow 30% to 50% to a UA
10.2	Secondary flow 30% to 50% to a large UC
10.3	Secondary flow 30% to 50% to a small UC
99	99 not coded: census tract has zero population and no rural-urban identifier information

Source: USDA (2016c)



Source: USDA (2003b)

Figure 4. Examples of Different USDA County Classifications.

U.S. Department of Transportation Federal Highway Administration

The USDOT Federal Highway Administration (FHWA) defines *rural* differently for different needs. For purposes of highway functional classification, *rural* is defined as areas with a population of less than 5,000, and for planning purposes, *rural* is defined as areas outside of metropolitan areas 50,000 or more in population (U.S. FHWA, 2001). FHWA (2001) defines *rural* as a nonmetropolitan area outside the limits of any incorporated or unincorporated city, town, or village. FHWA provides three further categories:

- Basic rural—dispersed counties or regions with few or no major population centers of 5,000 or more.
- Developed rural—fundamentally dispersed counties or regions with one or more population centers of 5,000 or more.
- Urban boundary rural—counties or regions that border metropolitan areas and are highly developed (USDOT, 2001).

Characteristics of Rural America

Although the different definitions give different absolute numbers, the following generally characterize rural America:

- Rural population for the 2010 census represented 19.3 percent of the U.S. population including Puerto Rico, approximately 50 million people (U.S. Census Bureau, 2015a).
- 83 percent (USDOT, 2001) to 97 percent of the land area of the United States is rural (U.S. Census Bureau, 2015a).
- Rural areas continue to experience population loss, a larger density of older populations, and lower educational attainment than urban areas (Kusmin, 2015).
- The largest poverty rates in rural America are among minority racial and ethnic groups (Kusmin, 2015), which is similar to urban areas.

Defining rural areas is important because rural and urban transportation issues and institutional arrangements differ. In urban areas, metropolitan planning organizations undertake metropolitan transportation planning. However, in rural areas, the responsibility for rural transportation planning varies by region; rural planning may be done by a State transportation department, a rural planning organization, or local governments (USDOT, 2001). Transportation is provided by a range of private firms, nonprofit organizations, and public agencies. USDOT (2001) sums up the rural transportation service situation, “This service is primarily local in nature and, largely, is not connected to the nation’s passenger service network.” Rural transit providers tend to serve a smaller client base with longer distances between destinations and higher per-unit costs. Furthermore, while metropolitan transportation is intended for use by a wide cross section of the population, rural transportation tends to target elderly and people with a disability.

Elderly

Similar to the concept of rural, there is no one accepted definition of *elderly* (Weeks, 2013). Most developed countries have accepted 65 years as the defining age (World Health Organization, 2016). This age, however, has been criticized for being arbitrary and out of sync

with other definitions used for various U.S. private and government programs. Examples of various age requirements include the following:

- Medicare eligibility begins at 65.
- The U.S. Internal Revenue Service offers free tax help to individuals age 60 or older (U.S. Internal Revenue Service, 2016).
- In California, individuals 65 or older may be eligible for Medi-Cal benefits, but nutritional services may be available for those aged 60 or older (California Department of Aging, 2015; California Department of Health Care Services, 2016).
- Elder abuse in Texas is defined as "...the act or omission that causes a person 65 years or older serious bodily injury, serious mental deficiency, impairment or injury and any kind of bodily injury" (Texas Young Lawyers Association, undated).
- Depending on the service, elderly services may be offered to individuals as young as 55 in Hawaii County, Hawaii (County of Hawaii, 2012).
- Americans 50 and older are eligible to become members of AARP (2012).
- Many people see retirement as a milestone marking an older phase of life; the average retirement age was 65.9 for American men and 64.7 for American women in 2014 (Organization for Economic Cooperation and Development, 2015).

Orimo et al. (2006) and Sieber (2007) argue that factors beyond chronological age should be considered in defining an elderly patient. Age 65 is not an adequate definition of elderly for medical treatment by a geriatrician (Sieber, 2007). Orimo et al. (2006) argue 75 and older should be the definition of *elderly* based on social, cultural, and medical evidence. Along these lines, those aged 65 to 74 are often referred to as *early elderly*, with *late elderly* being over 74 years old (Orimo et al., 2006; Gramenzi et al., 2012; Tabata, et al., 2015). A healthier, aging society accounts for the changing definition of *elderly* (Orimo et al., 2006). The elderly often fall into a category of older Americans, but the term *elderly* may be more specific. Again, researchers need to define intended ages.

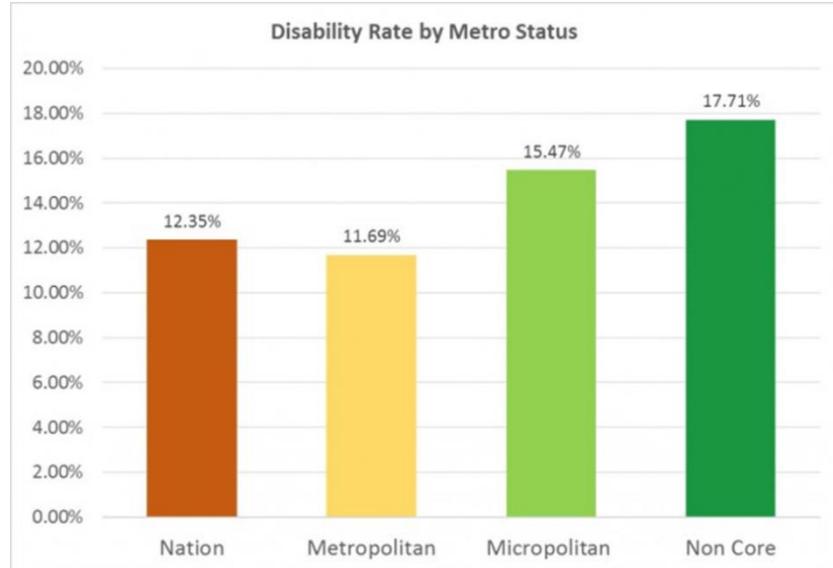
Disabilities

In discussing the geography of disability in the United States, Myers et al. (2016) note that although rural areas account for 72–97 percent of the land mass, only 15–19 percent of Americans live in rural areas (percentages vary based on the definition of *rural* used). They further state people "...living in rural areas represent a higher percentage of people who are unemployed, living in poverty, are elderly, and experience a disability" (Myers et al., 2016).

Individuals with disabilities face unique mobility challenges, which may be exacerbated by living in rural areas because transportation services are typically more informal and less specialized; travel distances are larger, services may cost more, and quality of service may vary between rural and urban areas (Weber et al., 2001; Dabson and Weber, 2008).

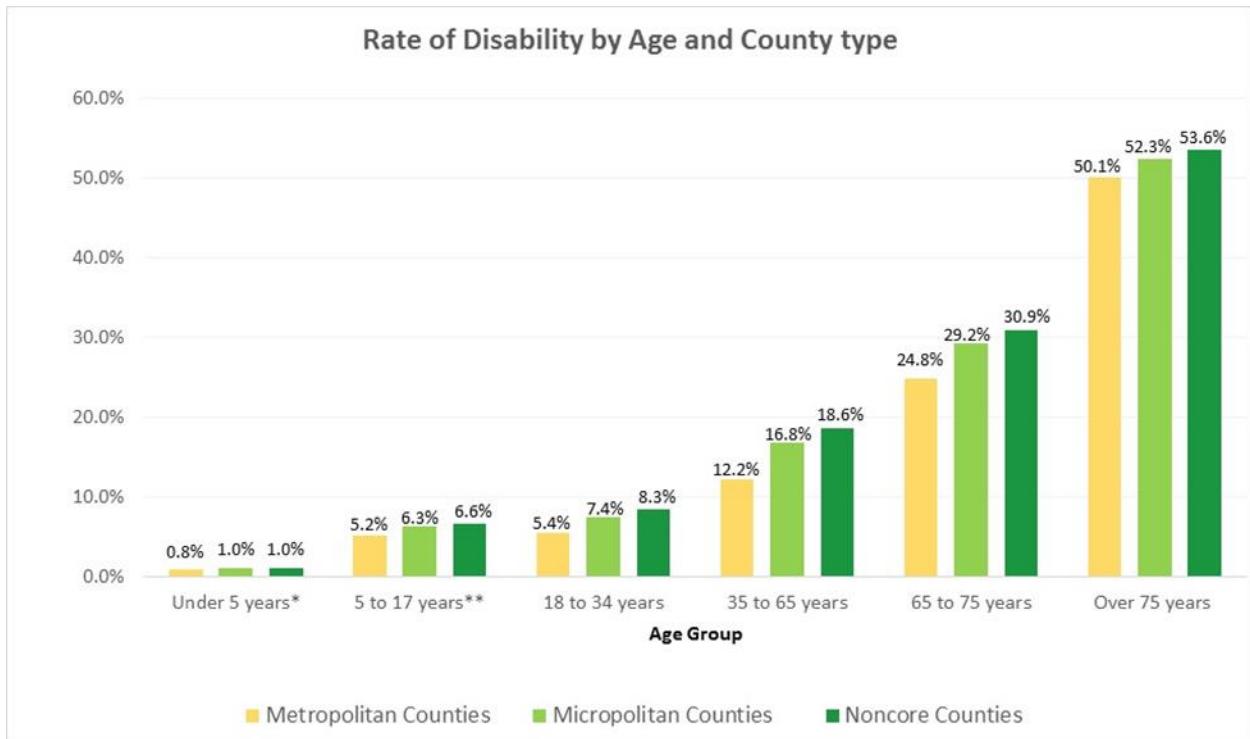
The disability and elderly population rates increase as one moves from urban to rural counties. The rate of individuals aged 65 years and older is 5.7 percent in micropolitan counties but 18 percent in noncore counties (mostly rural counties). Disability rates increase from 15.5 percent in micropolitan counties to 17.7 percent in noncore counties (Figure 5) (Myers et

al., 2016). Myers et al. (2016), however, note age does not explain all of the disparity in county type and disability rates. Disability rates are larger in rural than urban counties regardless of age (Figure 6). As expected, disability rates increase with age, with over 50 percent of the population over 75 years of age having some disability (Figure 6).



Source Myers et al. (2016)

Figure 5. Disability Rates by Metropolitan Status for All Age Groups.



Source Myers et al. (2016)

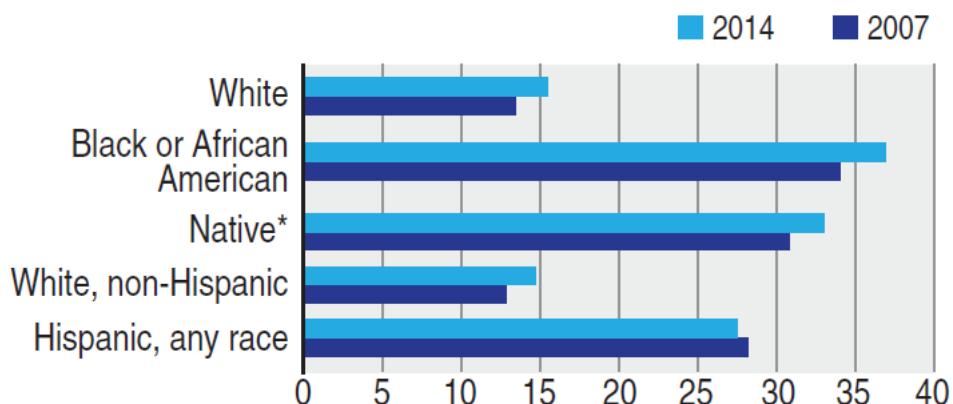
Figure 6. Disability Rates by Age and County Type for All Age Groups.

Disadvantaged

Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias within American society because of their identification as members of groups without regard to their individual qualities. Individuals from these groups may be socially disadvantaged: Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, Subcontinent Asian American, and members of other designated groups (U.S. Small Business Administration, undated; Legal Information Institute, 2011a, 2011b). Other individuals can be considered socially disadvantaged based on distinguishing features, including race, ethnic origin, gender, physical handicap, and long-term residence in an environment isolated from the mainstream of American society (U.S. Small Business Administration, undated; Legal Information Institute, 2011a, 2011b).

Economically disadvantaged individuals are socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired because of diminished capital and credit opportunities (U.S. Small Business Administration, undated; Legal Information Institute, 2011a, 2011b). USDA uses the socially disadvantaged definition to distinguish socially disadvantaged farmers but also includes women as a separate group (Williamson, 2015).

Transportation disadvantage, which is the disadvantage that results from difficulties accessing transportation and/or opportunities, is directly linked to both social and economic disadvantage (Pyrialakou et al., 2016). Rural poverty rates are highest among minority racial and ethnic groups (Figure 7). Family type also influences the poverty rate; nearly five out of every 10 rural families headed by a woman with related children and no spouse present are in poverty, whereas less than one in 10 rural married-couple families are below the poverty level (Kusmin, 2015). Rural poverty rates are lower for seniors at 10.5 percent than for all ages at 18.1 percent (Kusmin, 2015).



*Native includes American Indian or Alaskan Native race alone.

Source: USDA, Economic Research Service using data from the U.S. Census Bureau, American Community Survey, 1-year estimates, 2007 and 2014.

Source: Kusmin (2015)

Figure 7. Poverty Rates for Rural Counties by Racial and Ethnic Groups.

Gender differences among rural people over 65 and poverty are apparent, with eight percent of men versus 13 percent of women living in poverty (Rogers, 2005). Among those individuals 85 years and older, 10 percent of men and 17 percent of women were living in poverty in 2003 (Rogers, 2005). Marital status also plays a role; poverty rates were three times higher for widows than for married women over the age of 65 (Rogers, 2005).

An example of the vulnerability of disadvantaged groups in rural areas to economic conditions is the numbers presented by the American Public Transportation Association (undated). Native tribal households spend approximately 30 percent of their income on fuel compared to an average of six percent in metropolitan areas.

Mobility versus Accessibility

Transportation studies and policy frequently cite two distinct terms, *mobility* and *accessibility*, as justifications for investments. Webber et al. (2010) state there is widespread acceptance of the importance of mobility, but relatively few studies attempt to comprehensively portray mobility, and most studies are discipline specific. Similarly, accessibility is subject to different and discipline-specific definitions (Pucher and Renne, 2005).

Mobility

Metz (2000) notes the term *mobility* is employed in different contexts with quite different meanings. While movement can occur in social, psychological, and electronic space, within the literature about aging, the discussion is generally about movement in the physical space (Ziegler and Schwanen, 2011). Mobility, therefore, refers to the ability to travel (Robson, 1982)—the freedom, independence, and convenience of movement for nonmedical activities (Burns, 1999), or the ability to move independently (Patla and Shumway-Cook, 1999). Three general measures of mobility are (Ziegler and Schwanen, 2011):

- Actual realized movements such as the number of trips.
- The potential for movement such as the options people have for movement.
- Physical functioning such as the difficulty in undertaking daily activities.

Conceptual frameworks of mobility that relate to older individuals are briefly discussed. Although not directly associated with mobility, Rowles (1983) notes sources of social support for the elderly are derived from a hierarchy of environmental spaces. These spaces start at the home and then increase in spatial area from the surveillance or visual zone to vicinity, community, subregion, region, and nation. As people age, zones closer to home generally increase as a significant source of support (Rowles, 1983). This definition coincides with what Lord and Luxembourg (2007) call *déprise*—expecting limitations and adapting to them as one ages. Webber et al. (2010) present a conical model of mobility in life space where one's movement from the home depends on financial, psychosocial, environmental, physical, cognitive, gender, cultural, and biographic influences. The starting ring of the cone is the sleeping room, with additional rings increasing in distance from this room to include the home, outdoors, neighborhood, service community, surrounding area, and world. This model corresponds with Law's (1999) framework of gender daily mobility that, rather than controlling for demographic

characteristics in explaining travel behavior, embraces interaction between environmental and sociological realms in broadly shaping differences in transportation between men and women.

Carp's (1988) conceptual model stresses that mobility is fundamental to well-being, whether it is for life maintenance needs or higher-order needs. Focus groups identified mobility differences in two types of trips, necessary and discretionary, which roughly correspond to Carp's (1988) model (Ahern and Hine, 2012). Patla and Shumway-Cook (1999) view eight physical and environmental factors (minimum walking distance, traffic level, postural transition, attentional demands, external physical load, terrain characteristics, ambient condition, and time constraints) as spokes of a wheel. Their model highlights the interaction between the many dimensions of mobility. An index of mobility complexity can be viewed as contours of the wheel and the spokes the eight characteristics. Metz (2000 p. 150) argues, "...it would be desirable to articulate the concept of mobility in a way that would allow valid empirical measurement which captured the key elements of this common human experience." He states the following elements are important: travel to achieve access to desired people and places, psychological benefits of movements, exercise benefits, involvement in local community, and potential travel.

Shergold et al. (2012, p. 71), citing Kaufmann (2002, in French), note that a person's mobility options are a function of the person's motility capital. Motility capital is the sum of all factors that define a person's ability to be mobile, including "...not only the physical elements of transport and communications systems and their accessibility, but also (older) people's aptitude, mobility aspirations, time constraints and importantly, their knowledge of how to use systems" (Kaufmann, 2002, p. 38). Mobility is a complex, multidimensional aspect that relies on both personal abilities and availability of various modes of transportation. Multidisciplinary approaches are necessary to properly define this complex aspect (Metz, 2000; Webber et al., 2010).

Accessibility

Accessibility is experiencing increased attention in the literature as policy makers shift transportation strategy away from automobiles and roadways toward a more nuanced interaction between transportation and land use. Hanson (1986) defines *accessibility* as the number of sites available at a given distance or travel time and defines *mobility* as the ability to move between different activity sites (e.g., from home to grocery store). Accessibility, therefore, refers to the ease or ability in terms of time, costs, and efforts necessary to reach a destination (Metz, 2000; Pucher and Renne, 2005). Therefore, accessibility depends on the availability and quality of transportation networks, services, and opportunities (Pyrialakou et al., 2016). On the other hand, mobility is the amount and type of travel possible (Hanson, 1986; Pucher and Renne, 2005). Pucher and Renne (2005) note that rural accessibility has improved in recent decades as transportation and communications technologies develop. However, the authors conclude the elderly and poor most likely face greater mobility problems because public transportation investments have stagnated.

Definitions Used in This White Paper

Given numerous definitions of *rural*, *elderly*, and *transportation disadvantaged* used by various agencies, different disciplines, and the general public, the definition of these terms used in this

white paper are intentionally vague and meant to be inclusive. *Rural* refers to low population density areas. Similarly, the terms *elderly* and *transportation disadvantaged* are used in a general sense, again being very inclusive. The general inclusive nature does not take away from the recommendations of the white paper but rather enhances them. Inclusive definitions do not alter the recommendations of this white paper, and they allow agencies and communities the flexibility to define rural for their purposes. Specific studies and policies, however, need to identify their target populations, providing meaningful and useable definitions.

Background and Trends

Demographic Changes in Elderly Population and Rural Disadvantaged

By all accounts, the U.S. elderly population is increasing and will continue to increase as baby boomers age and the elderly live longer, healthier lives (Rosenbloom, 2004; He et al., 2005; Colby and Ortman, 2014). Rosenbloom (2004, p. 2) states:

Most of the elderly will be in good health and not seriously disabled. In fact disability rates have been falling among all cohorts of the elderly for decades, owing to a combination of good nutrition, improved health care, better education and higher incomes... Although disability rates increase with age, two-thirds of those over age 85 reported being in good to excellent health. Overall, new generations of older Americans will be healthier for a greater percentage of their lives than those just a few decades ago.

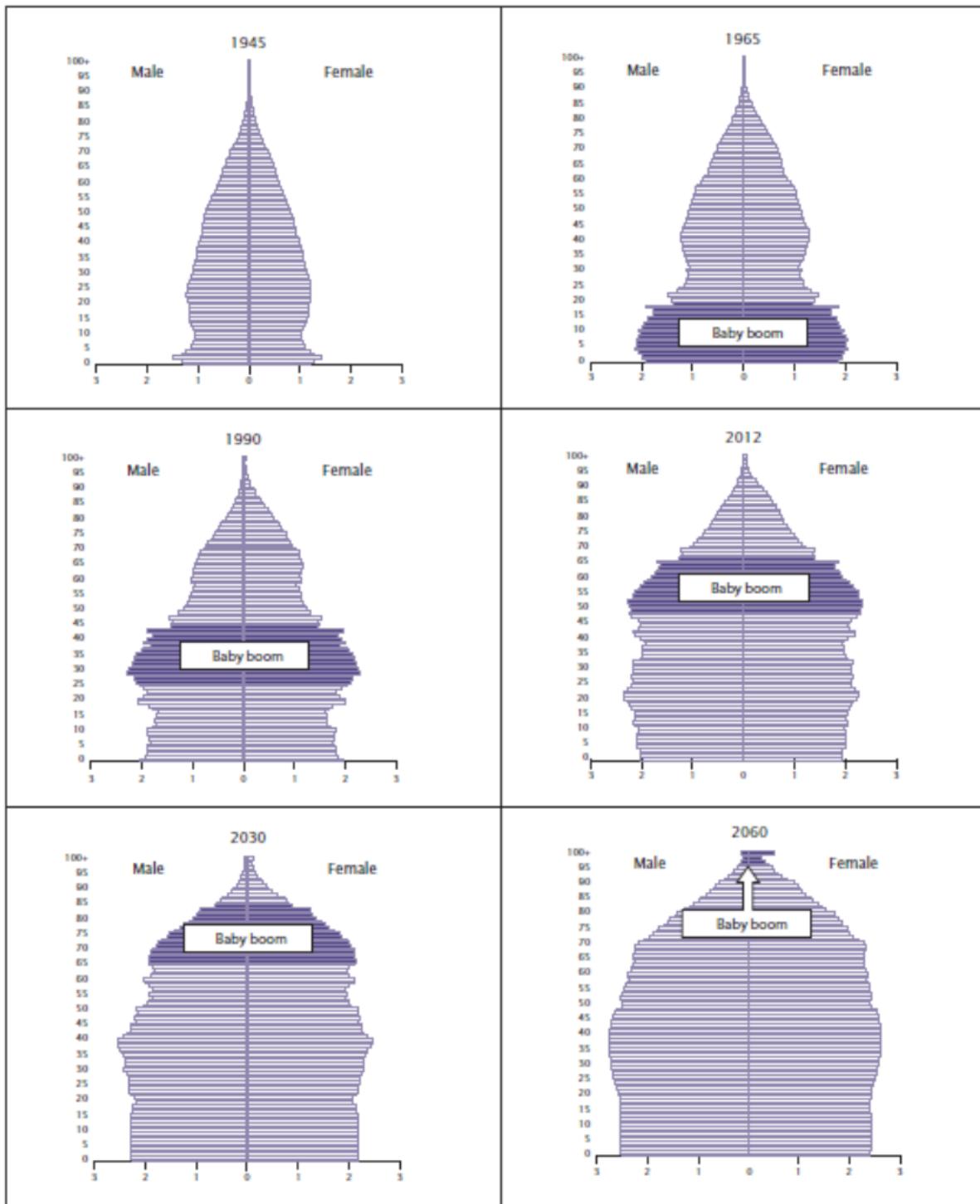
Projected age structure of the U.S. population showing the effect of the baby boomers is shown in Figure 8 and Figure 9. The U.S. Census Bureau Middle Series projects the percent of elderly will increase from 13 percent in 2010 to over 20 percent of U.S. residents by 2029 (Colby and Ortman, 2014). Associated with this aging and increasing life span is an increase in the number of elderly who are over 85 years of age (Figure 10). An aging population is not just a U.S. phenomenon; the world's elderly population is increasing (Figure 11). Because the world's elderly are living longer, to sustain an active lifestyle and remain independent, they may be more likely to need mobility assistance at some point in their life (Rosenbloom, 2004; He et al., 2005).

Although most accounts predict increasing life spans, authors such as Olshansky et al. (2005), Murray et al. (2006), and Ezzati et al. (2008)—predict life expectancies will decrease because of obesity and other health issues.

Residency Trends

Although the U.S. Census Bureau does not project population by age and urban versus rural (according to personal conversations with Census Bureau analysts), the literature predicts elderly Americans will be an increasingly important cohort in rural regions. In 2015, rural areas contained 5.3 percent elderly population in the United States (United Nations, 2014a). Rosenbloom (2004) and Kusmin (2015) identify several processes that are contributing to the aging of nonmetropolitan areas:

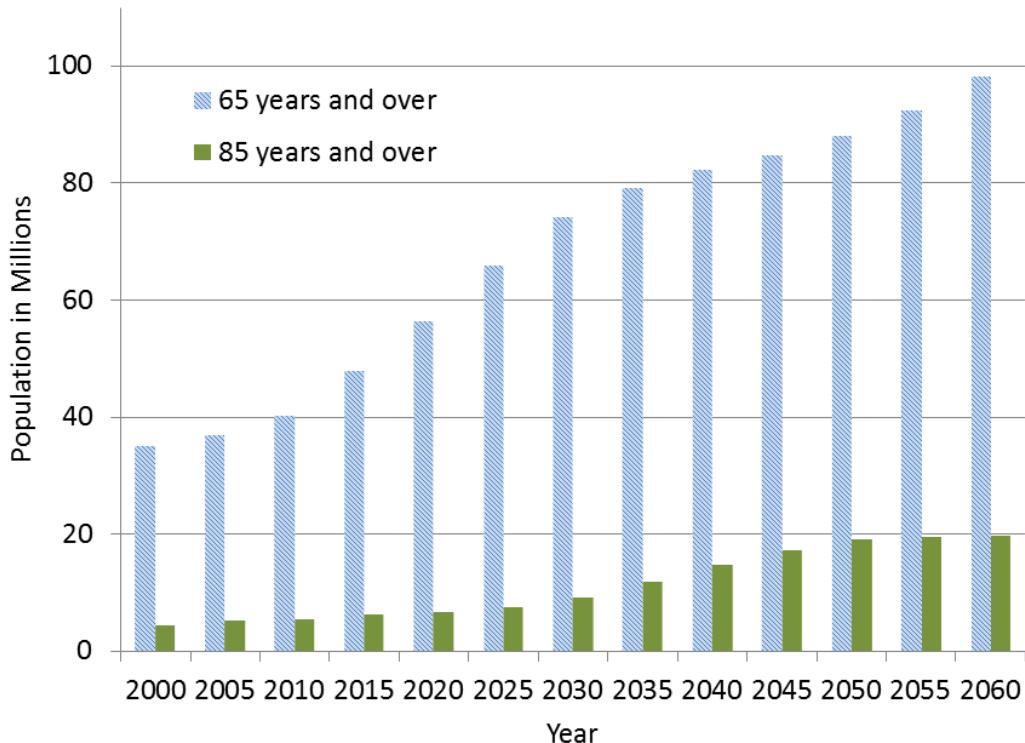
- Migration of older Americans to rural areas.
- The aging-in-place phenomenon.
- Outmigration of younger Americans to urban areas.



Note: Data for 1945 to 2012 are population estimates. Values for 2030 and 2060 are population projections. Estimates for 1945 and 1965 were available by single year of age for ages 0 to 84 with those aged 85 and over aggregated into one category. The distribution of the population 85 years and over from the 1950 Census was used to expand the estimates for 1945 into single year of age through 100+. Distributions from the 1950 and 1960 Censuses were used to expand the estimates for 1965 to single year of age through 100+. Source: U.S. Census Bureau, 1945 to 2012 Population Estimates and 2012 National Projections.

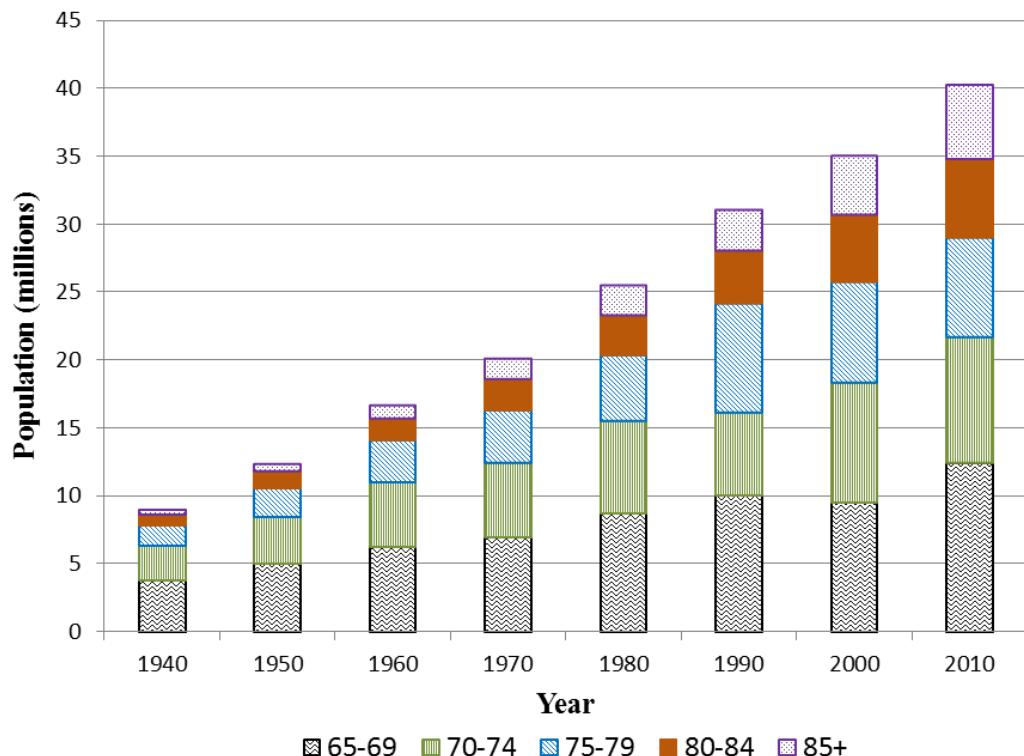
Source: Colby and Ortman (2014)

Figure 8. Projected Age Structure of the U.S. Population (Numbers in Millions).



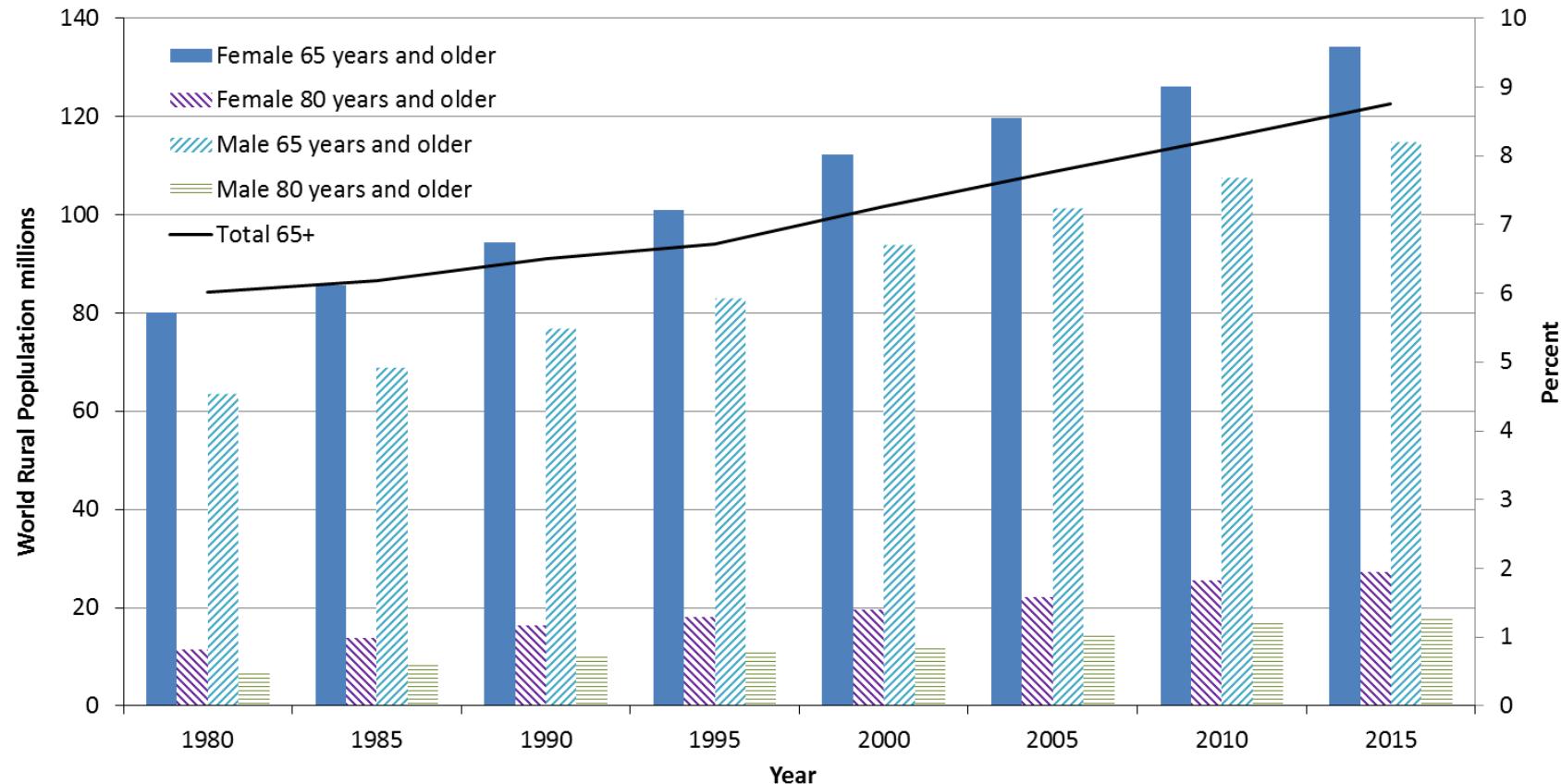
Source: U.S. Census Bureau (2017a, 2017b)

Figure 9. Historical and Projected Population over 65 Years of Age for the United States.



Source U.S. Census Bureau (Various Years)

Figure 10. Historical Age Structure of Individuals Age 65 or Older for the United States.



Source: United Nations (2014b)

Figure 11. World Rural Population over 65 Years of Age by Gender and Total Population over 65 Years of Age as a Percentage of Total World Rural Population.

Migration

The baby boomer cohort shows a tendency to move to rural areas (Nelson et al., 2004; Cromartie and Nelson, 2009). Baby boomers migrating to rural areas tend to be better educated, wealthier, and less likely to be living alone than those in the same age cohort that are aging in place in rural areas (Frey, 1999).

Aging in Place

The aging-in-place phenomenon is characterized by rural people remaining in their homes as they age (Alsnih and Hensher, 2003; Lin, 1999; Skinner and Stearns, 1999). Rural elderly that are aging in place tend to be less financially well off than their counterparts immigrating to rural areas; they generally have lower incomes, lower educational attainment, and a higher dependence on Social Security income.

Outmigration

Aging in place, along with increased migration rates, leads to an absolute growth in the rural elderly population; however, also contributing to the relative age increase is the outmigration of younger people from nonmetropolitan areas. Outmigration is dominated by young adults of childbearing age who would otherwise contribute to more births in rural areas (Kusmin, 2015).

Rural Elderly Population

The consensus is the rural elderly population will increase in both absolute and percentage terms. The rural elderly population is increasing as a percent of the rural population, but the density of rural areas remains small. This situation creates unique transportation issues that differ from issues experienced in urban areas. Because of low population density, providing public transit, for example, may be too expensive (Mulley and Nelson, 2009; Santos et al., 2010). Mulley and Nelson (2009) suggest unconventional modes of transportation are necessary to address rural transportation challenges. Although many fewer projections and studies on transportation issues for the rural socially, economically, and transportation disadvantaged exists, the same set of issues exist as for the rural elderly populations. The elderly may be a subset of the broader categories of the rural socially, economically, and transportation disadvantaged.

Quality of Life and Mobility

Different authors distinguish between the ambiguous terms *well-being* and *quality of life*, while other authors use the terms interchangeably (Nordbakke and Schwanen, 2014). In this white paper, the term *quality of life* is used to encompass both terms, referring to the complex, multifaceted aspects of the “good life.”

Not surprisingly, *quality of life* is defined along disciplinary lines. Nordbakke and Schwanen (2014) discuss 10 different approaches to quality-of-life studies; they emphasize these approaches are overlapping and not distinct as a listing would suggest. We emphasize that the distinctions are very fuzzy and exist because of disciplinary nomenclature. Quality of life has been measured both objectively (level of income, neighborhood, housing, toys owned, etc.) and subjectively (individuals’ perception of life satisfaction) (Zeigler and Schwanen, 2011; Nordbakke and Schwanen, 2014).

Regardless of the definition or measure of quality of life, studies almost conclude mobility contributes positively to the elderly's quality of life. Driving, although not the only mode of transit, is highly linked to mobility and thus quality of life. Driving cessation is linked to a decrease in mobility (Whelan et al., 2006). Conditions that limit driving may also limit access to other transport options, further limiting a person's mobility (Whelan et al., 2006). Using the number of trips and miles traveled per day as measures of mobility and data from the 2001 National Household Travel Survey, Pucher and Renne (2005) summarize rural mobility by age and income. Key findings include:

- Most elderly have a high degree of mobility.
- Almost no rural individuals use public transit, even if the household does not own a car.
- Regardless of income, the flexibility provided by the private vehicle is indispensable.
- Car ownership impacts the level of walking and cycling in rural areas.
- There is no statistical difference between races in rural areas in terms of the car's share of trips.
- The rural poor and elderly are at least as mobile as their urban counterparts.
- The relative mobility of the poor in rural areas appears to be higher than in urban areas.
- Mobility rates fall for those older than 65.
- The rural poor make fewer trips than the rural average.

Pucher and Renne (2005 p. 183) note public transit will remain a fringe mode of transport in rural areas and raise the issue "...of whether public policies should continue to subsidize the higher costs of providing a whole range of services to low density rural areas."

Mobility Summary

Many disciplines are involved in research concerning mobility for the elderly. Previous research has shown:

- Mobility increases the quality of life and livability of a region (Burns, 1999; Ripplinger et al., 2012).
- The elderly may have a need for improved transportation options (Glasgow and Blakely, 2000; Choi et al., 2012).
- The demand for mobility is increasing (Coughlin and D'Abrosio, 2012; Shaheen, 2012).
- Areas are designing and implementing innovative approaches to mobility (Cobb and Coughlin, 2004; Shaheen, 2012; Mujumdar et al., 2013).

Questions remain about whether transportation services should be publicly provided and how best to provide transportation services in light of tightening government budgets and the economic structure of the sector.

Modes of Transportation

In the American lifestyle, there is no question of the importance of the private automobile (car, van, sports utility vehicle, or pickup truck) to quality of life. In addition to the automobile, other main modes of transportation include public transit and nonmotorized travel such as walking or

biking. Using data from the 2009 National Household Travel Survey, Mattson (2012) reports for individuals 19 and older, 85 percent of all trips are by automobile. This number is down from 88 percent in the 2000 survey (Mattson, 2012). In 2009 (2000 percentages in parenthesis), walking encompassed 10 percent (7.7 percent), transit 2.3 percent (1.8 percent), and bicycling 0.7 percent (0.4 percent) of the trips. Similar percentages are obtained by categorizing by income, age, or geography. In analyzing the 2000 National Household Travel Survey, Pucher and Renne (2005, p. 165) conclude:

Somewhat surprisingly, the rural elderly and poor are considerably more mobile than their urban counterparts, and their mobility deficit compared to the rural population average is strikingly less than for the urban elderly and poor compared to the urban average. Data limitations prevented a measurement of accessibility, however, it seems likely that rural areas by their very nature, are less accessible than urban areas, especially for the small percentage of car-less poor and elderly households.

Car Usage by the Elderly

The automobile will remain the most popular form of transportation during retirement because the car is the most efficient manner to fulfill everyday mobility needs (Alsnih and Hensher, 2003; Rosenbloom, 2004). Although the most convenient mode of transportation, driving has its own set of benefits and concerns. For rural individuals over 65 years old, 92.3 percent of trips in 2000 were by automobiles (Pucher and Renne, 2005). Forty-three percent of trips were single occupancy, and 48 percent had two or more occupants (Pucher and Renne, 2005). Freedom of mobility is the most obvious benefit associated with driving oneself. This freedom may motivate elderly people to continue driving even after they suffer handicaps that cause them to have trouble driving (Burns, 1999; Glasgow and Blakely, 2000). It is estimated that people aged 65 and older will account for 25 percent of U.S. drivers by 2025 (National Center on Senior Transportation, 2010 [citing figures from AAA Foundation]).

To compensate for age-related disabilities, the elderly may limit their driving behavior. Night driving, rush hours, turning across traffic, city centers, highways, long trips, bad weather, and unfamiliar routes are driving situations the elderly frequently avoid (British Automobile Association, 1988; Burns, 1999; Rosenbloom, 2004, 2009; Baldock et al., 2006; Broberg and Willstrand, 2014). Many elderly eventually stop driving because of family or society pressures, age-related health, or cognitive problems (Glasgow and Blakely, 2000). Furthermore, even if disabilities are not an issue, the elderly may have to give up their automobile because they may not be able to afford the ownership costs (Gombeski and Smolensky, 1980). Older women and minorities may experience particular ownership problems because these groups have higher poverty rates than older Anglo males (Rosenbloom, 2004).

Elderly drivers may also pose a safety concern. The elderly are more likely to experience a crash per trip or mile driven and are more likely to be at fault, killed, or injured in a multicar crash than younger drivers (Dellinger et al., 2002).

Alternative Transportation Options for the Elderly

Older individuals may come to depend on services other than their automobile. Options most frequently used are rides from family and neighbors, walking, and public transportation (Gombeski and Smolensky, 1980; Glasgow and Blakely, 2000; Rosenbloom, 2004, 2009).

Rides from Family and Neighbors

As individuals age, they tend to become more dependent on others for transportation (Gombeski and Smolensky, 1980). The elderly may be hesitant to ask for rides because they do not want to burden family or friends; therefore, their mobility needs may not be fulfilled (Glasgow and Blakely, 2000). This is especially true for nonmedical trips. Although not broken down by age, 63.5 percent of trips by rural individuals who do not own an automobile are by car; over 42 percent are with two or more individuals (Pucher and Renne, 2005). These percentages are an indication of the importance of the car and rides from others.

Older individuals are often reliant on friends who are of similar age because family members do not live nearby or are limited by work schedules (Glasgow and Blakely, 2000). If the friend is also elderly, many of the same risks exist as if the person asking for the ride was driving. At some point, the older friend may lose the ability to drive. This person losing the ability to drive reduces the mobility of several elderly individuals (Rosenbloom, 1993).

Nonmotorized Travel

For rural elderly trips, walking (6.7 percent) and biking (0.3 percent) rank far behind the automobile as popular travel modes (Pucher and Renne, 2005). Sweeney (2004) finds the percentage of nonmotorized travel increases to one out of every four trips for individuals that do not drive. Lack of sidewalks (or a system of connected sidewalks), poor upkeep, obstruction problems, and safety concerns are complaints associated with nonmotorized travel (Rosenbloom, 2009; Rosenbloom and Herbel, 2009). In rural areas, activity locations are often too far apart to be feasibly reached by walking, compounding these complaints (Glasgow and Blakely, 2000).

Private and Public Transportation Alternatives

Transportation alternatives available to some elderly include private taxi services, public buses, and Americans with Disabilities Act (ADA) paratransit services. These modes of travel, however, are not highly used by older Americans (Glasgow and Blakely, 2000; Kim and Ulfarsson, 2004; Rosenbloom, 2004, 2009). In 2009, the rural elderly made up 0.1 percent of all trips by transit, compared to 1.3 percent of the urban elderly (Pucher and Renne, 2005). Reasons for the unpopularity of these modes as described in the literature are as follows.

Taxi Use. Private taxi services are often nonexistent in rural areas (Grant and Rice, 1983; McGhee, 1983), and when available, the private transportation services are often too expensive for many elderly to use, especially considering distances that must be traveled (Glasgow and Blakely, 2000). With the lack of private transit services, rural individuals are left to use public transit services, which are limited in rural areas (Glasgow and Blakely, 2000; Grant and Rice, 1983; Mattson, 2011).

Rural Public Transportation. Typical rural public transportation is demand-response transit requiring advance reservation. Although 77 percent of rural American counties in 2009 reported

having some type of public transportation, few systems are found in the most rural and isolated areas (U.S. Department of Transportation, Federal Transit Administration [FTA], 2009b). The majority of these systems are county based, followed by the multi-county level and then by the municipal level (U.S. FTA, 2009a). Improvements to rural public transportation are hindered because of rising costs and limited funding (U.S. FTA, 2009b).

ADA Complementary Paratransit Services. ADA paratransit is a required complementary service for people with disabilities in areas with fixed-route transit. Because many rural public transportation options do not include fixed routes, ADA paratransit is often not available in rural areas (Rosenbloom, 2004). ADA services are based on disability and not age; therefore, having minor age-related handicaps or being unable to drive does not necessarily qualify an individual for ADA paratransit. Rosenbloom (2009, p. 34) states:

Indeed, the vast number of older people in the United States do not and probably will not live in or travel in neighborhoods with ADA paratransit service, and, even if they do live or travel in such corridors, they are unlikely to qualify for those services for most of their lives after they reach age 65.

Public Transportation and Travel Independence. Access to public transit (public bus, ADA paratransit, etc.) does not mean an elderly person will be an independent traveler. Independence is limited because of trip-scheduling requirements, confinement of time and route limitations of transit systems, and rural systems stopping at the county line (Foster et al., 1996; Glasgow and Blakely, 2000; Stommes and Brown, 2002; Rosenbloom, 2004, 2009; Mattson, 2011). Nonprofit community groups often limit travel to destinations deemed essential, limiting the flexibility of travel for the elderly (Rosenbloom, 2009).

Travel Modes for the Disadvantaged

Not surprisingly, most of the same modes of transportation available to the elderly are used by other transportation disadvantaged populations with similar benefits and costs. Welfare respondents in Fletcher et al. (2010), for example, noted the car was the preferred mode of transportation; other modes included walking, getting rides from others, and borrowing a vehicle. Relying on others has additional costs such as imposition on others and uncertainty of availability (Fletcher et al., 2010).

Innovations/Institutional Changes for Mobility Enhancement

Various advancements in technology and institutional arrangements (henceforth, advancements and institutional arrangements are referred to as *innovations*) have been proposed and/or are currently in use to enhance the mobility of the elderly and disadvantaged. Several such innovations are briefly discussed to illustrate the wide range of innovations. By no means is this discussion comprehensive.

As one ages, physical and mental abilities such as vision, cognition, and memory necessary for safe driving start to decline (Kline et al., 1992; Drag and Bieliauskas, 2010). Smart cars have the promise of not only being beneficial to general drivers, but they may be particularly helpful for the elderly (Rhiu et al., 2015). Rhiu et al. (2015), however, note that because of declined abilities, there are key differences between the elderly and younger drivers. The authors conclude

that research should concentrate on safety and usability of smart cars. Smart cars run the gamut of fully autonomous vehicles—such as Google self-driving vehicles (Birdsall, 2014; Ji, 2015)—to simpler innovations—such as seat adjustments for those with a limited range of knee and hip motion (White, 2015). Commonly noted innovations are smart braking, smart windshields, night vision enhancements, automated parking systems, lane departure warning systems, crash notification and avoidance technologies, blind spot detection and back-over prevention systems, fatigue warning systems, forward collision warning with auto brake, and self-driving cars (Niselbaum, 2016). Reimer (2014) notes that these innovations promise increased mobility within the existing infrastructure.

Farber (2008) concludes that because school buses sit idle for part of the day and for months when school is not in session, they could represent a significant transportation resource for the rural elderly and disadvantaged. The legal challenges (e.g., school bus safety standards, ADA standards for public transit vehicles, and driver qualification requirements) and practical challenges (e.g., inadequate air conditioning and heating, labor arrangements, mixed-load concerns, and lack of maneuverability) can be overcome (U.S. FTA, 1999; Farber, 2008). Farber (2008) states schools may be able to rent the buses to transportation agencies, thereby providing an extra revenue stream to the schools. To be a viable option, costs to both the school and the agency using the buses need to be considered (U.S. FTA, 1999).

Although still minor, volunteer-provided transportation, including faith-based programs, are expanding and have the potential to impact rural areas. The National Volunteer Transportation Center (undated) was created in 2014 to “...support existing and emerging volunteer transportation programs and services across the country.” The center lists 940 volunteer programs across the country. Besides helping to meet the transportation needs of the elderly, volunteer programs impact those who volunteer to drive. Navarro et al. (2013, p. 484) state, “Drivers reported an increased connection and sense of community, as well as a sense of service to the person(s) with whom they provided the escort and/or mobility services.” Liability is an important consideration in these types of programs (Koffman et al., 2004). A wide range of supplemental transportation programs, whose purpose is to provide transportation to seniors that cannot access usual transportation services, are being implemented across the country (The Beverly Foundation, undated). The majority of these programs target rural or mixed (rural, urban, and suburban) areas (The Beverly Foundation, undated).

Various other innovations have been discussed or placed into practice. Taxi vouchers have been suggested as a way of supporting transportation for the elderly (Valkama and Bailey, 2001). The basic idea to provide a voucher to subsidize transportation is that the aggregate amount of the subsidies may be less than creating a new service. For-profit transportation companies directed specifically toward the elderly and disadvantaged are being created. For example, Affordable Senior Care operates a fleet of vans in the San Francisco and San Jose Bay area (Affordable Senior Care, 2016). Contracting with urban and suburban service providers (Rosenbloom, 2003) or forming public-private partnerships (AARP, 2012) is suggested as a way to reduce costs and increase transportation options. Programs that assess and improve senior driver abilities strive to improve safety of elderly drivers (Odenheimer et al., 1994; Wood et al., 2013; AAA, 2016; AARP, 2016).

Peek et al. (2014), in reviewing the literature, suggest technology being developed may support aging in place. As the younger baby boomers age, they may have an increased acceptance of technology because they have used and aged with technological advances. Technologies address a range of needs from fall detection and health monitoring to shopping and social interactions. Health programs that improve a person's quality of life as he or she ages may have an impact on transportation demand; increased life expectancy may increase the need for transit help, whereas living better may decrease the need. Relatively few academic studies have addressed these supplemental transportation programs.

Rural Transit

Rural transit agencies vary in terms of target ridership, size of service area, urban/rural context, and types of services operated. Further, rural area transportation services differ depending on community characteristics. In low-density, agricultural-type communities not adjacent to major metropolitan areas, points of origin and destination often spread across large geographic areas. The result is potentially higher operating costs per passenger carried. Rural communities that are adjacent to major metropolitan areas may have suburban transportation needs where commuter service is also appropriate. Other rural communities have retained the small-town characteristics where shopping, school, and services remain in the town center where destinations are walkable and transit services may be viable. Differences in community typology may determine how efficiently and effectively public transit providers can provide service.

Funding

FTA supports rural area public transportation by providing funding to States through the Section 5311 Formula Grants for Other than Urbanized Areas. In addition to Section 5311 funds, most rural transit providers receive State and local funds. Section 5311 program funds are appropriated to States by statutory formula based on the latest U.S. decennial census non-urbanized population and land areas. The Federal Government does not require State and local governments to establish rural transit agencies. In addition, about 20 percent of all rural transit services are provided by dual urban/rural agencies, which provide some services in and out of urbanized areas that are paid for by other FTA grant programs and State and local funds.

Services

Existing transit in rural areas is different from urban area transit. The National Rural Transit Assistance Program and the Community Transportation Association of America in 2008 updated the Transit Cooperative Research Program F-12 database of rural transit providers, listing 1,498 transit providers in the United States. Unlike urban transit that operates mainly fixed-route service, 89 percent of Section 5311 federally funded transit agencies provide demand-response service. Section 5311–funded agencies also reported that 31 percent provide fixed-route service, 25 percent provide subscription service, and 18 percent provide route or point deviation. About 66 percent of transit agencies serving rural areas have service areas defined at the county or multi-county level, whereas municipal transit systems represent about 20 percent, multiple town systems about nine percent, other (a portion of county or municipality) four percent, and tribal reservation agencies one percent. Almost 20 percent indicated also serving an urbanized area (Brooks et al., 2014).

Demand-response service is when passengers schedule individual rides from specific origins to specific destinations. A vehicle picks up passengers at their origin, usually curbside, and ultimately delivers them to their destination. The passengers, however, may share the ride (or a portion of the ride) with other customers. Demand-response services are inherently less productive (lower passengers per mile) than fixed-route services, further challenging rural providers to meet growing demand. Fixed-route services run along a pre-established route and stop at pre-established stops. In rural settings, these fixed-route services are often commuter or express services and may require that customers drive/ride to a fixed stop each morning to catch a nonstop ride to their work location. In some cases, drivers are allowed to deviate off the route slightly to pick up or drop off passengers, a practice often termed flex routing.

Rural Public Transportation Objectives

The objectives of transit policy have three distinct levels: fundamental, instrumental, and operational, which may not always be consistent within or between categories (Gwilliam, 2008). Fundamental objectives are the most general statements and are usually stated within the terms of the economic objectives of the government such as maximizing social welfare. Instrumental or tactical objectives provide ways to achieve the fundamental objectives. An example provided by Gwilliam (2008) of instrumental objectives is minimizing fuel consumption to meet a fundamental environmental objective. Operational goals are at the level of supply transit. Maximizing the number of passenger miles subject to budget constraints is an example.

Gwilliam (2008, p. 5) notes, "...there are a range of policy instruments - investment expenditures, fares, subsidies, regulations on entry, institutional reforms, etc. which are critical to the achievement of one or more fundamental objectives."

Economics Literature Review

Many disciplines are involved in research concerning mobility for the elderly. Previous research has shown mobility increases the quality of life and livability of a region (Burns, 1999; Ripplinger et al., 2012), the elderly need improved transportation options (Glasgow and Blakely 2000; Choi et al., 2012), the demand for mobility is increasing (Coughlin and D'Ambrosio, 2012; Shaheen 2012), and areas are designing and implementing innovative approaches to mobility (Cobb and Coughlin, 2004; Shaheen, 2012; Mujumdar et al., 2013). Questions remain about whether transportation services should be publicly provided and, if so, how best to provide transportation services in light of tightening government budgets and the economic structure of the sector.

Because past literature reviews concentrated on different aspects of transit, mobility, the economic disadvantaged, and/or the elderly (Goodwin, 1992; Whelan et al., 2006; Dickerson et al., 2007; Gwilliam, 2008; Santos et al., 2010; Ziegler and Schwanen, 2011; Nordbakke and Schwanen, 2014), this review concentrates on economic issues pertaining to rural transit and the elderly and transportation disadvantaged. The number of reviews and the amount of literature are not surprising, given the importance of mobility and the elderly cohort in society. Disciplines publishing in this area include, among others, psychology, transportation, sociology, engineering, economics, and health. A Google Scholar search for *elderly* and *mobility* yielded almost 38,000 hits since 2012. One pertinent review is the excellent review of issues in transit economics by Gwilliam (2008).

Gwilliam (2008)—A Review of Issues in Transit Economics

Gwilliam (2008) notes a rough chronology of issues in the literature. Before the 1980s, the emphasis was on costs and patterns of demand, with emphasis moving toward market regulation and competition after the 1980s. He is quick to note issues are relevant spanning the entire period, and therefore the review is topical based, including policy objectives, organization, demand, cost and efficiency, service quality, fares and subsidies, technology, regulation and reform, and transit and economic development. Gwilliam (2008, p. 19) concludes:

Transit economics is a broad area with an extensive literature. The policy issues are complex because of the wide range of objectives towards which transit is required to make a contribution, and because of the two way interaction between transit and urban form. This in its turn creates very difficult organizational and financial problems.

Critical issues include the estimation of demand and supply functions because of heterogeneity issues, the range of competing and complementary technologies, and management and regulation issues resulting from an array of objectives and actors across a fragmented set of transportation systems.

Gwilliam's (2008) review concentrates on urban and industrialized countries, with the word *rural* being present in only one sentence in the text. Issues for developing countries are presented

based on World Bank literature. Many of the issues discussed by Gwilliam (2008) are relevant to the economics of rural transportation for the elderly and transportation disadvantaged.

Lack of Economic Research in Rural Transportation for the Elderly and Disadvantaged

One contention is that previous reviews have only cursorily addressed this specific subarea. In defense of the reviews, economic studies have general ignored this specific area. As a nonscientific enquiry into this lack of studies, three economic transportation journals were searched using the key words *rural* and *elderly*. The journal *Economics of Transportation* returned no studies using these key words. Twenty-four articles include these key words in *Research in Transportation Economics*, whereas, *Transportation Research, Part A* returned 64 articles. Many of these articles are discussion based and only mention rural or elderly in passing. The largest value added to the literature would be to concentrate on economics and rural issues primarily associated with the elderly and other transportation disadvantaged people. Given the sparse number of articles in this specific subarea, the review contains articles from urban studies that have an idea or problem relevant to rural areas.

Communities and Community Development/Employment

A USDA-funded study, Study of Rural Transportation Issues, did not include the word *elderly* because this study focused on moving agricultural and other commodities (Casavant et al., 2010). The study, however, mentions accessibility is a key element that allows rural areas to thrive. The report defines *accessibility* as “Important services are easily reached regardless of a person’s mobility or income, either by being nearby or by use of convenient and affordable transportation” (Casavant et al., 2010, p. 130). Migration of older Americans to rural areas and outmigration of younger Americans impact communities because immigrating retirees boost the tax base and help sustain local businesses. Meanwhile, outmigration of the young may decrease tax dollars (Rogers, 2005). Further, the net migration will influence the need for medical services and long-term care for the aging population (Rogers, 2005).

A growing body of literature reveals that both urban and rural elderly—and in fact, communities in general—benefit from current and improved transportation services (Njenga and Davis, 2003; Fletcher et al., 2010; Wellman, 2012). Transportation services, however, may be more critical to quality of life for the rural elderly than for their urban counterparts for several reasons, including distances between homes and services (Glasgow and Blakely, 2000). Transit services are generally under-provided for the elderly in both rural and urban settings (U.S. FTA, 2009a; Wellman, 2012). Studies suggest that the elderly desire not only transit services but also improvements in the service. Furthermore, the rural general population is willing to pay for transit service improvements for the elderly but not at a level sufficient to fully fund the improvements (Isreal-Schwarzlose et al., 2014). Indeed, rural retirees have a positive effect on regional economies and positive net fiscal impacts regardless of age and income (Shields et al., 2003). Rigid scheduling and routing within regional systems and lack of connectivity between regional systems, however, limit the use and economic benefit of rural transportation systems (Stommes and Brown, 2002). Few studies, however, explore how rural transit providers can

operate more efficiently or even if rural transit authorities have a desire to better serve the elderly population (Ryser and Halseth, 2012).

Relationships between the availability of reliable transportation (usually car ownership) and employment (and/or other economic outcomes) have received a lot of attention in the literature (Raphael and Rice, 2002; Cervero et al., 2002; Gurley and Bruce, 2005; Fletcher et al., 2010). Fletcher et al. (2010, p. 126) note, "...there has been a dearth of multimethod research on transportation and rural poverty." In examining rural counties in Iowa, Fletcher et al. (2010) conclude policies that promote access to reliable private transportation will increase job opportunities for rural, low-income individuals. Reliable transportation increases the ability to obtain and retain jobs by allowing individuals to search a wider geographical area and work off-time shifts. Njenga and Davis (2003), in reviewing literature on development and transit issues in developing countries, conclude development of transportation infrastructure and services has implications for poverty reduction. Njenga and Davis (2003) highlight international issues of poverty and reliable transportation.

Institutional Issues

Stiglitz (2015) provides an excellent theoretical foundation concerning provision of pure public and publicly provided goods (transportation tends to fall into this second category). Although not directed specifically toward transportation, his theoretical foundation notes both political and economic factors enter into the number of and relationships among political entities. Forces leading to large entities are returns to scale and difficulties in internalizing costs that cross the boundaries of different groups, whereas diseconomies of scale and diversity of preferences favor smaller entities.

In addition to these forces, other characteristics affecting the formulation of political entities are the size of the population, mobility of the individuals, and net tax transfers between regions or groups. Further, issues of identity even in the face of substantial costs may influence some groups to want their own identity. Cook (2002) notes as regions increase in population, therefore geographical area, the demand for transit trips becomes more regional in nature; reorganization to a regional transit system (including rural areas) may more effectively respond to these demand changes.

While there are benefits of regionalizing transit services, there are also costs that must be considered (Cook, 2002). Sych (1999) finds that significant changes in institutional arrangements are difficult to achieve in public transportation.

Costs

Unlike a pure public good, where the marginal costs of providing the good to an additional individual is at or near zero, for many publicly provided goods, marginal costs are the average costs, indicating such goods are closer to being a private good (Stiglitz, 2015). Reasons noted by Stiglitz (2015, p. 84) for providing the service publicly rather than privately include "...market failures, the benefits of enhancing social cohesion through publicly provided education, and ensuring the attainment of basic rights..." Ripplinger (2012, p. 18) notes, "While more than 100

transit cost studies have been published in the past three decades, none have focused solely on rural transit in the United States.” Such statements reinforce the contention that little economic research has been done addressing the needs of the rural transportation disadvantaged, Riplinger (2012) being an exception. Further, costs are important in the efficient allocation of resources. Welfare economic analysis shows that the efficient allocation of resources is achieved when market prices in a competitive market are in line with social costs. According to Roson (2000, p. 81), “When applied to transport sector, this implies that the price of the various transport modes should be made equal to the sum of marginal production and external costs, like congestion, accidents, pollution and road maintenance.”

Using cost data from North Dakota rural transit agencies, Riplinger (2012) develops a rigorous economic model investigating costs structure and returns to scale in rural transit. He generally finds returns to density, size, and scope, and that most rural transit agencies are overcapitalized. Interestingly, he finds “Provision of transit service by a single agency across an area this large on the basis of economic efficiency is not supported by our analysis” (Ripplinger, 2012, p. 47), which is counter to most conventional wisdom. This study is one of the only, if not *the* only, study that rigorously estimates a cost function for rural transportation systems in the United States. Ryser and Halseth (2012, p. 328) argue, “Our findings indicate that greater coordination across multiple government agencies and jurisdictions is needed and more supportive policies and resources must be in place to facilitate a comprehensive regional transportation strategy.” They, however, provide no supporting data. Mujumdar et al. (2013) note that, attracted to cost savings, rural transit authorities are exploring partnerships with neighboring providers. Although mobility management programs have numerous funding sources, funding of mobility management programs remains a serious challenge (Mujumdar et al., 2013). The authors note the aims of mobility management include the provision of accessible, multimodal, and affordable transportation services to all individuals in a community, including the elderly, people with a disability, and lower-income individuals. Mobility management has the potential to deliver public transit services in a cost-efficient way using customer-driven, market-based approaches (Mujumdar et al., 2013).

Studies examine the efficiency of transportation, in general, but are not specific to rural settings. It is not surprising that much of the research is from countries other than the United States (Berechman, 1987, 1993; De Borger, 1984; Button and O’Donnell, 1985; Cambini et al., 2007), given the relative importance of mass transit in these countries compared to the United States. Studies in the United States have also been conducted (Obeng, 1985; Colburn and Talley, 1992; Karlaftis and McCarthy, 2002). Karlaftis (2008) provides an overview of efficiency, noting that clear-cut, market-oriented performance guides are lacking in the public transit area.

Studies decades apart highlight the literature’s conflicting results about economies of scale, though not specifically for rural transportation (Berechman and Giuliano, 1984; Karlaftis and Tsamboulas, 2012). These studies suggest the output measures and methodologies can have a significant effect on inferences from the study that may have an impact on policy implications. Furthermore, data and transit systems included differ. Examples of difference in data and systems include time series data on one system (Berechman and Giuliano, 1984) and cross-sectional (Obeng, 1985) and time series data on multiple systems (Karlaftis and Tsamboulas, 2012). Examples of the range of data and studies include the following. Obeng (1985) uses data from 1982 provided by USDOT on 62 transit firms operating between 25 and 600 vehicles. He

concludes long-run diseconomies of scale exist for all bus systems analyzed. Colburn and Talley (1992) use time series data from one urban transit district that provides multiservice, one transit service, and three paratransit services to estimate the long-run cost structure. Their results indicate the firm exhibits economies of size over a range of services, but the results do not support economies of scope. Harmatuck (2007), using data from 1996 to 2002 on 68 urban bus systems in the Midwest, estimates a cost frontier; he finds location has an impact on efficiency. Minnesota and Wisconsin systems consistently operate closer to the frontier than Michigan systems.

Karlaftis and McCarthy (2002) use the National Transit Database to generate a panel of 256 transit systems from 1986 to 1994. Researchers often use this data source because of its availability; however, as noted by Barnum et al. (2011), only the largest systems are required to report all variables that maybe of interest in an economic analysis. Karlaftis and McCarthy (2002, p. 1) state, “The results indicate that US transit properties are heterogeneous with different production technologies, which implies that transit cost analyses based upon a set of homogenous systems will generate incorrect inferences on public transit cost and production structures.” Along these lines, Williams and Dalal (1981) find using vehicle miles as the measure of output results in increasing economies of scale for large urban systems but decreasing economies of scale for small urban systems in Illinois. Karlaftis et al. (1999) found just the opposite, increasing economies of scale for small to medium-size systems but decreasing economies of scale for large systems. Data are for transit providers in Indiana, but small does not necessarily translate to rural. Karlaftis and Tsamboulas (2012), using data from 1990 to 2000 for 15 European transit systems, conclude efficiency and effectiveness are only weakly negatively related. Studies have contributed inefficiencies to capital subsidies (Li and Wachs, 2004) and externally imposed requirements such as meeting peak-hour demands (Berechman, 1993).

Filippini et al. (1992) note that in Switzerland, most transit companies are not operating at an optimal scale. Even if mergers reduce the scale inefficiencies, lack of demand may still be an issue. This finding highlights that transit systems can only be successful when policies take into account demand and production properties of transit systems (Karlaftis et al., 1999). The economic environment along with the regulatory environment will ultimately determine the feasibility and successful nature of any transit policy.

Demand

Demand for transportation is most often a derived demand, derived in the sense demand arises from “...the need or desire to do something (other than travel) at some place other than home” (Hanson, 1986, p. 4). Travel occurs because of the need or desire to participate in a nontravel activity such as work, shopping, or volunteering. Trade-offs always exist between doing an activity at home and the cost of travel (Hanson, 1986). Some travel such as a Sunday drive or a bike ride for pleasure is engaged in for travel’s own sake (Hanson, 1986). Travel for its own sake may increase with age and/or poverty as a social or recreational activity.

Two related types of travel demand, induced and suppressed, have received little attention in the literature in the context of transportation for the rural and disadvantaged populations. For transportation, induced demand has generally received more attention (Weis and Axhausen,

2009) than suppressed demand (Duvarci and Mizokami, 2009). Difficulties arise in the measurement and analysis of these two demands types because of multidimensionality (accessibility, mobility, cost, convenience, and access to information) of the transportation disadvantaged (Duvarci and Mizokami, 2009). Induced demand is the “...additional demand for transport services directly caused by improving travel conditions...” (Weis and Axhausen, 2009). Concerning induced demand in Switzerland, Weis and Axhausen (2009, p. 17) conclude that:

...price changes and accessibility improvements are causing the increasing mobility levels of the older population, which will shift the planning discussion in new directions, as the older population is increasingly interested in return to highly accessible and lower travel cost urban locations.

An unanswered question is if reliable transportation for the rural transportation disadvantaged is improved, what is the induced demand effect? When accessibility is improved and travel costs (including nonmonetary) are lowered, the suppressed demand of transportation disadvantaged groups is released (Duvarci and Mizokami, 2009).

Studies considering the roles of age, income, and other factors in determining transportation demand suggest that demand has remained strong over time. Forty years ago, transportation was one of the greatest needs articulated by elderly individuals surveyed. Surprisingly, loss of health, income, and the ability to participate did not affect their perceived need for services (Keith, 1978). Over 50 percent of surveyed rural automobile owners who expected to live beyond age 75 and remain in rural areas stated they would need to use public transportation (Mjelde et al., 2012). Erickson et al. (2012) find that rural residents prefer to stay in their hometown and are willing to travel to nearby towns for goods and services, but when transportation becomes problematic, they may be forced to move.

Studies have examined transportation issues (although not limited to rural populations) concerning issues such as paratransit. Bearse et al. (2004) find that growth rates in the demand for paratransit are strongly affected by the growth in elderly populations. Fitzgerald et al. (2000) suggest the long-term benefits of passenger education programs directed toward responsible use of paratransit outweigh the costs. In estimating both demand and cost functions, Nguyen-Hoang and Yeung (2010) find the level of service influences the demand for paratransit, and the benefits of paratransit outweigh the costs.

Stern (1993) estimates demand for different types of transportation for the rural elderly and people with a disability. His findings suggest transportation-handicapped people take a limited number of trips, which are generally necessary trips and are less responsive to price changes (price inelastic). Door-to-door service is highly valued. Taxis and buses are poor transportation alternatives because of monetary and travel distance costs.

Costs and Benefits Estimation

A few studies have examined the costs and/or benefits of rural transportation, although more studies have addressed these issues for urban transit services (Godavarthy et al., 2015).

Generally, these studies conclude rural transportation benefits are larger than the costs to provide the services (Ferrell, 2015). Three caveats on most (if not all studies) of these studies are:

- The benefits and costs are not categorized (and most likely could not be) into categories such as rural elderly, rural transportation disadvantaged, urban, etc.
- Input/output analysis is mistakenly used to estimate benefits.
- Studies tend to provide an annual value using benefit/cost ratios rather than the preferred net present value approach.

Use of multipliers in input/output analysis gives impacts or contributions and not benefits. Using impacts overstates the benefits relative to costs. Because these benefit/cost studies are only tangentially relevant to this white paper's subject, they are only briefly discussed here. The main point is that when properly conducted, such studies are useful to estimate the costs and benefits of transit.

Although calculated benefits and costs can be useful, the main benefit of such studies is the systematic listing of costs and benefits which provides policy makers information on what to consider when making policy decisions. Categories of monetary transit benefits and costs identified by the various studies differ but include traffic congestion, health care costs, safety and security, costs for transit users switching to alternative modes, economic and social costs of forgone trips, accidents, and the environment, along with transit agencies employment, purchases, and capital expenditures (Burkhardt et al., 1998; Skolnik and Schreiner, 1998; Southworth et al., 2005; Ferrell, 2015).

At face value, the studies generally find rural and small urban systems yield lower benefit/cost values than urban systems (Skolnik and Schreiner, 1998; Godavarthy et al., 2015; Ferrell, 2015). The largest benefit of rural transit systems tends to be health care access (Penet, 2011; Godavarthy et al., 2014; Ferrell, 2015). Such trips make up approximately one-half the benefits of rural transportation. User mobility dominates the benefits (Southworth et al., 2005). In reviewing studies, Ferrell (2015) notes the benefit/cost ratios range from 0.47 to 9.7 for rural and small urban transit systems. Godavarthy et al. (2014) find a benefit/cost ratio of 1.12 for rural transportation services in the United States. The small benefit/cost ratios for rural systems reflect the challenging environments (small ridership, small populations, and dispersed land use patterns) in which these transit services operate (Ferrell, 2015).

Willingness to Pay and Contingent Valuation

Most studies examine only user benefits and costs. Two important categories of benefits, option and non-user value, have received little attention in the literature as related to transportation in general and rural areas in particular (Roson, 2001; Geurs and van Wee, 2004; Wallis and Wignall, 2012). Option value is the willingness to pay (WTP) for the option of having transportation service in the future even if the option may never be used (Wallis and Wignall, 2012). An example is "...car-owners may value the ability to use a public transport service when for whatever reason they cannot drive or their car is unavailable" (Geurs and van Wee, 2004, p. 138). Non-user values are the WTP for transportation even though it will not be directly consumed (Wallis and Wignall, 2012); non-user values arise because of cultural and existence

aspects. An example of non-user value is when “...transport services may be valued by individuals for specific groups such as the handicapped or elderly people” (Geurs and van Wee, 2004, p. 138). Option and non-user benefits help provide justification for subsidizing public transport services (Roson, 2001). Geurs and van Wee (2004) conclude there is a need for utility-based accessibility measures in policy evaluations; mobility should be added.

Israel-Schwarzlose et al. (2014) conducted a choice experiment survey involving residents in three counties in Texas to value days of operation, hours of operation, type of route, and senior fare for rural transit. WTP amounts for the transportation attributes are similar across counties, with residents tending to value more flexible options over the least flexible option. The most flexible option may not have the largest WTP. Most important, county residents’ WTP may not cover the cost of desired improvements to the transportation systems. In an extension of Israel-Schwarzlose et al. (2014), Mjelde et al. (2016) show students’ valuation of the attributes may differ from that of the general population. Inference from both studies is that the non-elderly value elderly mobility.

Literature directly addressing the economics of *rural* transportation for the elderly and disadvantaged is sparse. Although research is necessary in this area, one should not ignore the literature on urban transit systems. Only a small sampling of this literature is presented.

Research Team Meeting

Subconference Team and Structure

Subconference team members were recruited through a call for members in summer 2016 that was sent to agricultural economics and economics departments. The call was also sent to various lists interested in rural development and transportation. The call was for both established and early-career professionals (including students) with a strong interest in rural transportation and/or elderly issues. Accepted members agreed to collaborate both before and after the subconference. The subconference was associated with the 2016 National Conference on Rural Public and Intercity Bus Transportation (RIBTC). Team members also participated in RIBTC activities. Members range from a master of science student to established academic professionals (see the list of subconference members at the beginning of this white paper).

The 22nd RIBTC was held October 3–5, 2016, in Asheville, North Carolina. Approximately 400 individuals registered onsite at the conference. Attendees included Federal agency personnel (FTA, Interior, and Fish and Wildlife), State departments of transportation personnel (planners and administrators with statewide responsibility), transportation providers (transit, health and human service, tribal, veterans, and intercity bus), researchers, consulting firms, and vendors. Attendees participated in a broad program of meetings organized to facilitate learning and sharing about the latest in best practices and current research in mobility and access in rural communities. The conference included multiple subject tracks: planning and design; policy, funding, and finance; rural transportation in today's operating environment; technology and training solutions; and special topics in rural mobility.

During the RIBTC, the subconference team met formally twice. At a kickoff meeting for USDA Adjoining Conference team members and at the USDA Economics and Rural Transportation Research Needs – Open Discussion. Further, team members helped at the subconference Expo booth, which included the goals of the subconference. The booth staff offered general discussion with RIBTC attendees and questionnaires for participants to complete.

Before the conference, all members interactively developed background material. The team later updated this material, which forms the background and economic review part of this white paper. Finalization of the white paper took place after the RIBTC. Background material, survey results, and the open discussion form the basis for the recommendations of this white paper.

USDA Economics and Rural Transportation Research Needs

An open discussion session was held as a concurrent final session of the RIBTC. All conference attendees were invited to attend (Appendix A) and discuss issues concerning rural transportation as it affects their organization. The discussion was a forum to encourage the exchange of ideas and concerns from differing perspectives. A wide range of people involved in rural transportation attended. Non-subconference participants represented transportation systems that ranged in service area from remote areas to areas near larger cities. In addition, one participant was a Federal Government employee, while two others worked for rural transit consulting firms.

Attendees' work locations included the East Coast, Washington, D.C., New York State, the Midwest, and Colorado.

The frank and lively discussion lasted for approximately two hours. The discussion opened with a short synopsis of the subconference goals, and then the floor was open to any attendee or subconference team member. It was clear from the discussion that although many providers face the same set of problems, there are individual problems unique to each provider. Size of the service provider's ridership and area create unique problems. Problems faced by providers whose main ridership was people commuting to work from rural areas to the urban center differed dramatically from the problems faced by providers whose main ridership was people, individually or in small groups, traveling from their rural home(s) to appointments such as medical appointments in a city miles away. The discussion ranged from very specific topics an individual provider faces to more speculative, abstract, and theoretical issues of rural transit. Through the discussion, it became apparent that there is no one-size-fits-all set of problems or solutions. Similarly, there is no single type of rural transit provider.

A fundamental question asked was "Do we need transit services in rural areas?" Though all the participants were involved in rural transit, answers to this question and associated issues were diverse. While some answers may not be new, others were unexpected. Issues associated with a perceived need for rural transit include: transportation as a livability issue; how to properly measure and interpret benefits and opportunity costs; quality and quantity of life changes with and without mobility; is cost-benefit analysis needed and is it appropriate; and how to value rural people and places – encourage/explore migration based on needs.

The question arose if it is a market failure that rural transit is not provided to all. Choosing to live in rural areas (like all areas) comes with its own set of benefits and costs. By making this choice, rural residents consider the benefits of the rural package greater than the costs. How, if at all, do they value transit within that package?

Speculative, abstract, and theoretical issues involve a wide range of topics. One issue is the stigma of public transport and the role of the automobile in rural culture. Issues were raised about how to get potential riders to accept public transportation to increase ridership and remove negative connotations about using public transportation. The need and purpose of providing incentives rather than penalties (negative connotations) for ridership were mentioned.

Along these lines, a concern was raised about the ambiguity generated by the different meanings of *public transit* existing among local officials (given attitudes and existing knowledge) who influence the acceptance and funding of public transit. Riders' potential adverse selection, moral hazard issues, asymmetric information, and externalities of rural transit were discussed. The need to examine economies of scale using cost data was mentioned. Further, examination of this need will help address sizing issues in the management topic. Institutional issues discussed in the meeting included examining rural transit at levels of aggregation higher than the local provider level and considering combining service providers across agencies and areas to avoid duplication.

By far, the topic generating the most discussion was the management and day-to-day issues associated with rural transit providers and providing accessibility and mobility to their clients.

Concerns arose if the current business model of rural transit is sustainable. For example, the tailoring of transit to a highly individualized level, such as using a van to transport a single person for several hours, was challenged. Many transit systems are funded by local taxes, but riders need service that extends beyond local boundaries. Additional funding comes from competitive funding grants, but small providers lack a grant staff, placing them at a disadvantage. Funding is often tied to performance measures, which vary greatly by size of ridership. If riders per trip, for example, are the measure, a more populated rural area will have a better performance measure (more riders per trip and more fare box recovery) than a same-distance trip in a desolate area. Some States allocate grant funds for rural transit using a combination of land area and population measures and efficiency and effectiveness performance measures.

Boundary issues also arose. Right-sizing and appropriate service mixes are issues that providers face. Another question was how many rural transit riders live below the poverty level. Further, can we identify new services, or can service combinations be identified that would appeal to potential users and to transit authorities where there are gaps in service? What are these gaps? What is (are) the threshold level(s) for economic viability for new services?

One provider, whose main ridership is one or a few riders (living in a rural area) needing transportation to appointments in a city miles away, provided some insights. There is a need for more cost-effective methods for necessary single trips. Issues faced on a daily basis include differing appointment lengths (forcing co-riders to have to wait to return home), the need to balance co-riders' needs and incorporate social aspects into trips, and specialists' potential willingness to schedule co-riders on the same day at approximately the same time to shorten or decrease the number of trips.

How future developments may improve rural transportation was also discussed. These developments ranged from bizarre to mundane. One participant noted that by purchasing tickets, people in Sweden can mail themselves through their postal service using the same vehicles that transport mail—the point being it is time to think outside the box, not only in the use of existing constructs and infrastructure but in opening the table to any and all innovations.

Volunteer incentives need to be addressed. Medicaid, for example, compensates volunteers for mileage when using their own vehicle but neglects considerations such as the opportunity cost of time for the individual who drives a Medicaid-eligible individual. Participants felt there was a need for more professional, better-funded rural volunteer driver programs to fill gaps in existing transit coverage. Safety issues and insurance were two important points brought up in response to volunteers.

Transportation disadvantage is a broad term ranging from permanent disabilities to temporary disadvantage, such as when a car is broken down. Transportation advancements may work for some people (and areas) but not others. Autonomous vehicles may work for people who are transportation disadvantaged but not for some people with disabilities. Those with disabilities may need passenger assistance, which autonomous vehicles cannot offer. In addition, the infrastructure required to support such technologies might not exist in many of the rural regions of the United States. Another example is car sharing, which would work in some instances but would not help a person who does not drive unless they have a driver available, in which case the

need for sharing a car likely would not exist. Organizations and websites such as ITNAmerica.org are not only improving awareness of rural transportation issues but helping to address these issues.

Information technology (IT) was seen as a way to improve services. Mobility-on-demand services can take advantage of IT as the aging population becomes more tech savvy. Improved data collection and, maybe even more important, data sharing may improve the efficiency of transit systems. Furthermore, improved and better access to data about the elderly and transportation disadvantaged, such as people's longevity after losing their driver license, would help in exploring many rural transit issues. A transit service provider with a large number of military veterans living in its area brought up the questions of how transit can help veterans, who are disproportionately located in rural areas compared to the general population, integrate back into society.

Additional comments were made about economic development and transit. Improved transit can lead to increased quality of life for rural residents and economic development in the area. One aspect raised was the need for rural transit to incorporate a tourism element into planning.

Obviously, the discussion is summarized here. At the conclusion of the discussion, all participants stated they greatly appreciated the forum and the opportunity to present their views. The consensus was that the attendees hoped Federal and State agencies would listen to their concerns. The views presented could help guide Federal, State, and local agencies in addressing the areas where improvement is needed.

Conference Questionnaire

A nonrandom survey of registered participants at the 2016 RIBTC held in Asheville, North Carolina, October 3–5, 2016, was conducted. A questionnaire was included in each participant's registration packet. In addition, questionnaires were available at the subconference booth in the Expo part of the RIBTC. In the registration packet, a stylus pen to complete the questionnaire and a bookmark ruler with the subconference agenda were given to RIBTC attendees. Participants were informed that those who returned a questionnaire would be entered into a drawing for either an Amazon gift certificate or a handmade Bethlehem Olivewood pen and pencil set.

The questionnaire was designed to obtain the participants' opinions rather than their organization's view because of the diverse nature of respondents. Questions are partially based on questions asked by Coughlin and Proulx (2012). A copy of the questionnaire is in Appendix B. Texas A&M University Institutional Review Board approval was obtained (approval number IRB2016-0667M).

Three hundred and eighty questionnaires were distributed to individuals who picked up their registration packet. Eighty-one questionnaires were returned, giving a response rate of 21 percent. Nonresponse bias occurs in surveys whenever the responses of those who completed the survey differ from the potential responses of those who did not respond. In this study, 79 percent of the population did not respond to the survey. No attempt was made to judge any nonresponse bias.

Survey Results

Respondents and Their Organizations

The lack of demographics on conference attendees and transit stakeholders precludes assessing whether the survey sample is representative of the populations of either conference attendees or rural transit stakeholders. The sample, however, demonstrates considerable respondent and organizational diversity (Table 5). More females (58 percent) responded than males (42 percent). Respondents ranged in age from 24 to 86 years old, with an average age of 49. Most respondents are white. Approximately 39 percent of the respondents rate themselves as politically conservative or very conservative, 42 percent liberal, and the remainder centrist or other.

Respondents have a variety of roles in their organization, including many respondents with multiple roles (Table 6 and Table 7). The type of organization employing the respondents is also diverse, with nonprofit organizations (26 percent), and local (20 percent) and State governments (17 percent) employing the most respondents. In terms of territory served, 25 percent of the respondents' organizations have a national scope. The majority of organizations do not have a main objective to serve or advocate for a specific segment of the population. Fifty-four percent of the respondents' organizations are directly involved in providing transportation services. Respondents' work location is in 29 States and Washington, D.C.

Table 5. Respondents' Characteristics.

Age	Years	Gender	Percent
Mean	49.4	Male	41.8
Maximum	86	Female	58.2
Minimum	24	N	79
St. Dev.	13.8		
N	78		

Race/Ethnic Background	Percent	Political Leaning	Percent
White	87.3	Very conservative	2.5
African American/Black	5.1	Conservative	36.7
Native American, Alaska Native, or Native Hawaiian	2.5	Centrist	16.5
Hispanic/Latino	2.5	Liberal	34.2
Asian	1.3	Very liberal	7.6
Mixed Race	1.3	Other	2.5
N	79	Boy Scout leader 30+ years "...to help other people at all times..."; open minded and don't label myself	
		N	79

St. dev. is standard deviation. N is the number of respondents responding to the question; for some questions, respondents indicated more than one answer. See Table 7 for open-ended responses to the various questions.

Table 6. Characteristics of Respondents' Organizations—Percent of Respondents.

Role in Organization	Percent	Type of Organization	Percent
Management	60.5	Nonprofit organization	25.9
Project management	23.5	Local government	19.8
Transportation planner	24.7	State government	17.3
Accountant/financial analyst	6.2	Private firm	13.6
Scheduler/dispatcher	2.5	Intrastate region (e.g., planning district or association of governments)	6.2
Vehicle maintenance supervisor/technician	2.5	Federal government	4.9
Board member	1.2	Public university/college	4.9
Vehicle operator/driver	1.2	Private university/college	2.5
Elected official	0	Tribal government	1.2
Other	22.2	Multistate region	0
N	81	Other	12.3
		N	81

Mechanisms Used to Gauge the Needs of the Rural Elderly	Percent	Agency Serviced Territory	Percent
Surveys of riders	60.8	National	24.7
Meeting with stakeholders for the elderly and individuals with disabilities or in poverty	49.4	One or multiple States	75.3
Telephone comments	40.5		
Surveys of the general public	39.2		
Meeting with elected officials (e.g., tribal leaders and local/State officials)	35.4	Organization's Main Objective Is to Serve or Advocate for a Specific Segment of the Population	Percent
Public meetings at regular intervals	34.2	No	79.0
Ad hoc public meetings (e.g., commentary for a new route or service changes)	29.1	Yes	21.0
Online comments	25.3		
Research studies	25.3	Organization Operates Transportation Services	Percent
Do not specifically gauge the needs of the elderly and disadvantaged rural populations	20.3	Yes	54.3
Other	10.1	No	45.7
N	79	N	81

N is the number of respondents responding to the question; for some questions, respondents indicated more than one answer. See Table 7 for open-ended responses to the various questions.

Table 7. Open-Ended Responses to Various Questions.

Other Responses to Role in Organization
Assistant director; business development for transit management firm; executive director; grant officer for DOT; human services transportation plan coordinator; marketing; mobility manager/trainer/consultant; program manager; research assistant; researcher; safety officer; State DOT office of local transit support; student; systems engineer; vehicle analyst/procurement; vendor; volunteer
Other Responses to Type of Organization
An authority; bus manufacturer; consulting; human services; insurance; joint powers authority; public commissions; regional government; research; travel industry
States Agencies Provide Services
Multistate (Alabama, Missouri, Louisiana, Texas, Florida) (Massachusetts, New Hampshire, Maine, New Jersey) (North and South Dakota, Colorado, Wyoming) (Ohio with one stop in West Virginia); Arizona (2); California (4); Colorado; Florida; Georgia; Idaho; Illinois (3); Iowa (2); Kansas (2); Louisiana (4); Maryland; Michigan; Missouri; Nebraska (6); Nevada; New York; North Carolina (14); Ohio; Oklahoma; Oregon (2); Tennessee; Texas (2); Utah; Virginia; West Virginia (2)
Organization's Main Objective Is to Serve or Advocate for a Specific Segment of the Population
5310-Urban/5310-Rural/EDTAP-Urban; aging and people with a disability also public transportation; county department of social services; elderly (2); elderly and rural residents; elderly/people with disabilities (3); for in-home and community-based support services; work with all branches of the military/job corps students/Indian reservations; anyone/everyone needing public transit (4)
Other Responses to Mechanisms Used to Gauge the Needs of the Rural Elderly
Direct outreach through churches, community events, social media; mobility management and travel training programs; one-on-one consultation; surveys of transportation, aging, and disability organizations; TAG (Transit Advisory Group); unmet transit needs process; updated to TDP, coordinated plan, and unmet needs process
State Office Is Located (the State of Your Work Address)
Arizona (2); California (4); Colorado (2); Florida (5); Georgia; Idaho; Illinois (6); Indiana (2); Iowa (2); Kansas (2); Kansas City (State not clear); Louisiana (4); Maryland (2); Massachusetts (3); Michigan; Missouri; Nebraska (6); Nevada; New York; North Carolina (14); North Dakota; Ohio (2); Oklahoma; Oregon (2); Tennessee; Texas (4); Utah; Virginia (3); Washington, D.C. (3); West Virginia (2)

The number in parenthesis indicates the number of respondents indicating the particular answer.

The respondents' organizations use a variety of mechanisms to gauge the needs of the rural elderly (Table 6). Approximately one-half of the organizations use meetings with stakeholders and surveys of riders. Approximately 20 percent of the organizations do not specifically gauge the needs of the elderly and disadvantaged rural populations. Of the 44 respondents indicating their organization provided transportation services, demand response is the most common service being provided by 84 percent of the organizations (Table 8). The FTA Section 5311 Rural Area Formula funds provided funds to over 90 percent of the organizations.

Table 8. Characteristics of Respondents Whose Organization Is a Transportation Provider.

Services Provided	Percent	Sources of Funding	Percent
Demand-response bus	84.1	FTA Section 5311 Rural Area	90.9
Fixed-route bus	43.2	Formula	56.8
Flexible/deviated bus	31.8	State funds	56.8
Intercity bus	27.3	County funds	56.8
Vanpool	13.6	FTA Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities	54.5
Bus rapid transit	6.8	Grants or donations	47.7
Other	13.6	City funds	29.5
Demand-response minivans; non-emergency medical transportation; provide these services in 31 different areas; volunteer driver reimbursement		FTA Section 5307 Urbanized Area Formula	18.2
		Tribal funds	9.1
		Other	43.2
		ARDA Agency on Aging Funding; contract funds (5); fares (3); Federal Lands Highway Program/Federal Lands Access Program; fundraising; in-kind match from Greyhound (2); Medicaid contract; non-emergency medical transportation; Old Americans Act; parking revenues, lodgers tax contracts; senior tax programs, AAA, etc.; volunteer time	
Ridership	Riders	Organization Provides Trips to the General Public	Percent
Mean	2,427,244	Yes	95.5
Maximum	44,000,000	No	4.6
Minimum	600		
St. Dev.	8,350,247		

Based on 44 respondents who provided useable responses (except ridership, which is based on 40 respondents). For some questions, respondents indicated more than one answer.

Respondents' Opinions

Opinions are discussed based on the number of respondents answering each statement or question. The opinions are discussed in relation to the grouping of questions presented in the questionnaire (Appendix B). No statistical analysis was undertaken.

Generally, respondents agreed or strongly agreed with the following statements: demand for transportation services for the elderly has increased over the last 10 years, the late elderly will be more active and mobile in the future, and the late elderly will need additional transportation services to meet their needs (Table 9). Respondents tended to disagree with the statement that the elderly will require comparatively less assistance with transit services than at present. Further, respondents felt transportation services for the elderly in 20 years will be different than present services. One change may be that technological advances will alter how assistance with transportation will be provided to the elderly. Respondents tended to agree or strongly agree with the statement that the government should play a very large role in providing rural transit for all

elderly and disadvantaged persons, but respondents were more neutral about whether the political influence of the elderly will increase in the future. Opinions about the role of government may be related to the number of respondents working for national, State, and local governments.

Respondents tended to agree that transit innovations have generally resulted in mobility improvements for the elderly and disadvantaged populations (Table 10). Respondents felt that transit innovations have improved both the elderly and general population; however, respondents felt innovations for the elderly have helped the general population more than innovations for the general population have helped the elderly. Opinions were more divided on whether these innovations have reduced costs per trip. Most respondents felt the government is not adequately funding infrastructure, institutions, and services to meet the future needs of the elderly and disadvantaged.

In line with the respondents' opinions of funding, respondents tended to feel that governments are not adequately prepared to meet the elderly's future transportation needs (Table 11). More respondents disagreed than agreed with the following statements: 1) Federal, State, and local governments' long-range transportation plans will meet the transportation needs of the rural elderly and disadvantaged in 20 years; 2) current rural land-use policies encourage walking, transit-oriented development, and other initiatives to promote livable communities for elderly and disadvantaged; and 3) rural areas are currently employing creative land use, integration of multimodal transportation options, strategic investments in transit, and transit accessibility to improve the mobility of the elderly and disadvantaged. Respondents are consistent in that they tended to feel people will be less reliant on their own vehicles and there will be an increase in use of alternatives to driving in the future.

Respondents tended to be ambivalent about potential innovations to their industry. Among all the innovations listed in Table 12, only "public-private partnerships to provide transportation" and "increased acceptance of technology by the elderly and disadvantaged for everyday activities" had more respondents answering "noticeable changes" or "major changes" than "little to no change."

Volunteer-provided transportation, programs assessing and improving senior driver abilities, and partnerships using school buses have the most respondents feeling they will have no change in the demand for public transit in rural areas. Opinions concerning fully automatous vehicles had the largest standard deviation, suggesting that respondents had the largest range of responses concerning the impact of this forthcoming technology. A listing of other innovations in rural transit provided by the respondents is given in Table 13. Many different innovations are being used; the effect of these innovations beyond the immediate local area appears to be small.

Table 9. Number of Respondents Indicating Their Level of Disagreement and Agreement to Question 6—How Much Do You Agree or Disagree with Each of the Following Statements about the Future of Transportation Services for the Elderly in Rural Areas?

Statement	Mean	St. Dev.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N
Demand for transportation services for the elderly has increased over the last 10 years.	4.46	0.57	0	0	3	38	40	81
The late elderly (75+) of the future will be more active and mobile than in the past.	4.21	0.75	0	3	7	41	30	81
The late elderly (75+) of the future will need additional transportation services to meet their needs relative to today's elderly.	4.28	0.75	0	2	8	36	35	81
In the future, the elderly will require comparatively less assistance with transit services than at present.	2.48	1.07	14	34	15	16	2	81
Technological advances are likely to alter how assistance with transportation will be provided to the elderly.	4.12	0.70	0	2	9	47	23	81
The political influence of the elderly will increase in the future.	3.67	0.84	1	5	25	39	11	81
Transportation services for the elderly in 20 years will be different than present services.	4.36	0.62	0	1	3	43	34	81
Government should play a very large role in providing rural transit for all elderly and disadvantaged persons.	4.11	0.87	1	3	11	37	29	81

Mean and standard deviation are based on the coding of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. N gives the number of respondents answering each statement.

Table 10. Number of Respondents Indicating Their Level of Disagreement and Agreement to Question 7—How Much Do You Agree or Disagree with Each of the Following General Statements about Mobility for the Elderly and Disadvantaged Populations in Rural Areas?

Statement	Mean	St. Dev.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N
Over the last 10 years, transit innovations have generally resulted in mobility improvements for the elderly and disadvantaged populations.	3.98	0.74	1	2	11	51	16	81
Over the last 10 years, transportation innovations have generally resulted in a reduction in costs per trip.	3.21	0.80	0	15	38	24	4	81
Efforts to provide better transportation services for the elderly and disadvantaged populations also improve mobility for the general population.	4.25	0.70	0	1	9	40	31	81
Efforts to improve mobility for the general population typically also improve mobility for the elderly and disadvantaged populations.	4.05	0.84	0	6	8	43	24	81
The Federal, State, and local governments are adequately funding infrastructure, institutions, and services to meet the future needs of the elderly and disadvantaged.	2.09	1.03	27	31	13	9	1	81

Mean and standard deviation are based on the coding of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. N gives the number of respondents answering each statement.

Table 11. Number of Respondents Indicating Their Level of Disagreement and Agreement to Question 9—How Much Do You Agree or Disagree with Each of the Following Statements about the Rural Elderly and Disadvantaged Populations in Rural Areas?

Statement	Mean	St. Dev.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N
Relative to today, in 20 years government subsidies for transit for the elderly and disadvantaged will make up a greater share of total transit costs.	3.38	0.89	1	14	24	36	5	80
Federal, State, and local governments' long-range transportation plans will meet the transportation needs of the rural elderly and disadvantaged in 20 years.	2.63	0.99	8	32	25	12	3	80
In 20 years, most elderly and disadvantaged will have to rely on their own vehicles or rides with family and friends to meet their transportation needs.	2.69	0.89	3	37	24	14	2	80
The number of the elderly and disadvantaged using alternatives to driving will increase in the future.	3.99	0.70	0	5	5	56	14	80
Current rural land-use policies encourage walking, transit-oriented development, and other initiatives to promote livable communities for elderly and disadvantaged.	2.56	1.03	12	31	17	20	0	80
Rural areas are currently employing creative land use, integration of multimodal transportation options, strategic investments in transit, and transit accessibility to improve mobility of elderly and disadvantaged.	2.65	0.97	8	31	23	17	1	80
Rural residents bear a personal responsibility to ensure they are able to meet their transportation needs as they age.	3.16	0.96	4	17	23	34	2	80

Mean and standard deviation are based on the coding of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. N gives the number of respondents answering each statement.

Table 12. Number of Respondents Indicating Their Level of Disagreement and Agreement to Question 10—Please Indicate How the Following Innovations, Institutional Changes, Transportation Alternatives, etc. Will Decrease the Demand for Public Transit in Rural Areas.

Statement	Mean	St. Dev.	Little to No Change	Some Change	Noticeable Changes	Major Changes	Unsure	N
Transportation network companies (TNC) (e.g., Uber, Lyft)	2.62	1.15	13	29	21	12	6	81
Volunteer provided transportation—faith based, nonprofit, elderly provided, etc.	2.05	1.08	28	34	10	5	4	81
Laws providing limited liability to providers of volunteer services (faith based, nonprofit, elderly provided, etc.)	2.46	1.24	16	37	13	5	10	81
Fully autonomous vehicles (e.g., Google self-driving cars)	2.65	1.42	24	17	14	15	11	81
Safe vehicle enhancements (e.g., smart braking, back-over prevention, and night vision)	2.26	1.16	24	29	16	7	5	81
Sharing of vehicle ownership expenses (e.g., multi-household ownership of a car)	2.16	1.13	25	34	11	6	5	81
Public-private partnerships to provide transportation	2.65	0.99	10	26	29	14	2	81
Partnerships with schools to use buses during off hours or student volunteers	2.16	1.32	33	24	11	4	9	81
Voucher programs such as for taxi fee payments	2.35	1.05	16	35	21	4	5	81
For profit transportation companies that specifically market to the elderly and disadvantaged	2.49	1.15	14	35	17	8	7	81
Increased acceptance of technology by the elderly and disadvantaged for everyday activities (e.g., shopping or personal interactions)	2.72	0.91	6	28	32	13	2	81
Programs assessing and improving senior driver abilities	2.12	1.03	27	25	24	2	3	81
Programs to improve the elderly and disadvantaged cognitive and physical abilities	2.36	1.22	21	32	13	8	7	81

Mean and standard deviation are based on the coding of 1 = little to no change, 2 = some changes, 3 = noticeable changes, and 4 = major changes. Unsure is not included in the mean and standard deviation calculations. N gives the number of respondents answering each statement.

Table 13. Open-Ended Responses to Question #11—What Other Innovations Are People Using to Make Transportation Available in Rural Environments?

No.	Response
1	1. Community mobility education—way2go.org / 2. Integrating transit & carshare—rural seniors take bus to town, use carshare for shopping trips, take bus home / 3. Income-eligible van pool subsidies / 4. I-call, I-click call centers / 5. Subsidized group ride taxis / 6. Electric bikes / 7. Rideshare-car pool, vanpool / 8. Guaranteed Ride Program—to and from work
2	Accessible on-demand transportation fits the needs of the rural elderly
3	Apps (liberty)/van share/mobility management
4	Bike lanes in rural western North Carolina
5	Carpooling with friends
6	Carsharing (owned by private capital)/improved bike and ped facilities
7	Churches developing transit systems for the rural areas
8	Connecting the elderly to transportation through apps, phone calls, etc./the rich volunteering their money or drivers
9	Deviated fixed routes
10	Donate your car to volunteer organization; get free rides up to value of donation
11	Even in our declining population public transit is getting used more. Not much competition for rides. Gas prices indicator.
12	I am unsure
13	Improving public transportation systems/vehicle sharing
14	Including access to public lanes as part of a scheduled or on-demand transit/mobility service
15	Increased importance of multimodal considerations in jurisdictions with adopted complete streets policies. Ex: Illinois DOT having adopted complete streets...have to consider at the very least. DOT has control of most major rural roadways.
16	Land use-walkable communities
17	Linking health care facilities and public transit systems through real-time online reservations, etc.
18	Local coordinated “rural” planning effort underway. Most rural communities have no plan. This will be the first.
19	Members programs/total volunteer programs/P3s
20	More group transportation
21	N/A
22	Not much in low-income rural areas especially those long distance from services
23	Partnerships to vanpool/co-bus locations for school bus and public transit stop
24	Surveys
25	TNCs specific to rural, elderly markets/improved transportation service (same-day reservations, more reliability)
26	Uber
27	Unknown
28	Unsure
29	Volunteer programs/Uber (maybe)/public transit

Only 10 percent of the respondents felt age-related rural transit issues had a high agenda status (Table 14). Most respondents' opinions are that competition for attention (22 percent) and for resources (54 percent) are the main reasons rural elderly transportation issues are not high agenda items. More respondents felt funding for the next generation of rural transit elderly and disadvantaged needs should come from the public sector (28 percent) or equally from public and private sources (69 percent) than met by private sources (3 percent). However, 45 percent of the respondents agreed rural residents bear a personal responsibility to meet their transportation needs as they age (Table 11).

Finally, respondents were posed open-ended question/requests: "How best can the USDA contribute to improving transportation services, especially for the elderly and disadvantaged populations?" (Table 15) and "Please provide any additional comments or thoughts" (Table 16). The most frequently mentioned issue was funding. Funding appears to remain one of the most important issues in rural transit. Several respondents indicated that rural transit may be on its way out; as stated by one respondent, "Rural transportation is becoming economically ineffective." Quality of life is also an important issue; one respondent's comments provide a good definition: "Quality of life isn't medical care or death with dignity but LIFE." Impressions from reading the comments indicate the respondents consider rural elderly and disadvantaged transit issues important issues in the United States, and think that more discussion, research, and funding are necessary. As to USDA's role, respondents had many suggestions, but it appears they are not familiar with USDA's agenda or goals. In fact, one conference participant whose one role is to develop partnerships between Federal agencies stated in a private conversation outside the survey that he had never considered approaching USDA for transit issues but will look into such partnerships.

Table 14. Percentage of Respondents Indicating Their Beliefs on Funding Agenda Status and Funding Sources for the Elderly and Disadvantaged.

Primary Reason Age-Related Rural Transit Issues Are Often Believed to Have a Low Agenda Status	Percent	The Next Generation of Rural Transit Elderly and Disadvantaged Needs Should Be Met	Percent
I disagree; it has a high agenda status	9.9	More by the public sector	28.4
Competition for attention—the transportation agenda is crowded (other important issues grab public attention and funding, such as safety and congestion)	22.2	Public and private sector equally	69.1
Competition for resources, including funding	54.3	More by the private sector	2.5
Changing perception of aging—old is now older than years ago (it will become an issue in future decades but is not an issue now)	7.4		
Other	6.2		
Written responses to Other: After a certain period, the aging became invisible; few are advocating for themselves; insufficient public attention is paid; not yet integrated with health care delivery—this is changing; transit does better in Arizona when we focus on aging in place as a focus of transit			

Based on 81 respondents.

Table 15. Open-Ended Responses to the Question #23—How Best Can USDA Contribute to Improving Transportation Services, Especially for the Elderly and Disadvantaged Populations?

No.	Response
1	By embracing technology and automation, and by being willing to try new and different ideas
2	Change the mindset. We concentrate on affordable elderly/disadvantaged transport for the essentials like medical but people need more than that for quality of life that reduces medical need. Things like get people to the grocery store every day to intercity, get grandpa to the McDonald's at 0630 every morning so he can get senior citizen coffee and solve the worlds' problems. Quality of life isn't medical care or death with dignity but LIFE.
3	Consistent funding
4	Coordinate with USDOT
5	Could fund trips to grocery store, food banks, and farmer's market, possibly by voucher
6	Create dedicated funding for rural public services
7	Don't know
8	Educate elderly to remove fear of giving up their "freedom" by depending on others for transportation
9	Education about alternative funding sources. Local option sales tax based on need services for elderly and people with a disability. Education programs for the elderly.
10	Education and training opportunities/funding
11	Ensure that USDA monies allocated to provide transportation actually make it to the transit systems, even if it comes in the form of fare revenue
12	Figure out their needs and if they will use transit
13	Financial local match especially for capital items
14	Free hamburger program after x number of rides
15	Funding
16	Funding
17	Funding for programs
18	Help provide P3s for transit for rural areas. Support HSTs in rural areas.
19	I honestly don't know how the USDA relates to transportation services and would love to know more about this
20	I'm uncertain of USDA's capacity to contribute
21	Improve public transportation overall
22	It would be great to do marketing that can be done nationwide supporting transit. The RTDP marketing tool kit is not sophisticated enough. We'd like ads we can personalize. Something to convey the importance of transit for all.
23	More subsidies
24	N/A
25	Need best way to get word out what is available. In our area have three senior centers in our county of 60,000 population.
26	Need to do more
27	Not have a NEMT broker
28	Pilot projects so communities can try new solutions to providing transportation without having to provide a local match
29	Provide flexibility in regulations so that providers can work with multiple Federal funding agencies. Discourage States from putting additional regulatory burdens onto programs/providers.

No.	Response
30	Provide flexibility with transportation funds in rural areas
31	Provide more vehicles
32	Provide transportation to grocery stores & markets, especially farmers' markets. Partner with USDOT to develop grant programs to connect transportation nutrition.
33	Provide vouchers for transportation participants. Work with providing system to advertise transit services. Many think that public transportation is for the elderly.
34	Rural areas do not have funding to match Federal/State funds. Therefore, they have little transportation, vehicles, operations.
35	Sensible funding programs to enhance expansion of existing transit services
36	Support agencies with funding and technology to reduce administrative paperwork and reduce having to enter each trip 2-3 times in programs
37	The #1 problem for services is funding! There are plenty of companies ready, willing, and able to provide service, but the elderly and disadvantaged can't afford the cost. How this fits into USDA's agenda I have no idea!
38	There needs to be improved discussion about the costs of transit. Also more utilization of partnerships, new technologies, and better policies to adapt to them.
39	Unsure
40	USDA? Market availability of rural public transit? Encourage farmers to distribute sort of like a farmers' market meals on wheels? Use rural public transit?
41	We should explore this topic through web meetings. Contact *****.
42	Work more with transit agencies and DOTs, MPOs and the Forest Service, Federal Land Transit Program, and the Federal Lands Transportation Program
43	Work toward coordinating transportation funding to enable the elderly to continue to live in rural communities. Keep Social Security dollars in these rural communities and don't force elders to go to cities.

Table 16. Open-Ended Responses to the Question #24—Please Provide Any Additional Comments or Thoughts.

No.	Response
1	Good subject for a survey
2	I don't know a lot about the commuting practices of the elderly
3	I've been working with AAA since the mid-1990s and have never seen a penny spent on fare revenue, purchase of passes, or passing money thru to transit to get seniors to meal sites, etc. I think 100% our regions \$ is either hidden for the front-line AAA staff or totally supports meals on wheels.
4	Local funding is key
5	Looking forward to the results. I enjoy working with Texas A&M.
6	Many people with a disability age 40–50–60 need services due to chronic conditions
7	Personally, I envision a future where rural public transit is discontinued as a publicly funded resource—people are being “encouraged” to move to towns for all resources. Rural transportation is becoming economically ineffective.
8	Remote rural elderly and disadvantaged have very limited resources; they rely on assistance to age in place. Vouchers for at-will travel is a must.
9	Rural transportation is critical for equality and growth of society, improving educational, health and medical, and employment opportunities of all people. With the degrade of passenger rail and intercity bus over the last 50 years, we are no more “connected” as a people in the electronic age than we were in the stage coach age, and that connectivity is a public responsibility.
10	State DOT & USDOT could do more education on public transit as well as commit to funding capital projects at a level which brings vehicles replacement to a realistic point
11	Substitute “older adults” for “elderly”—a depersonalizing term. Especially, do not use “late elderly”—I don’t have a great solution, just simply say “adults 75 and older.”
12	Thank you
13	Thanks
14	There needs to be a method of communication by State DOTD, Medicare, transportation brokers, Older American Act Agency and State. We should be able to share information.
15	USDA can provide subsidies to locals to be used as match for Federal funds
16	We did a study in Arizona to gauge the perception of transit
17	You can contact me—*****

Research Recommendations

USDA, through its long history and presence in rural areas, is in a unique position to address rural transportation issues beyond commodity movement. The agency possesses unique contacts and knowledge that other agencies do not possess. At the same time, expanding from agriculture and rural infrastructure to addressing the needs of the rural elderly and transportation disadvantaged has costs; therefore, these needs may be better addressed by agencies with different expertise. USDA must decide if it wants to move into rural elderly and transportation disadvantaged issues. If it does, the next question is how best to use its limited funds.

This white paper does not address these important questions. The objective of this white paper is much narrower—to provide recommendations for applied, theoretical, and policy research. Although the white paper was funded by USDA, these recommendations are of broad interest to rural transit funding agencies and organizations.

Fundamental questions that arose throughout the conference and white paper development remain:

- Should we provide rural transportation for the elderly and transportation disadvantaged?
- If so, at what level?

The onus of child care is typically placed on parents; should equally dependent adults be more of a family issue? Society, however, does provide transportation for children to schools, and low-income programs exist. Should society provide similar programs for seniors and other socially disadvantaged people? Is there a market failure in providing rural transit?

The following recommendations provide information for addressing these fundamental questions along with informing management personnel and policy makers on available alternatives and their potential influences on individuals, communities, regions, and the nation. Not all rural transit agencies are the same; there is no one-size-fits-all set of problems or solutions. Five highly interrelated categories that form the recommendations are:

- **Theoretical issues**—Applied economic studies can lead to improved basic theoretical understanding while addressing the needs of rural transit.
- **Innovative solutions**—Rural transit is faced with increasing demand and limited funds; as such, innovative solutions are being proposed. The influence adoption of these solutions will have on rural areas should be determined.
- **Rural socioeconomic considerations**—The availability of rural transit influences the lives of those that rely on it. How individual needs translate into broader community issues including livability and sustainability of rural communities needs to be determined.
- **Economic assessment and evaluation of rural transit**—Rural transit has been subject to economic assessment studies, but because many studies rely on incorrect methods and assumptions, correct usage of economic and social assessments is necessary.
- **Information technology solutions**—Usage of technological advancements, including data collection, may improve the coordination and management of rural transit systems and needs to be addressed.

Each topic is discussed to support and clarify the above broad categories. By no means is this discussion comprehensive. While this white paper avoids recommending specific research topics or policies, a list of ideas generated by conference participants is included in Appendix C. Building a rural-specific research base toward systematically identifying and addressing rural transportation problems using common definitions is an underlying theme throughout the following recommendations. Multidisciplinary studies are necessary.

Theoretical Issues

Exploring rural transit issues provides unique opportunities that are not currently being exploited by economic research, some of which are highlighted here.

Demand

Demand Estimation

How will demographic and cultural changes in rural areas, innovations occurring in the transit field, and policy/funding influence the demand for transit by the rural elderly and social disadvantaged? As changes improve rural transit systems by improving travel conditions and accessibility and by decreasing travel costs induced and suppressed demand will be released. Determination of these latent demands is a challenging and basically untouched area in rural transit studies, but determining the overall demand for such services could have enormous impact on transportation service providers.

Willingness to Pay

Rural transit operates in an economically poorly defined market. Therefore, nonmarket techniques may be necessary to value the population's WTP for attributes and transit alternatives. Is the WTP larger than the costs? From a theoretical standpoint, WTP studies of rural transit provide some unique opportunities. One such opportunity is estimating option value. Option value, the risk associated with the potential future use of a service, has some interesting aspects associated with rural transit. Option value in this case may include values for the individual and the individual's family, with varying timing given different ages in the family. Ideas such as this need to be developed and explored to see if and how they are appropriate.

Supply and Cost-Efficiency

Supporting studies to examine costs and develop supply curves for rural transit are beneficial to many issues faced by rural transit. Such studies provide information required for many of the research recommendations. Addressing the proper service mix of vehicles and types of services, for example, requires coupling demand and supply estimates. There is clearly a lack of understanding of cost structures, supply, and efficiencies in the rural transit industry. Economies of scale and size are basically unknown. Given the unique aspects of providing transit to different riders, it is not clear if larger transit systems are more efficient than smaller systems. Are some programs more cost efficient than others while reaching the same clients?

Institutional Issues

Rural transit is seeking innovative solutions to meet the current and future needs of its riders. Many of these solutions involve institutional changes. One innovation mentioned in the

literature, for example, is partnerships among rural transit providers and other nonprofit, public, and private for-profit entities. Rural transit provides a unique opportunity to examine empirically and theoretically institutional issues associated with such partnerships, along with issues raised by Stiglitz (2015). Other institutional issues include funding issues and how government programs with differing objectives impact rural transit. Given the richness of rural transit, institutional studies (in the broadest sense) have the opportunity to have an impact in the economic literature, policy area, and rural transit provision.

Market Failures

Are limited rural transit services evidence of market failures that should be addressed by governments and other institutions, or are limited demand and service provision simply a function of small populations? Extending market failure theories and studies to rural transportation can help shed light on whether market failures exist either in rural passenger transportation markets themselves or in preventing the migration of rural residents to population centers with more robust transportation options and amenities.

Management

Whether operating within existing demand or seeking to expand demand, transit operators attempt to optimize their system's operation. Management decisions include route coordination, partnership with other systems or agencies, and equipment purchases and repairs. Transit management studies could leverage the vast economics management and operation research literature to improve rural transit system operations. Unique partnership opportunities within the transit sector provide fruitful opportunities for management researchers.

Other Theoretical Issues

Studies of interest include research into vertical and horizontal integration, rural choice of living and self-sorting (adverse selection and moral hazard), advertising, and participant learning (e.g., travel training). These are just a few of the multitude of issues that could be addressed.

Innovative Solutions

As demand for rural transit increases and funding sources are squeezed, rural transit is looking for and experimenting with a wide range of innovative solutions. The effect of these options on transit for the rural elderly and disadvantaged is relatively unknown. Speculation on the effects is abundant, but few research studies back up the speculation. It appears many of these supplemental options have the potential to greatly influence transportation for the rural elderly and socially disadvantaged at a local scale but not at the national scale, other than major technological advances.

Rural Socioeconomic Considerations

Transit is hailed as a path to economic development and growth, but does providing transit to the elderly and other transportation disadvantaged lead to economic growth? Social/economic impacts of not providing rural transit are relatively unknown. Obviously, there is a large impact on individuals relying on public transit, but what is the impact of not providing such services to

the community as a whole? Most evaluation studies have focused on mobility, but accessibility may be a better measure. What are the proper measures or metrics to evaluate rural transit?

These issues lead to evaluation of the livability of a community. Does providing adequate transit service to the elderly and disadvantaged enhance the livability of the region? Future research might include the role of the transit services on livability and the relationship between livability and sustainability. Demographic, policy, institutional, and technological changes are changing the demand for and supply of rural transit options. Public transit is only one such option. What are the economic and social implications to riders, providers, and communities of these changing conditions?

Economic Assessment and Evaluation of Rural Transit

Governments are interested in their return on expenditures. Differing returns are one basis for allocation of limited funds. Numerous methods, including multicriteria, input/output, social impact, benefit risk, and cost-benefit analyses, exist to provide evaluation of rural transit systems. Unfortunately, many of the previous evaluation studies are flawed at the conceptual level and/or based on incorrect methods and assumptions; there is a need for proper economic and social assessments. Previous studies, however, provide a framework of which benefits and costs to include in analyses. The proper conduct of such assessments relies on many of the previous research recommendations. Cost-benefit analyses, for example, rely on changes in producer and consumer surplus, which necessitates knowledge of how supply and demand will change under the proposed change. Numerous nonmarket and nonmonetarized aspects need to be included in these analyses, necessitating the use of nonmarket valuation techniques.

Information Technology Solutions

Technological advances are often touted as solutions to society's problems. It is unknown how such advancements will influence the demand and supply of rural transit as it impacts the elderly, social disadvantaged, and rural communities. Medical advances are allowing people to live longer, but does longer life mean increased need for transit by the rural elderly? Will technology decrease the need for transit? An example may be the decreased need for medical office visits as virtual medical diagnosis and treatment develop. But the elderly and people with disabilities need human interaction both for help with transit and mental well-being.

Technology also allows for improved data collection locally, regionally, and nationally. Will such collection and improved availability lead to improved coordination and management? Although viewed as a solution, technology brings in a different set of costs and benefits to society. Technology may improve the efficiency of transit systems through coordination, scheduling, and management.

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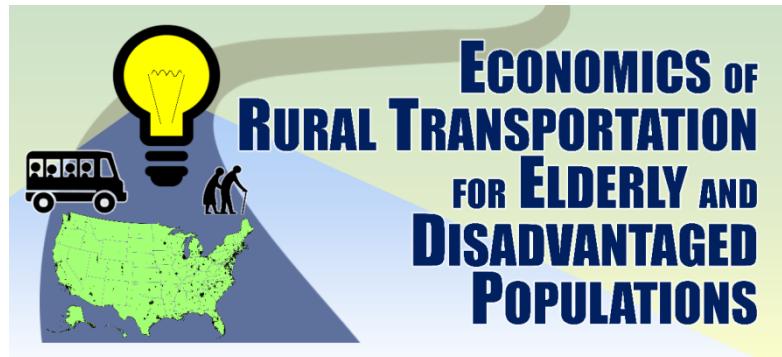
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Appendix A—One-Page Handout

A one-page description of the subconference objectives and activities included in National Conference on Rural and Intercity Bus Transportation attendees' registration packet.



United States Department of Agriculture
National Institute of Food and Agriculture

SPONSORED ADJOINING MEETING

THE TEXAS A&M
UNIVERSITY SYSTEM



An USDA-sponsored adjoining meeting within the



NEAR-TERM OBJECTIVE

The project aims to catalyze research on the economics of transportation for the rural elderly and disadvantaged population by convening established and early career economists with an interest in rural transportation topics to identify priorities, establish a network of collaborators, and publish a white paper. Further, opinions of federal, state, tribal-, and local stakeholders on transportation issues associated with the rural elderly (generally age 65+) and disadvantaged populations are being solicited. The white paper will provide guidance to the USDA and other agencies on the nexus of public transportation and economic research needs of elderly and disadvantaged populations in rural communities in the United States.

LONG-TERM OBJECTIVE

The long-term objective of the USDA funding the adjoining meeting is to enhance the provision of rural transportation options that improve the quality of life for elderly and disadvantaged rural populations and strengthen regional economies. Effective improvements in mobility may lead to rural community development and overall general economic improvements. Research-based improvements in the public transportation sector are also expected to inform research and policy in other aspects of regional rural service provisions.

GET INVOLVED

Get involved in the conversation

- Complete the survey (provided to you at registration)
- Visit our booth at the Vendor Expo, Booth #101
- Listen to the presentation discussing recent research on the economics of nonmedical transportation for the rural elderly and disadvantaged, Tuesday, 8 am, Windsor B
- Participate in our research needs meeting on Wednesday, 11:00 a.m.–1:00 p.m. in Windsor A (lunch provided)

MORE INFORMATION

For more information, contact economics adjoining meeting organizers

- Dr. James Mjelde, Texas A&M University, [\(j-mjelde@tamu.edu\)](mailto:j-mjelde@tamu.edu), (979) 845-1492
- Dr. Rebekka Dudensing, Texas A&M AgriLife Extension Service, [\(rmdudensing@tamu.edu\)](mailto:rmdudensing@tamu.edu), (979) 845-1719
- Jonathan Brooks, Texas A&M Transportation Institute, [\(j-brooks@tti.tamu.edu\)](mailto:j-brooks@tti.tamu.edu), (713) 613-9206

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Appendix B—Questionnaire

A survey questionnaire distributed to rural and intercity bus transportation attendees.

Meeting Transportation Needs for the Elderly and Disadvantaged Populations in Rural America



Funded by

United States Department of Agriculture (USDA)
National Institute of Food and Agriculture

The **purpose of this research study** is to collect the opinions of federal, state, tribal, and local stakeholders on transportation issues associated with the rural elderly (generally age 65+) and disadvantaged (groups historically subjected to racial or ethnic prejudice or cultural bias). The questionnaire should take 10-15 minutes to complete.

Attached please find a **stylus pen** to use in completing the questionnaire and a **bookmark ruler** with our meeting times (feel free to attend). If you return the survey to us at the vendor Expo (booth #101), you will be entered into a random drawing for **one of two Amazon gift cards or a handmade Bethlehem Olivewood pen and pencil set**. If you are unable to attend the Expo, you can return the questionnaire at the registration booth throughout the conference, at any of our meetings, or scan and e-mail the questionnaire to Rebekka Dudensing at rmdudensing@tamu.edu.

Participation is voluntary. You may decide not to participate or to withdraw at any time without affecting your current or future relations with the Texas A&M University System. **The records of this study will be kept confidential** to the extent permitted or required by law. If you have questions, please contact Rebekka Dudensing at rmdudensing@tamu.edu or **(979) 845-1719** or the Texas A&M University Human Research Protection Program office at 1-855-795-8636 or at irb@tamu.edu. Please reference study protocol #IRB2016-0667 Economics of Rural Transportation for the Elderly and Disadvantaged Populations.

Thank you for your time and participation.

Meeting Transportation Needs for the Elderly and Disadvantaged Populations in Rural America

Part 1. Your Organization

- 1. What is your role in your organization? *Circle all that apply***
 - a. Elected official
 - b. Board member
 - c. Management
 - d. Project management
 - e. Transportation planner
 - f. Accountant/financial analyst
 - g. Vehicle operator/driver
 - h. Scheduler/dispatcher
 - i. Vehicle maintenance supervisor/technician
 - j. Other _____

- 2. What type of organization do you represent? *Circle all that apply***
 - a. Federal government
 - b. Multi-state region
 - c. State government
 - d. Tribal government
 - e. Local government
 - f. Intrastate region (e.g., planning district, association of governments)
 - g. Private university / college
 - h. Public university / college
 - i. Private firm
 - j. Nonprofit organization
 - k. Other _____

- 3. In which state(s) does your agency provide services?**
 - a. National (all states)
 - b. State(s) _____

- 4. Is your organization's main objective to serve or advocate for a specific segment of the population (e.g., veterans, the elderly, individuals with disabilities, etc.)?**
 - a. No
 - b. Yes – please explain below

- 5. In what state is your office located (the state of your work address)?**

Part 2. Rural Transportation Challenges and Needs

6. How much do you agree or disagree with each of the following statements about the future of transportation services for the elderly in rural areas? Place an X in the appropriate box.

Example

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Asheville is a cool place for this conference.					X

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Demand for transportation services for the elderly has increased over the last 10 years.					
The late elderly (75+) of the future will be more active and mobile than in the past.					
The late elderly (75+) of the future will need additional transportation services to meet their needs relative to today's elderly.					
In the future, the elderly will require comparatively less assistance with transit services than present.					
Technological advances are likely to alter how assistance with transportation will be provided to the elderly.					
The political influence of the elderly will increase in the future.					
Transportation services for the elderly in 20 years will be different than present services.					
Government should play a very large role in providing rural transit for all elderly and disadvantaged persons.					

7. How much do you agree or disagree with each of the following general statements about mobility for the elderly and disadvantaged populations in rural areas? Place an X in the appropriate box.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Over the last 10 years, transit innovations have generally resulted in mobility improvements for the elderly and disadvantaged populations.					
Over the last 10 years, transportation innovations have generally resulted in a reduction in costs per trip.					
Efforts to provide better transportation services for the elderly and disadvantaged populations also improve mobility for the general population.					
Efforts to improve mobility for the general population typically also improve mobility for the elderly and disadvantaged populations.					
The federal, state, and local governments are adequately funding infrastructure, institutions, and services to meet the future needs of the elderly and disadvantaged.					

- 8. The next generation of rural transit elderly and disadvantaged needs should be met**
- more by the public sector
 - public and private sector equally
 - more by the private sector

9. How much do you agree or disagree with each of the following statements about the rural elderly and disadvantaged populations and rural areas? Place an X in the appropriate box.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Relative to today, in 20 years government subsidies for transit for the elderly and disadvantaged will make up a greater share of total transit costs.					
Federal, state, and local governments' long-range transportation plans will meet the transportation needs of the rural elderly and disadvantaged in 20 years.					
In 20 years, most elderly and disadvantaged will have to rely on their own vehicles or rides with family and friends to meet their transportation needs.					
The number of the elderly and disadvantaged using alternatives to driving will increase in the future.					
Current rural land-use policies encourage walking, transit-oriented development, and other initiatives to promote livable communities for elderly and disadvantaged.					
Rural areas are currently employing creative land use, integration of multi-modal transportation options, strategic investments in transit, and transit accessibility to improve mobility of elderly and disadvantaged.					
Rural residents bear a personal responsibility to ensure they are able to meet their transportation needs as they age.					

10. Please indicate how the following innovations, institutional changes, transportation alternatives, etc. will decrease the demand for public transit in rural areas.

Statement	Little to No Change	Some Change	Noticeable Changes	Major Changes	Unsure
Transportation network companies (TNC) (e.g., Uber, Lyft)					
Volunteer provided transportation – faith based, nonprofit, elderly provided, etc.					
Laws providing limited liability to providers of volunteer services (faith based, nonprofit, elderly provided, etc.)					
Fully autonomous vehicles (e.g., Google self-driving cars)					
Safe vehicle enhancements (e.g., smart braking, back-over prevention, and night vision)					
Sharing of vehicle ownership expenses (e.g., multi-household ownership of a car)					
Public–private partnerships to provide transportation					
Partnerships with schools to use buses during off hours or student volunteers					
Voucher programs such as for taxi fee payments					
For profit transportation companies that specifically market to the elderly and disadvantaged					
Increased acceptance of technology by the elderly and disadvantaged for everyday activities (e.g., shopping or personal interactions)					
Programs assessing and improving senior driver abilities					
Programs to improve the elderly and disadvantaged cognitive and physical abilities					

11. What other innovations are people using to make transportation available in rural environments?

12. Which mechanisms does your organization currently use to gauge the needs of the rural elderly and disadvantaged? *Circle all that apply*

- a. Telephone comments
 - b. Online comments
 - c. Public meetings at regular intervals
 - d. Ad hoc public meetings (e.g., commentary for a new route or service changes)
 - e. Meeting with elected officials (e.g., tribal leaders and local/state officials)
 - f. Meeting with stakeholders for the elderly, individuals with disabilities or in poverty
 - g. Surveys of the general public
 - h. Surveys of riders
 - i. Research studies
 - j. Other _____
 - k. We do not specifically gauge the needs of the elderly and disadvantaged rural populations
-

13. What is the primary reason age-related rural transit issues are often believed to have a low agenda status? *Circle only one*

- a. I disagree; it has a high agenda status
- b. Competition for attention – the transportation agenda is crowded (other important issues grab public attention and funding, such as safety and congestion)
- c. Competition for resources, including funding
- d. Changing perception of aging – old is now older than years ago (it will become an issue in future decades but is not an issue now)
- e. Other _____

14. Does your organization operate transportation services?

- a. Yes (Please continue to part 3)
- b. No (Please skip to part 4)

Part 3. Questions for Transportation Providers

15. What services do you provide? Circle all that apply

- a. Fixed-route bus
 - b. Flexible / deviated bus
 - c. Intercity bus
 - d. Demand-response bus
 - e. Vanpool
 - f. Bus rapid transit
 - g. Other _____
-

16. Does your organization provide trips to the general public?

- a. Yes
- b. No

17. About how many riders do you carry each year? _____

18. Which sources of funding support the operations costs of your agency? Circle all that apply

- a. FTA Section 5307 Urbanized Area Formula
 - b. FTA Section 5311 Rural Area Formula
 - c. FTA Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities
 - d. State funds
 - e. Tribal funds
 - f. County funds
 - g. City funds
 - h. Grants or donations
 - i. Other _____
-

Part 4. Tell Us about Yourself

19. What is your age? _____ years

20. What is your gender?

- a. Male
- b. Female

21. What best describes your racial / ethnic background? *Circle all that apply*

- a. African American/Black
- b. Asian
- c. Hispanic/Latino
- d. Native American, Alaska Native, or Native Hawai'ian
- e. Pacific Islander
- f. White or Caucasian
- g. Mixed Race
- h. Other _____

22. Which category best describes your views?

Circle only one

- a. Very conservative
- b. Conservative
- c. Centrist
- d. Liberal
- e. Very liberal
- f. Other _____

Part 5. Open Ended Questions

23. How best can the USDA contribute to improving transportation services, especially for the elderly and disadvantaged populations? Please explain.

24. Please provide any additional comments or thoughts.

25. If you would like a copy of the study's results, please provide your email address
(Your email address will not be shared or used in any way other than to provide you the final white paper in electronic form.)

Thank you for your insights and time!

Don't forget to return your survey to us (at our booth, meetings, registration booth, or email rmdudensing@tamu.edu).

Don't forget to turn your questionnaire into Expo Booth #101 for a chance to win one of two Amazon gift cards or a handmade Bethlehem Olivewood pen and pencil set.

Appendix C—Potential Topics

This appendix is a laundry list of potential topics that were discussed at the open discussion at RIBTC. The topics are included here for completeness and to provide specifics to the general recommendations. The listing is in no specific ordering and is presented with only minor editing for clarity.

- Can school buses be used to supplement rural transit?
- Can partnerships with organization such as the Wounded Warriors Project or another specialized interest group offset some of the costs of transit for the socially disadvantaged?
- Examine the reallocation of other funds such as Medicare and Medicaid funds to pay for transit.
- Create a program for rural transportation that works similarly to the Supplemental Nutritional Assistance Program where vouchers are distributed to those in need.
- Investigate investment in transit in the context of other federally funded programs in rural areas to identify the comparative value to society.
- Could a strategic public-private partnership be established and sustain a viable transportation network company? How?
- How would transit change if instead of focusing on mobility, the focus was accessibility?
- Benefit-cost analysis of multimodal public transportation models by rural density level.
- Estimate the nonmarket valuation of travel time savings and comfort for rural elderly for different modes of public transportation.
- Have USDA-subsidized housing projects reduced or increased the residents' mobility?
- How does the USDA-subsidized housing program further or hinder transportation provision?
- Might housing subsidies near Veterans Administration hospitals, medical/renal centers, and the like be better than transporting folks over great distances?
- To warrant the public sector's involvement, what is the market failure that is in need of intervention and correction?
- The scale and scope by which transport can be incorporated into business models, both directly and through contracting.
- Investigate how transit solutions can be marketed toward rural stakeholders not conventionally associated with transportation.
- Do adverse selection and moral hazard problems and associated concerns exist within rural transit?
- Consider the externalities, both positive and negative.
- Promote a national database to generate new studies/research including multidisciplinary research.
- Cost-benefit analysis of service provision in time intervals, routes, and route types.
- Estimate the latent demand for rural transit.
- Improve economic impact methodologies for transit.
- Use existing and explore new methods to account for culture changes and policy and planning efforts to increase ridership, instead of just predicting based on past demand.

- Assess the effectiveness and impacts of alternative solutions for rural transit.
- Are analyses necessary to account for nonmonetary benefits?
- Incorporate benefits of rural transit and how they are related to progress toward community goals.
- Solutions should be explored for individuals whose circumstances force them to live in rural areas (e.g., homeless individuals placed in rural areas and veterans) rather than non-urban setting.
- How will alternative transportation options actually work? In what settings will they work? What are they?
- Investigate the factors holding people back from self-sorting into new communities or adapting to their new life circumstances.
- What is the role of the transit services in terms of livability and relationship between livability and sustainability?
- Identify why we do not have enough transit supply.
- For what purposes is rural transit used?
- How does availability affect behavior (work, medical care, social interactions, etc.)?
- Demand price elasticity.
- Combining fixed-route and demand-response service.
- How will the increase in demand for recreation influence future transit demand?
- Possible efficiencies in providing service.
- Organizational efficiency of rural transportation providers.
- Long-term care in rural areas and transportation.
- Community health centers and community mental health centers.
- Measures of well-being, effects of transportation quality on well-being, and measurement of well-being.
- Effects of Federal and State subsidies for capital and operating costs.
- Independence and the optimal provision of public goods.
- Alternative financing mechanisms.
- Medicaid pricing for transit.
- Agency pricing rules/incentives.
- Private service provision: efficiency, quality, service, etc.
- Urban/rural cost sharing.
- Private transportation sharing.
- Organizational efficiency of rural transportation providers.
- Race and distribution of transportation resources.
- Transportation effects on education quality.
- Impact of low tax revenues in rural counties (and interactions with Federal/State subsidy rules).
- Transportation and voting patterns.
- Local resistance to transportation improvement.
- Possible uses of technology: substitute for transportation (telemedicine, medic alerts, and drones for delivery).
- Automotive technology: safety options, self-driving cars, etc.
- Agricultural communities for people with intellectual disabilities and transportation.

- Churches and transportation.
- Rural Uber-like companies.
- Who uses public rural transportation?
- Data issues: missing early years, problems with data collection, and appropriate measures of service.
- Does road quality (snow) influence elderly driving?
- What prevents migration from rural to urban areas by the elderly and people with a disability?
- Statistical/econometric issues in evaluation/measurement.
- Public data sources.
- Public and private rural transportation in other countries.
- Driving difficulties for the rural elderly.
- The effect of rural transportation availability on health.
- Handicap accessibility in rural areas.
- Long-term care in rural areas and transportation.
- Measures of well-being and the effects of transportation quality on well-being.
- Can the use of vouchers increase efficiency in rural transit?
- What are the relationships between funding sources and transit providers?
- Implications of the transfer of funds from urban to rural areas.
- Can programs be changed to allow current programs to fund rural transit riders?
- Supplemental transportation options—including using school buses during the day, volunteers to provide transit, car share programs, Uber-type programs, strategic partnerships, and technological advancements in automobiles such as self-driving—need to be examined.