

TRANSPORTATION, MOBILITY, AND OLDER ADULTS IN RURAL MICHIGAN

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Introduction

Mobility, or the ability to get from place to place, is important for everyone. Mobility enables people to conduct the activities of daily life, stay socially connected with their world, participate in activities that make life enjoyable, and maintain their quality of life. In most Western Nations and in the United States (US) in particular, mobility is closely linked with the ability to drive a personal automobile. This preference for cars is particularly pronounced in rural areas where there are generally fewer transportation options. The long distances between rural residences and necessary services can lead to significant unmet need for transportation options in rural communities. At the same time, providing public transportation in remote areas is especially complex and expensive (Kihl, Knox, & Sanchez, 1997), and even when available, public transportation may not be an adequate mode of travel for the older population. While the rural population in Michigan presents challenges for transportation planners; connecting rural areas with improved transportation systems is also a challenge for the nation as a whole. With the increased population of older rural residents, providing adequate mobility options will continue to be an especially important issue in the coming years.

According to US Census Bureau (2009), Michigan's population is aging. In 2000, Michigan older adult residents accounted for about 12% of the population. By 2030, Michigan older adults will represent about 20% of the population. This increase will be even greater for the oldest Michigan residents. Residents age 80 and older will account for slightly more than 5% of the population—up from 3% in 2000. Thus, Michigan is facing a coming wave of older adults who will: be driving more than the current cohort of older adults; be dependent on the motor vehicle for mobility; likely be experiencing declines in driving related skills; and want and expect to have their mobility needs met if driving is limited or no longer possible.

County	Percent
Iron	19.2
Marquette	10.4
Hillsdale	10.7
Mason	13.3
Huron	15.7
Alpena	14.0
Michigan (all counties combined)	9.5

US Census Bureau (2010) data show that nationwide and in Michigan, older adults are increasingly living in rural areas. For example, Table 1 shows the percentage of people age 70 and older in the six rural counties in Michigan that are the specific focus of this project compared to all of Michigan. As can be seen in this table, all of the counties had a larger percentage of older adults than average in Michigan. Indeed, in three of these counties, more than one of every five individuals was an older adult. These relatively high concentrations of older adults are expected to increase in the coming years.

Older adults who live in rural areas are faced with unique transportation problems. It is well documented that community mobility services are limited or nonexistent in many rural areas (Dickerson, et al., 2007). Thus, it is likely that older adults are forced to continue driving longer than they can safely do so. Indeed, studies show that serious-injury and fatal crash risk can be twice as high for older adults in rural areas when compared to similar-aged cohorts in urban areas (see e.g., Boufous, et al., 2008; Thompson et al., 2010). Studies also show that rural older adults who are involved in injury crashes are more likely to have health problems and declines in functional capacity as compared to urban older drivers in similar crashes (Griffin, 2004).

As the population of older adults in Michigan continues to grow, particularly in Michigan's rural counties, it is becoming increasingly critical that the Michigan Department of Transportation (MDOT), and other Michigan organizations understand the mobility needs of older adults and address these needs through transportation facility design, planning, and programs.

This report explores issues related to transportation and mobility in rural areas generally, and in rural areas of Michigan specifically. The information from this report is intended to assist Michigan in meeting the transportation needs of its rural older adult population. The report has two main sections. The first is a review of the literature that covers a number of topics including: aging in place; travel behavior; effects of driving cessation among rural older adults; rural community mobility; barriers to using public transportation; transportation coordination; mobility management; travel training; American Indian transportation issues; and rural transportation funding. The second part of this report presents the results of a demographic analysis of: six rural counties in Michigan that are the focus of our research study (Iron, Marquette, Hillsdale, Mason, Huron, and Alpena); all rural Michigan counties combined; and all of Michigan. The demographic analysis covers the following areas: the current population; population forecasts; older adult driver licensing; and older adult vehicle crashes.

Literature Review

Aging in Place

One reason why older adults commonly live in rural areas is that they prefer to age in place. That is, older adults tend to live in rural areas not because they are moving to rural areas to retire, but because they already live in rural areas and prefer to stay where they currently reside (Frey, 2007). According to Rosenbloom (2003) older adults have consistently become less likely to move over time, are less likely than younger adults to move, and do not move far when they do move. An AARP (2010) survey found that nearly 90% of those over age 65 wanted to stay in their residence for as long as possible and 80% believed that their current residence was the location where they will always live (Keenan, 2010). Thus, it is likely that the rural areas of Michigan will continue to have a larger proportion of older adults than urban areas of Michigan.

Travel Behavior of Rural Older Adults

Understanding the travel patterns of rural older adults is important for the development and implementation of adequate community mobility options. It is well-established that both urban and rural older adults use the personal automobile as their primary mode of transportation (Foster, 1995; Glasgow, 2000; Glasgow & Blakely, 2000; Pucher & Renne, 2005). For example, Foster (1995) found that only 0.3% of trips by rural older adults (age 75 and older) in an Iowa sample were taken using transit. Of those trips, transit was most often used for medical purposes (followed by social/recreation and shopping trips), suggesting non-driving transportation becomes more critical for rural older adults in the absence of access to an automobile to meet rural older adults' needs, especially for medical care. Further, studies have found rural older adults travel more miles than their counterparts in urban areas (Hanson, 2004; Hildebrand, Myrick, & Creed, 2000), most often travel for shopping, social/recreation, and personal business (Foster, 1995; Hanson, 2004; Hanson & Hildebrand, 2011b; Hough, Cao, & Handy, 2008), and often travel during non-peak times of day (Hanson, 2004; Hildebrand et al., 2000).

Despite the prevalence of and preference for the personal automobile by rural older adults (either as driver or passenger), there is still a need for non-driving community mobility options in rural areas to meet mobility needs. One study found that rural older drivers would not make 34% of trips they normally make if they lost access to a personal vehicle (Hanson & Hildebrand, 2011b). Mattson (2010) found rural older adults have a desire for taking more trips and cite a lack of transportation as the limiting factor to meeting those desires. A Canadian study of rural older drivers (age 54-92)

found that more than one-half of respondents reported that they would rely on friends and family to make the trips they currently make as drivers, and 70% reported that more transportation options were needed in rural areas in addition to being able to rely on family and friends (Hanson & Hildebrand, 2011b). Focus groups in rural New York found that older adults (75 and over) who were not currently driving or had never driven, relied primarily on rides from friends and family but also on public buses and senior-specific paratransit services (Glasgow & Blakely, 2000). Other work has found that rural older adults who have a large social network were better able to meet their mobility needs than those without such networks who had to rely on other community mobility options (Hough, 2007). Thus, it appears that rural older adults prefer to drive to meet their mobility needs, and, when they cannot drive they prefer to get rides from family or friends. In both cases, many rural older adults are not taking as many trips as they would like and would possibly use community mobility options if they were available.

Adverse Effects of Driving Cessation among Rural Older Adults

As people age, they begin to experience age-related health conditions that can make it difficult to safely operate an automobile (Eby, Molnar, & Kartje, 2009). Several studies have shown that driving reduction or cessation can be a very stressful experience for many older adults, resulting in a poor psychological outlook and reduced quality of life (see Whelan, Langford, Oxley, Koppel, & Charlton, 2006). Driving cessation has been associated with reduced independence and mobility (Adler & Rottunda, 2006), increased social isolation (Liddle, McKenna, & Broome, 2004), and increased depressive symptoms (e.g., Fonda, Wallace, & Herzog, 2001; Marottoli et al., 1997; Ragland, Satariano, & MacLeod, 2005). Not surprisingly, one study found rural older adults (age 71-91) continued to drive against advice and despite deteriorating health for fear of losing their independence and becoming socially isolated (Johnson, 2002). Prior to giving up driving, many rural older adults also begin to avoid driving situations that make them uncomfortable, which often results in a reduction in the ability to meet mobility needs. For example, a study in Canada found that one-half of rural older adults who responded to a survey reported that they avoided driving at night and 40% avoided driving on major highways (Hanson & Hildebrand, 2011a). Because of the adverse consequences associated with driving reduction and cessation, coupled with the dependence on the personal automobile for continued mobility, it is in society's best interest to keep older adults driving for as long as they can safely do so and to provide good community mobility options when driving is no longer possible (Dickerson et al., 2007).

Older adults living in rural areas face special transportation challenges because of the limited public and paratransit services available, and the long distances they must often travel to reach health and social services destinations and to participate in social,

religious, and other enrichment activities. According to the National Council on Disability (2005), approximately 40% of the rural population has no public transportation at all, and another 25% has only minimal service. Alternatively, urban residents have access to 25 times more public transportation service than those in rural areas and are also closer in proximity to necessary goods and services. Due to the lack of transportation options in rural areas, caregivers tend to be the primary driver for many older people living in such areas (St. Louis, Zanier, Molnar, & Eby, 2011). In addition, older adults living in rural areas are more likely to be older (age 85 and older), in worse health, and have a lower income than older adults in urban and suburban areas (Molnar, Eby, St. Louis, & Neumeyer, 2007).

Rural Community Mobility

Implementing transportation systems in rural areas is challenging. Rural transit is defined as transportation services available to the public in communities of fewer than 50,000 residents (Federal Highway Administration [FHWA], 2001). This includes traditional transit systems, demand response transit for older adults and the disabled, passenger rail, intercity bus, ferries, commercial scheduled air service, and car and van pooling. Passenger transportation in rural areas is provided by a variety of private sector, not-for-profit organizations, and various public agencies (FHWA, 2001).

Transportation providers in rural areas face a number of challenges in delivering cost-effective accessible services to the public, including limited funding, limited trip purposes, client-only transportation, limited days and hours of service, lack of long distance transportation, high cost of transportation, limited use of advanced technologies, and limited driver training (Easter Seals Project ACTION, 2006; Foster, Damiano, Momany, & McLeran, 2007). Rural communities are commonly served by county governments, whose responsibilities often cover vast areas but are often limited by small tax bases. The greater distances to cover, coupled with small populations, makes traditional public transportation options economically infeasible in most rural areas (Casavant & Painter, 1998). Generating local matching funds also remains one of the greatest barriers facing many rural transit systems. Because of the inability to match funds at a local level, some states cannot spend all of their Federal Transit Agency funds (Michigan Office of Services to the Aging, 2005).

Barriers to Using Rural Public Transportation

Transportation options for older adults in rural areas, when available, may be difficult to use, inconvenient, or simply unknown. Transportation systems are not always responsive to factors that may affect rural older adults such as physical limitations, failing health, costs, and not feeling comfortable using the transportation system. For

the majority of older adults who stop driving as a result of poor health, their poor health also precludes them from using public transit services even when it is available. Difficulty walking to the nearest bus stop or the inability to climb the stairs of a paratransit van are just two examples of how older adults may not be able to access public transportation options (Dickerson et al., 2007). Additionally, some older adults may need an escort to assist them physically to get to their destination or to be with them for emotional support.

Focus groups participants (age 65 and older) in rural areas reported that the main benefits to using a public bus, door-to-door paratransit, senior citizens bus, and church/business volunteer transportation were low costs and increased social interactions (Glasgow & Blakely, 2000). Participants also noted that many community mobility options were often inconvenient, limiting, or unable to accommodate certain disabilities. A survey of rural older adults in North Dakota also cited inconvenience as well as a lack of adequate shelter at stops as the main problems with public transportation (Mattson, 2010). Another barrier to rural public transportation use is that many older adults are unaware of the services that are available to them in their community. As many of one-half of rural older adults reported that they were unaware of many of the community mobility options that are in their community (Foster et al., 2007; St. Louis et al., 2011).

Transportation Coordination

In Michigan, transportation is provided by a combination of agencies, including a number of countywide public transit systems, Community Action Agencies, Commissions on Aging, and other small providers. Transportation services in the Upper Peninsula tend to focus on providing services to seniors and there are many areas that have limited to no transportation services. However, the majority of Michigan's older adults have access to some sort of publicly-funded transportation service (St. Louis, Zanier, Molnar, & Eby, 2011). An analysis of transportation services for older adults in Michigan (Michigan Office of Services to the Aging, 2005) concluded that Michigan has an extensive transportation network for older adults, with every county having some form of older adult transportation service. At the same time, the report concluded that gaps in and barriers to services remain, largely due to lack of funding, particularly in some rural areas, as well as lack of coordination among transportation providers.

In the face of significant transportation needs and severely limited resources, a key challenge for rural communities is to use existing resources as effectively as possible (Burkhardt, Nelson, Murray, & Koffman, 2004). To provide the rural older adult population with a broad array of transportation options, it is necessary to coordinate transportation services and programs among federal, state, and local agencies.

Individual transportation services and programs within communities and regions should be viewed as part of a system (Eby, Molnar, & Kartje, 2009). Lack of coordination among transportation providers can make it difficult to navigate through the multiple transportation agencies in a region to determine which one will provide service. Strategies that have been found to be effective in promoting and facilitating transportation coordination include: establishing broad-based coalitions and partnerships; coordinating planning through ongoing relationships with planning and development agencies; leveraging funding from a variety of sources; paying careful attention to the specific objectives and regulations of federal transportation programs, given that much of the funding originates with federal programs aimed at unique needs of individual populations; and integrating new technologies into operations to improve efficiency and responsiveness to users (US Department of Health and Human Services, 2005). Several states and communities have implemented many of these recommendations, however, lack of coordination of transportation services continues to be the leading obstacle to meeting the mobility needs of the people who need the services most (Intelligent Transportation Systems Joint Program Office, 2012).

Travel Training

Providing older adults with information about transit before they stop driving and offering travel training are two approaches that may help increase use of public transit (Cevallos, Skinner, Joslin, & Ivy, 2010). Travel training programs vary widely around the US and other countries, with some offering only on-line instructions while others start with a comprehensive analysis of an individual's needs and capabilities and then offer customized training including instruction while actually using the public transportation system (Hardin, 2005). Most programs are targeted at older adults and people with disabilities. Some programs use other older adults as travel trainers (Cevallos, Skinner, Joslin, & Ivy, 2010). Travel training programs are becoming very popular although few have been formally evaluated. The few studies that have evaluated a travel training program have found that public transit use did increase among older adults after they had received such training (Shaheen, Allen, & Liu, 2009; Stepaniuk, Tuokko, McGee, Garrett, & Benner, 2008).

A number of transportation service providers in Michigan have developed travel training programs to assist riders with navigating the system, including *The Ride* in Ann Arbor Transportation authority and *The Rapid* in Grand Rapids. In some cases, older adults volunteer to teach potential riders how to use the transportation system by providing riders with information about the different transportation options as well as riding with older adults to ensure they are comfortable with the route. Participants will sometimes receive compensation, such as free bus passes (Michigan Office of Services to the Aging, 2005).

In addition to helping rural older adults use fixed route transit system, these programs can also save transportation agencies money. A recent cost-benefit study of three travel training programs in the Western US found that all had positive cost-benefit ratios ranging from 1.45 to 3.98, meaning that at least among the three agencies studied, travel training services resulted in cost savings (Wolf-Branigin, Wolf-Branigin, Culver, & Welch, 2012).

American Indian Transportation Issues

American Indians and Alaska Natives comprise 0.6% of the population of Michigan (US Census Bureau, 2010). Many American Indian tribes in Michigan are located in rural areas, requiring transportation options for tribal members living on these reservations. Tribal transportation programs are a coordinated effort between tribes and transportation providers to meet the needs of often isolated tribal communities by using the most efficient and cost-effective method (FHWA, 2005). According to the American Indian Disability Technical Assistance Center (AIDTAC, 2002), Indian tribes may have unique issues regarding transportation for older adults and people with disabilities. These issues include: most tribes have no, or poorly organized, transportation assistance programs; tribes generally do not have their own infrastructure for public transit; roads on Indian land are often unpaved and lack pedestrian facilities; many tribes do not have cooperative relationships with the states in which they reside; issues of sovereignty and jurisdiction, including land and water issues, can hinder state and tribal relations; and tribes must interact with the federal, county, local governments, and tribal governments to create or improve the transportation system which can be a significant barrier for providing effective transportation services on tribal land.

On most of the more than 300 American Indian reservations in the US, there is no existing infrastructure for public transit systems. Many rural tribes also have to travel on isolated dirt or gravel roads that are poorly maintained. While the main road on a reservation may be paved, roads to homes or outlying areas of the reservation may not be (Brusin & Dwyer, 2002). Long-range planning for infrastructure and transportation programs are necessary to allow a better connection between rural tribal communities with needed services both within and outside of the reservation.

Hensley-Quinn and Shawn (2006) highlighted a particularly successful tribal transit program in rural New Mexico. The Pueblo of Laguna reservation spans 547,000 acres and expands into three counties. The Pueblo of Laguna *Shaa'srk'a Transit Program* serves the community through demand-response, fixed route, modified fixed route services to meet the transit needs of the rural community members. Service is provided to ensure access to employment, education, medical care, family-social services and

recreation (New Mexico Department of Transportation [NMDOT], 2011). Shaa'srk'a Transit's fleet is comprised of four 15-passenger vans (three of which are wheelchair accessible) and a mini-van (Hensley-Quinn & Shawn, 2006). Coordination is a key contributor to the success of this program. Shaa'srk'a coordinates rides with the Community Health Representative Program, local Indian Health Services hospital, and the Department of Education (NMDOT, 2011).

Blackfeet Transit of Montana is another successful tribal transit program (Hensley-Quinn & Shawn, 2006). Nearly 9,000 members of the Blackfeet Tribe live on a 1.5 million acre reservation in Northwest Montana. The transit system has been in operation since 1978 and currently provides approximately 24,000 rides to people with disabilities, those going to medical appointments, older adults, and people transitioning from welfare to work. Blackfeet Transit is a demand-response system with a full-time dispatcher. The program includes two mini-vans that are each able to transport seven people and two paratransit buses with wheelchair lifts that can transport 13 passengers. Funding for the program is provided by both federal and local dollars (Hensley-Quinn & Shawn, 2006).

A variety of federal programs exist for assisting American Indian tribal communities with transportation planning and implementation. The US government officially recognizes 563 tribes as sovereign nations, and this recognition grants tribes the eligibility to use federal funds for transportation assistance (Hensley-Quinn & Shawn, 2006). A comprehensive list of funding sources and grant opportunities for transportation assistance within American Indian tribal communities has been published by the National Center on Senior Transportation (NCST, 2011).

MDOT maintains ongoing government-to-government communication with 12 federally recognized sovereign tribal governments whose lands are situated within Michigan, most in rural areas of Michigan. The population of American Indians in Michigan is approximately 62,000. MDOT has a Tribal Affairs Coordinator whose primary role is to serve as a point of contact for tribal governments and to facilitate communication and problem resolution on transportation-related topics (MDOT, 2012).

Stakeholder and public meetings with tribal leaders throughout Michigan revealed that the transportation needs of these tribes are similar to the needs of most people who live in rural areas, but they can often be more pronounced due to the unique conditions on some reservations (MDOT, 2007). For instance, reservations often span hundreds of miles, creating vast distances across the tribal communities as well as great separation from business outside of the reservation. The geographic distances make tribal transportation services more difficult to initiate and maintain. Through collaboration with the tribal communities, the issues of greatest importance were found to be connecting

the transportation system to support economic growth and making the system physically and economically accessible to all (MDOT, 2007).

Rural Transportation Funding

The federal government has dedicated programs to assist with transportation issues in areas where less than 50,000 people reside. One federal program that provides funding for rural areas is the Transportation for Elderly Persons and Persons with Disabilities Program (Section 5310). Funding from this program goes to states to assist private nonprofit groups in meeting the transportation needs of older adults and persons with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs (USDOT, 2012c). The state agency ensures that local applicants and project activities are eligible and in compliance with Federal requirements and that private transportation providers have an opportunity to participate. Once the application is approved, funds are available for state administration of its program and for allocation to individual sub-recipients within the state (USDOT, 2012c).

The Rural Transit Assistance Program (RTAP) provides a source of funding to assist in the design and implementation of training and technical assistance projects and other support services tailored to meet the needs of transit operators in rural areas. RTAP funds support rural transit activities in four categories: training, technical assistance, research, and related support services (USDOT, 2012b).

The Section 5311 Formula Grants for Other than Urbanized Areas is a rural program that provides funding to states for the purpose of supporting public transportation in rural areas. The goal of the program is to provide the following services: enhance the access of people in rural areas to health care, shopping, education, employment, public services, and recreation; assist in the maintenance, development, improvement, and use of public transportation systems in rural areas; encourage and facilitate the most efficient use of all transportation funds used to provide passenger transportation in rural areas through the coordination of programs and services; assist in the development and support of intercity bus transportation; and provide for the participation of private transportation providers in rural transportation. Section 5311 provides funds for the Rural Transit Assistance Program and the Tribal Transit Program (USDOT, 2012a).

Currently, there are 62 federal programs that fund transportation services for low-income individuals, people with disabilities, and older adults (ITS Joint Program Office, 2012). In a continued effort to ensure all people have the ability to get to the places they want and need to go, the 6-year surface transportation reauthorization budget proposal

increases support for transportation in rural communities. The budget proposal highlights several areas in which the federal government proposes to allocate funding. The FHWA is proposing a minimum of approximately \$250 million for rural road safety, and another \$15.6 billion is eligible through the Flexible Investment Program of the National Highway Program (Office of Management and Budget, 2012). This funding would go toward improvements that offer enhanced transportation access in rural areas. Under the FTA, rural communities would receive almost \$766 million to support important public transportation services, which represents, a 43% increase over FY 2010. FTA is offering continued support for rural transit service to communities with less than 50,000 in population, with particular attention to intercity bus services (Office of Management and Budget, 2012). The proposed funding for developing more comprehensive transportation networks in rural areas is encouraging not just for transportation planners, but also for the aging population and caregivers of older adults who no longer drive.

Demographic Analysis

Population

In 2010, the population of the state of Michigan was reported by the US Census to comprise 9,883,630 people. As shown in Table 2 (US Census Bureau, 2010), nearly 10% of all Michigan residents were age 70 or older. Among these, 59% were between the ages of 70-79 years and 7% are age 90 or older. About one-half of Michigan residents were male and this percentage dropped with increasing age, where at age 90 or older only 27% were male. Table 2 also shows population data for all 58 Michigan counties that have been defined by the state as rural (State of Michigan, 2001). Note that the percentages show that these rural counties were composed of slightly more older adults and males when compared to Michigan overall.

	Population	Age 70+	Age 70-74	Age 75-79	Age 80-84	Age 85-89	Age 90+
Michigan	9,883,640	942,905	306,084	244,085	200,855	126,935	64,946
% State	--	9.5	32.5	25.9	21.3	13.7	6.9
% Male	49.1	41.1	46.0	43.0	40.2	34.9	26.7
All Rural MI Counties	1,779,476	210,487	74,236	55,249	42,103	25,418	13,481
% All Rural Counties	--	11.8	35.3	26.3	20.0	12.1	6.4
% Male	50.5	44.2	48.9	46.6	42.6	37.0	27.4

Table 3 shows the 2010 distribution of older adults in the six Michigan counties that are the focus of this project by 5-year age intervals, as well as the proportion of males in each group (US Census Bureau, 2010). It is clear from this table that the percentage of adults age 70 and older ranges from about 11% to 19%, which is higher than for Michigan overall and slightly higher than for all rural counties, combined. The percentage of older adult males is about 42-43% in the six counties, which is about the same as all rural counties in Michigan. As with the data shown in Table 2, the percentage of older adult males decreases with age group (less than 30% in all six counties).

County	Population	Age 70+	Age 70-74	Age 75-79	Age 80-84	Age 85-89	Age 90+
Alpena	29,598	4,152	1,365	1,137	840	515	295
% County	--	14.0	32.9	27.4	20.2	12.4	7.1
% Male	49.1	42.0	47.8	44.7	40.5	34.4	22.7
Hillsdale	46,688	4,983	1,796	1,344	883	601	359
% County	--	10.7	36.0	27.0	17.7	12.1	7.2
% Male	49.6	43.2	49.1	44.6	40.8	35.4	27.9
Huron	33,118	5,187	1,685	1,343	1,090	709	363
% County	--	15.7	32.5	25.9	21.0	13.7	7.0
% Male	49.6	42.8	47.7	45.5	41.4	35.4	29.2
Iron	11,871	2,281	624	546	522	373	216
% County	--	19.2	27.7	23.9	22.9	16.4	9.5
% Male	49.0	41.3	48.9	43.2	42.5	32.7	26.9
Marquette	67,077	6,943	2,269	1,759	1,447	923	536
% County	--	10.4	32.7	25.3	20.8	13.3	7.7
% Male	50.5	43.2	47.9	46.2	41.9	37.4	28.0
Mason	28,705	3,787	1,381	953	706	461	286
% County	--	13.2	36.5	25.2	18.6	12.2	7.6
% Male	49.4	43.8	49.2	46.1	44.5	31.5	29.0

Table 4 shows other 2010 demographics for all rural counties in Michigan combined, all of Michigan, and for the six Michigan study counties (US Census Bureau, 2010). As can be seen, median household income in the six counties was lower than for Michigan overall. The percent of households below the poverty level range from 14% to 18% in the six counties, which was about the same for Michigan overall and all rural counties in Michigan. Education levels were also about the same in the six counties as in Michigan

and rural Michigan. The six counties and all the rural counties, however, were much less racially diverse than Michigan overall. The percent of African Americans in the six counties and all rural counties was less than 2%, compared to about 14% for the state overall.

Table 4. Demographic Data for the Six Counties in 2010

	Median Household Income (2009)	% Below Poverty Level	% High School Graduates	% Bachelor Degree or Higher	% White	% African American	% Native American	% Asian
All Rural Counties	n/a	17.2	86.3	15.7	93.4	1.9	1.5	0.5
Michigan	\$45,254	16.1	87.4	24.5	78.9	14.2	0.6	2.4
Alpena	\$35,710	16.6	87.1	15.3	97.5	0.3	0.5	0.5
Hillsdale	\$38,094	16.8	86.1	14.3	97.0	0.5	0.4	0.4
Huron	\$22,301	15.4	84.2	13.4	97.5	0.4	0.3	0.4
Iron	\$33,650	16.9	88.2	14.2	97.1	0.1	0.9	0.3
Marquette	\$41,576	14.0	90.9	28.6	93.8	1.7	1.7	0.6
Mason	\$38,073	17.8	87.4	19.1	94.8	0.6	1.0	0.5

Population Forecasts

County level population projections for 2015-2040 for Michigan counties by age and sex were developed by the University of Michigan Institute for Research on Labor, Employment and Economy (2012) and provided by MDOT Statewide & Urban Travel Analysis Section. Tables 5-10 show population projections (both numbers and percentages of county population) for Michigan's older adult populations by age group, sex, and year (in 5-year increments up to 2040) in each of the six study counties. Note that in nearly each county (except Iron), the projections showed increasing numbers and percentages of older adults in the future. This trend was particularly pronounced for males and for adults age 85 and older. In Iron County, the projections showed slight decreases in the number and percentages of older adults residing in the county in the next 30 years.

	Year						
	2010	2015	2020	2025	2030	2035	2040
All							
70-84	3,286	3,329	3,669	4,105	4,369	4,362	4,003
85+	835	947	954	1,003	1,105	1,268	1,470
70+	4,120	4,276	4,623	5,108	5,474	5,630	5,473
70+ (% county)	13.9	14.9	16.3	18.1	19.3	19.8	19.4
85+ (% county)	2.8	3.3	3.4	3.6	3.9	4.5	5.2
Male							
70-84	1,456	1,496	1,659	1,853	1,982	1,947	1,754
85+	239	295	320	344	386	450	540
70+	1,695	1,791	1,978	2,198	2,368	2,397	2,294
70+ (% county)	11.7	12.8	14.4	16.0	17.2	17.4	16.7
85+ (% county)	1.7	2.1	2.3	2.5	2.8	3.3	3.9
Female							
70-84	1,830	1,833	2,010	2,252	2,388	2,415	2,249
85+	595	652	635	659	718	818	930
70+	2,425	2,485	2,645	2,910	3,106	3,233	3,179
70+ (% county)	16.0	16.9	18.2	20.0	21.3	22.1	21.9
85+ (% county)	3.9	4.4	4.4	4.5	4.9	5.6	6.4

	Year						
	2010	2015	2020	2025	2030	2035	2040
All							
70-84	4,050	4,620	5,184	5,839	6,191	6,118	5,708
85+	948	1,211	1,464	1,683	1,976	2,396	2,815
70+	4,998	5,831	6,648	7,522	8,167	8,514	8,524
70+ (% county)	10.7	12.6	14.5	16.6	18.1	18.9	18.9
85+ (% county)	2.0	2.6	3.2	3.7	4.4	5.3	6.2
Male							
70-84	1,834	2,090	2,360	2,641	2,778	2,779	2,600
85+	300	405	497	592	712	851	1,003
70+	2,134	2,495	2,857	3,233	3,490	3,630	3,603
70+ (% county)	9.2	10.9	12.6	14.4	15.7	16.4	16.3
85+ (% county)	1.3	1.8	2.2	2.6	3.2	3.9	4.5
Female							
70-84	2,217	2,532	2,825	3,199	3,414	3,341	3,110
85+	648	806	968	1,091	1,265	1,545	1,812
70+	2,865	3,338	3,793	4,290	4,678	4,885	4,922
70+ (% county)	12.2	14.3	16.4	18.6	20.4	21.3	21.4
85+ (% county)	2.8	3.5	4.2	4.7	5.5	6.7	7.9

	Year						
All	2010	2015	2020	2025	2030	2035	2040
70-84	4,146	4,327	4,652	4,946	5,024	4,853	4,349
85+	992	1,107	1,121	1,196	1,325	1,472	1,607
70+	5,138	5,434	5,773	6,142	6,349	6,325	5,956
70+ (% county)	15.5	17.2	19.0	20.6	21.5	21.7	20.8
85+ (% county)	3.0	3.5	3.7	4.0	4.5	5.1	5.6
Male							
70-84	1,847	1,946	2,105	2,243	2,337	2,237	1,974
85+	329	376	393	424	461	526	609
70+	2,175	2,322	2,498	2,667	2,798	2,763	2,583
70+ (% county)	13.2	14.8	16.6	18.1	19.3	19.3	18.4
85+ (% county)	2.0	2.4	2.6	2.9	3.2	3.7	4.3
Female							
70-84	2,300	2,382	2,547	2,703	2,687	2,615	2,375
85+	663	731	729	772	865	946	998
70+	2,963	3,113	3,275	3,475	3,551	3,562	3,373
70+ (% county)	17.8	19.5	21.3	23.0	23.7	24.0	23.1
85+ (% county)	4.0	4.6	4.7	5.1	5.8	6.4	6.9

	Year						
All	2010	2015	2020	2025	2030	2035	2040
70-84	1,690	1,792	1,941	1,974	1,891	1,824	1,662
85+	524	587	549	551	650	662	700
70+	2,215	2,379	2,490	2,525	2,540	2,486	2,361
70+ (% county)	18.8	19.5	19.2	18.0	16.7	15.2	13.6
85+ (% county)	4.4	4.8	4.2	3.9	4.3	4.1	4.0
Male							
70-84	742	815	901	914	866	820	756
85+	165	190	181	188	243	253	261
70+	907	1,006	1,082	1,102	1,108	1,073	1,018
70+ (% county)	15.3	16.5	16.7	15.7	14.6	13.2	11.8
85+ (% county)	2.8	3.1	2.8	2.7	3.2	3.1	3.0
Female							
70-84	950	977	1,040	1,062	1,026	1,004	906
85+	359	397	368	363	407	409	438
70+	1,308	1,373	1,408	1,424	1,433	1,414	1,344
70+ (% county)	22.2	22.6	21.8	20.3	18.8	17.2	15.3
85+ (% county)	6.1	6.5	5.7	5.2	5.3	5.0	5.0

Table 9. Mason County Population Forecasts by Age, Sex, and Year							
	Year						
All	2010	2015	2020	2025	2030	2035	2040
70-84	2,996	3,425	3,948	4,412	4,672	4,572	4,228
85+	803	836	864	1,016	1,207	1,481	1,709
70+	3,799	4,261	4,811	5,428	5,879	6,053	5,937
70+ (% county)	13.2	14.5	16.0	17.8	19.2	19.8	19.5
85+ (% county)	2.8	2.8	2.9	3.3	3.9	4.9	5.6
Male							
70-84	1,340	1,535	1,738	1,933	2,058	1,971	1,837
85+	254	290	302	368	421	540	617
70+	1,594	1,824	2,040	2,301	2,479	2,511	2,453
70+ (% county)	11.3	12.7	13.9	15.5	16.7	16.9	16.7
85+ (% county)	1.8	2.0	2.1	2.5	2.8	3.6	4.2
Female							
70-84	2,357	2,708	3,007	3,191	3,044	2,638	2,209
85+	919	1,043	1,269	1,483	1,663	1,777	1,701
70+	3,276	3,751	4,276	4,674	4,707	4,415	3,911
70+ (% county)	22.4	25.0	27.8	29.9	29.9	28.1	25.0
85+ (% county)	6.3	7.0	8.2	9.5	10.6	11.3	10.9

Table 10. Marquette County Population Forecasts by Age, Sex, and year							
	Year						
All	2010	2015	2020	2025	2030	2035	2040
70-84	5,543	6,299	7,438	8,676	9,795	9,896	9,133
85+	1,455	1,762	1,893	2,130	2,422	3,119	3,976
70+	6,997	8,061	9,331	10,807	12,217	13,016	13,108
70+ (% county)	10.5	11.3	12.4	13.9	15.4	16.4	16.7
85+ (% county)	2.2	2.5	2.5	2.7	3.1	3.9	5.1
Male							
70-84	2,556	2,983	3,543	4,068	4,473	4,416	4,040
85+	468	590	648	762	900	1,189	1,498
70+	3,024	3,573	4,191	4,830	5,373	5,606	5,537
70+ (% county)	9.0	10.0	11.2	12.5	13.7	14.4	14.4
85+ (% county)	1.4	1.7	1.7	2.0	2.3	3.1	3.9
Female							
70-84	2,988	3,318	3,895	4,607	5,320	5,479	5,092
85+	987	1,172	1,245	1,369	1,522	1,930	2,478
70+	3,974	4,489	5,140	5,975	6,842	7,409	7,571
70+ (% county)	11.9	12.6	13.6	15.2	17.1	18.5	19.0
85+ (% county)	3.0	3.3	3.3	3.5	3.8	4.8	6.2

Table 11. Michigan Population Forecasts by Age, Sex, and Year						
	Year					
Overall	2015	2020	2025	2030	2035	2040
70-84	823,728	964,410	1,144,150	1,282,635	1,339,502	1,315,950
85+	230,893	244,468	263,842	311,233	393,450	483,350
70-84 (% by state)	8.3	9.7	11.4	12.7	13.2	12.9
85+ (% by state)	2.3	2.5	2.6	3.1	3.9	4.7
Male						
70-84	359,965	425,575	505,847	566,285	590,587	579,658
85+	75,802	80,710	89,111	108,099	139,745	173,324
70-84 (% by state)	7.4	8.7	10.3	11.5	11.9	11.7
85+ (% by state)	1.6	1.7	1.8	2.2	2.8	3.5
Female						
70-84	463,763	538,835	638,312	716,350	748,915	736,292
85+	155,091	163,758	174,732	203,134	253,705	310,027
70-84 (% by state)	9.2	10.6	12.5	13.9	14.4	14.1
85+ (% by state)	3.1	3.2	3.4	3.9	4.9	5.9

Table 11 shows the population forecast for Michigan by age and year. These forecasts also predicted that the older adult population in Michigan will continue to grow both in the number and percentage of older adults. As with the six rural counties, this growth will be greater for the older age group. Growth in the proportion of both older males and females is predicted, with greater growth in the oldest age group.

Table 12 shows the population forecasts for the 58 rural counties in Michigan combined by age, sex, and year. Similar to what was found in the six study counties, the population forecasts showed that rural counties in Michigan can expect large increases in both the numbers and percentages of older adults over the next several decades. Again, this growth will be largest for men and for those age 85 and older.

Table 12. All Rural Counties Population Forecasts by Age, Sex, and Year						
	Year					
All	2015	2020	2025	2030	2035	2040
70-84	189,605	216,035	241,917	257,610	257,451	242,978
85+	46,398	50,321	57,094	67,492	80,992	94,460
70-84 (% by all rural counties)	10.7	12.1	13.6	14.5	14.5	13.7
85+ (% by all rural counties)	2.6	2.8	3.2	3.8	4.6	5.3
Male						
70-84	86,393	98,080	109,550	116,641	116,107	109,280
85+	16,125	17,729	20,294	24,051	29,218	34,377
70-84 (% by all rural counties)	9.6	10.9	12.2	13.0	12.9	12.2
85+ (% by all rural counties)	1.8	2.0	2.23	2.7	3.3	3.8
Female						
70-84	103,277	118,030	132,461	141,076	141,442	133,785
85+	30,273	32,592	36,800	43,441	51,774	60,083
70-84 (% by all rural counties)	11.7	13.3	15.0	16.0	16.1	15.2
85+ (% by all rural counties)	3.4	3.7	4.2	4.9	5.9	6.8

Older Adult Driver Licensing

The demographic analysis also analyzed 2010 driver licensing trends by age group and sex in the six study counties, all rural counties combined, and for Michigan overall using Michigan driver license data (Michigan Department of State, 2010). Table 13 shows the results. In the 70-75 age group, nearly all older adults held a driver license in the six counties, all rural counties, and Michigan overall, except for women in Michigan overall. For this group, only 91% held licenses, indicating that older women were more likely to be licensed in rural areas of Michigan. As age increased, the percentages of the population that held a driver license decreased, with significant decreases for older adults age 90 and older.

Table 13. Percent of Population that are Licensed to Drive by Age Group, Six Counties, All Rural Counties, and Michigan Overall in 2010					
	Age Group				
	70-74	75-79	80-84	85-89	90+
Alpena - all	99.1	95.1	91.6	74.4	39.7
Men	97.6	100	97.4	94.4	70.2
Women	100	90.9	87.6	63.9	30.7
Hillsdale-all	99.0	94.1	94.1	73.7	45.7
Men	100	100	100.0	89.7	76.0
Women	97.9	89.1	86.8	65.0	34.0
Huron-all	98.8	97.4	88.4	82.1	64.4
Men	100	99.5	98.9	98.4	83.0
Women	96.4	95.6	81.1	71.4	56.6
Iron	96.5	89.2	82.0	69.7	43.5
Men	100	94.1	86.9	97.5	77.6
Women	93.1	85.5	78.3	56.2	31.0
Marquette	94.1	87.5	82.6	63.5	41.0
Men	96.1	93.7	91.9	78.6	58.7
Women	92.2	82.2	75.9	54.5	34.2
Mason	98.5	95.3	89.1	81.8	46.4
Men	99.3	100	94.0	100	66.3
Women	97.7	87.2	85.2	69.6	38.9
All Rural Counties - all	97.5	95.3	89.0	76.1	50.7
Men	98.4	98.4	96.5	92.3	78.3
Women	95.9	90.9	82.3	65.9	39.7
Michigan- all	93.3	88.6	82.3	70.6	46.9
Men	96.2	94.7	91.8	87.7	75.0
Women	90.6	83.6	75.8	61.2	36.6

Motor Vehicle Crashes

Table 14 shows the number of crash-involved drivers in Michigan, in all Michigan rural counties, and in each of the six study counties from 2008-2010. Data from Michigan Vehicle Crash Files (University of Michigan Transportation Research Institute, 2009, 2010, 2011) that contain every police-reported vehicle crash in the state were used for this analysis. Note that these data do not indicate fault in the crash. They simply mean that the driver was involved in a crash. This table shows that the percentage of crash involved older drivers was about 5% each year. In rural areas, the percentage was slightly higher. Iron County had the highest older driver crash involvement.

Table 14. Number of Crash-Involved Drivers 2008-2010 by Age and Year			
	2010	2009	2008
	All drivers Drivers age 70+ % drivers age 70+	All drivers Drivers age 70+ % drivers age 70+	All drivers Drivers age 70+ % drivers age 70+
Michigan	480,181 25,610 5.3	481,073 24,913 5.2	522,677 25,072 4.8
Rural Counties	83,108 5,450 6.6	88,405 5,779 6.5	5,643 93,365 6.0
Alpena	1,230 87 7.1	1,242 97 7.8	1,366 131 9.6
Hillsdale	2,229 137 6.4	2,228 114 5.1	2,472 129 6.2
Huron	2,065 144 7.0	2,166 161 7.4	2,084 129 6.2
Iron	757 64 8.5	644 64 9.9	764 72 9.4
Marquette	3,168 229 7.2	3,279 199 6.1	3,312 207 6.3
Mason	1,756 124 7.1	1,889 153 8.1	2,092 137 6.5

The analysis also examined the casualties of severe injury crashes of older adult residents for 3 years from 2008 to 2010. Table 15 shows the statewide number of traffic crash casualties by travel mode and whether the victim suffered a fatal or incapacitating injury. An incapacitating injury is defined as an injury that has been classified as level A on the KABCO scale used in Michigan's UD-10 police accident reports. The number of casualties for all ages is shown, as is the number and percent of total that are age 70 and older. As can be seen, older adult traffic-crash casualties was variable, but they tended to decrease over the 3-year period.

Table 15. Michigan Statewide Crash-Related Deaths and Incapacitating Injuries, Total, and Age 70+			
	2010	2009	2008
	All Ages Age 70+ % age 70+	All Ages Age 70+ % age 70+	All Ages Age 70+ % age 70+
Driver Killed	627 95 15.2	549 86 15.7	634 104 16.4
Driver Incapacitating Injury	4,222 285 6.8	4,263 290 6.8	4,596 302 6.6
Passenger Killed	182 22 12.1	182 18 9.9	207 26 12.6
Passenger Incapacitating Injury	1,522 83 5.5	1,616 84 5.2	1,495 103 6.9
Bicyclist Killed	29 2 6.9	19 4 21.0	25 0 0
Bicyclist Incapacitating Injury	166 5 3.0	201 5 2.5	171 4 2.3
Pedestrian Killed	135 23 17.0	121 10 8.3	114 13 11.4
Pedestrian Incapacitating Injury	425 17 4.0	431 21 4.9	463 23 5.0
Total	7,308 532 7.3	7,382 518 7.0	7,705 575 7.5

Table 16 shows the number of traffic-crash casualties by travel mode and whether the victim suffered a fatal or incapacitating injury for all 58 rural Michigan counties combined. These data showed that casualties were variable from year-to-year and do not seem to be decreasing as was found in the statewide data.

Table 16. Michigan Rural Counties Crash-Related Deaths and Incapacitating Injuries, Total, and Age 70+			
Year	2010	2009	2008
	All Ages Age 70+ % age 70+	All Ages Age 70+ % age 70+	All Ages Age 70+ % age 70+
Driver Killed	202 25 12.4	172 34 19.8	190 24 12.6
Driver Incapacitating Injury	1,401 114 8.1	1,226 80 6.5	1,304 109 8.4
Passenger Killed	67 7 10.4	57 7 12.3	49 6 12.2
Passenger Incapacitating Injury	478 33 6.9	537 34 6.3	471 36 7.6
Bicyclist Killed	7 0 0	1 0 0	8 0 0
Bicyclist Incapacitating Injury	34 0 0	28 0 0	27 0 0
Pedestrian Killed	20 5 25.0	17 3 17.6	20 2 10.0
Pedestrian Incapacitating Injury	65 4 6.2	50 2 4.0	51 5 9.8
Total	2,274 188 8.3	2,088 160 7.7	2,120 182 8.6

The crash data for the six study counties showed that there were very few traffic-crash-related fatalities or incapacitating injuries in these counties during 2008-2010. Therefore, Table 17 shows the numbers by whether the person was a driver, passenger, or pedestrian.

Table 17. Fatalities and Incapacitating Injuries Sustained by Persons Age 70+ in the Six Study Counties						
	2010		2009		2008	
	Fatal	Incapacitating	Fatal	Incapacitating	Fatal	Incapacitating
Alpena	0	1 passenger	1 driver	2 drivers 1 passenger	0	5 drivers
Hillsdale	2 drivers	3 drivers 2 passengers 1 pedestrian	1 driver	4 drivers 3 passengers	1 driver	3 drivers 2 passengers
Huron	1 pedestrian	2 drivers	1 driver	0	1 driver	0
Iron	0	1 pedestrian	1 driver	2 drivers	0	0
Marquette	0	3 drivers 1 pedestrian	0	1 driver 2 passengers	0	3 drivers
Mason	0	1 driver 2 passengers	0	1 passenger	0	7 drivers 4 passengers

Because the numbers of fatalities are low when considering small geographic regions and the fact that whether a person sustains an incapacitating injury or is killed in a crash is often a matter of chance, both fatalities and incapacitating injuries crashes are often combined for analysis. Table 18 shows the serious crash casualty rates (fatal and incapacitating injuries combined over 3 years), for Michigan overall, all rural Michigan counties, and each of the six study counties per 1,000 population. The severe crash casualty rate for people age 70 and older was lower than for the entire state, for the rural counties, and for five of the six study counties. The casualty rates in rural counties and in four of the study counties, however, were higher than for the overall state rate, suggesting that severe older adult crashes were elevated in rural areas of Michigan. One should note that the numbers of the casualties in the age 70 and older category were low and a single casualty can affect the overall rate.

Table 18. Serious Crash Casualty Rate per 1,000 Persons		
	Total Population	Population Age 70+
State of Michigan	0.0755	0.0575
All Rural Counties of Michigan	0.1214	0.0841
Alpena	0.0743	0.0802
Hillsdale	0.1257	0.1471
Huron	0.0926	0.0321
Iron	0.1292	0.0583
Marquette	0.0899	0.0480
Mason	0.1440	0.1320

Discussion

This report reviewed important issues about transportation, mobility, and older adults who reside in rural areas, particularly in Michigan. Because Michigan American Indian tribal land also tends to be located in rural areas, the report also addresses the unique transportation issues that are faced by American Indians. This report also includes a detailed analysis of census, licensing, and crash data in Michigan and presents results for older people as a function of Michigan overall, all 58 rural Michigan counties, and by the six study counties that are the focus of the current project.

It is appropriate for MDOT to focus resources, programs, and research on issues related to safe mobility for older people who live in rural areas of Michigan for several reasons. A greater proportion of people who live in rural Michigan counties are age 70 and older and the number and percent of rural older adults is expected to increase for the next several decades. There is good evidence that older adults who live in rural areas are not satisfying all of their mobility needs, particularly those who no longer drive. Public transit services are inadequate in many rural areas and the barriers to using public transit in rural areas are unique and challenging to overcome.

There is also good reason for further investigating the transportation challenges faced by American Indian tribes in rural Michigan. These tribes may have unique issues regarding safe transportation for older adults including a lack of transportation infrastructure and issues of sovereignty and jurisdiction. Further research into issues is an important first step in improving the mobility for tribal members who are elderly.

In conclusion, as the population of older adults in rural Michigan continues to grow, it is becoming increasingly critical that state organizations, such as MDOT, better understand and monitor the mobility needs of older adults and address these needs through transportation facility design, planning, and programs.

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