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# Impacts of Transit on Health in Rural and Small Urban Areas


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## Disclaimer

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# ABSTRACT

This research examines the many ways that public transportation affects health, with a focus on rural and small urban areas. First, a comprehensive literature review is conducted. Research on the social determinants of health, access to health care, physical activity benefits, social isolation, and mental health and how each is related to public transportation are reviewed. The study examines transportation to health care services in rural and small urban areas, the role of public transportation in improving access to care, and the effects of missed or delayed health care trips. A survey was conducted of older adults in non-metro areas across the United States that asked questions related to health care use and travel behavior, as well as impacts from the COVID-19 pandemic on access to care. Regression analyses of the survey data and data from the Medical Expenditure Panel Survey (MEPS) were conducted to understand factors related to delayed health care as well as the impact of delayed care on total health care expenditures. Analysis of the survey data showed that those without access to a vehicle and those who reported difficulties using transit since the pandemic started were significantly more likely to have missed a health care trip. Analysis of the MEPS data showed that missed health care trips were more likely as travel time to health care services increased, and health care expenditures were significantly higher for those who had missed or delayed a health care trip.

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# 1. INTRODUCTION

Transit can impact the health of its users in several ways. Many transit riders in rural communities rely on public transportation to get to their medical appointments. Transit improves access to health care services, which can result in reduced health care expenses and improved quality of life. Missing a trip for routine care or preventive services can often result in a medical trip that is costlier than the trip that was missed. A missed trip can lead to emergency trips or hospitalization. Improving access to health care allows the individual to maintain well-managed care, reduces the need for more expensive services, and improves quality of life.

Improving access to other types of activities can also have health benefits. Improved access to grocery stores and nutritious food can directly impact health, while improved access to other activities can be indirectly beneficial to health. By allowing users to make trips they otherwise would not have made, transit reduces social isolation and stress, allows for independent living, and increases a person's social network. This leads to quality-of-life benefits that can ultimately impact both physical and mental health. Improved access to work also allows the transit user to maintain employment, which leads to increased income and greater likelihood of having health insurance. Income and health insurance are both significant determinants of health.

Transit has also been shown in urban areas to positively impact health by increasing the physical activity of its users. Transit users, particularly fixed-route users, often walk more because they need to walk to and from transit stops.

For all these reasons, transportation is often referred to as a social determinant of health. There is ample evidence that transportation plays a significant role in determining a person's health. Previous research has demonstrated the significant monetary benefits of providing non-emergency medical transportation (Hughes-Cromwick et al. 2005). Mattson et al. (2020) applied results from previous work to demonstrate the substantial health benefits that transit services in Greater Minnesota provide by improving access to health care.

This research examines the many ways that public transportation affects health in rural areas. The report is organized as follows:

- First, a comprehensive literature review is conducted. This is presented in Section 2. The literature review includes a focus on rural and small urban areas but also includes research from urban areas. Research on the social determinants of health, access to health care, physical activity benefits, social isolation, and mental health and how each is related to public transportation are reviewed. Based on the literature review, the study draws conclusions on further research needs.
- Study methods are described in Section 3. The study provides greater focus on transportation to health care services in rural and small urban areas, the role of public transportation in improving access to care, and the effects of missed or delayed health care trips. A survey, conducted of older adults in non-metro areas across the United States, asked questions related to health care use and travel behavior. The impact of the COVID-19 pandemic on access to care was also explored. A regression model was developed to show the relationships between transportation and the likelihood that a survey participant had to miss or delay a health care trip. Further analysis was conducted of data from the Medical Expenditure Panel Survey (MEPS) to understand factors related to delayed health care as well as the impact of delayed care on total health care expenditures.

- Section 4 summarizes the survey results and presents the regression results. Results show the benefits that public transportation can provide by improving access to care and reducing the number of health care trips that are missed or delayed.
- A summary and conclusions are provided in Section 5.

# 2. LITERATURE REVIEW

## 2.1 Transportation as Social Determinant of Health

The social determinants of health (SDOH) are the environmental and social conditions that impact a person's health and well-being. SDOH can be grouped into five domains: economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context (U.S. Department of Health and Human Services n.d.). Several factors within each of these areas can have major impacts on health and well-being, and many studies have analyzed these factors (Schulz and Northridge 2004; Wanless, Mitchell, and Wister 2010; Hege et al. 2018; Taylor et al. 2016; Singu et al. 2020). Research has been conducted in a variety of contexts, including rural areas. For example, Hege et al. (2018) studied health disparities among rural communities by focusing on social determinants of health such as poverty, access to health care, food insecurity, and others. Research on the COVID-19 pandemic showed how social determinants of health impact disadvantaged populations during times of crisis (Singu et al. 2020). While there are many factors that contribute to health, transportation is widely considered to be one of the social determinants of health (Mirza and Hulko 2022). It relates to each of the five domains of SDOH.

First, economic stability is critically important to help people meet their health needs. About 12% of the U.S. population is living below the poverty line. Lack of economic stability makes it difficult for individuals to afford health care, healthy foods, or adequate housing, which all contribute to their health. Transportation contributes to economic stability by providing a means for people to get to work and maintain employment. Maintaining employment is difficult for those without access to a car or quality public transit. Mattson et al. (2020) surveyed users of rural and small urban transit services in Greater Minnesota and found that many of the riders rely on these services to get to work. Results from surveys of riders of six transit agencies showed that work trips are the most common type of transit trip, and a large majority of those who use transit to get to work reported that the transit service is very important to them and that they would not be able to keep their job without it (Mattson et al. 2020).

The next domains of SDOH are access to education and health care and the quality of those services. Transportation improves access to education and health care, thereby impacting health. There are several reasons why an individual may not have access to quality health care, such as a lack of health insurance or a primary care provider or the inability to afford services. Lack of transportation and the travel distances to health care providers also create a barrier for accessing health care. Several studies have focused on transportation and access to health care. Transportation also improves access to education. Fewer riders surveyed by Mattson et al. (2020) used public transportation to access school or job training, compared with health care, but many of those who used transit for that purpose relied on it as a primary means of transportation.

The built environment is another domain of SDOH, which is again linked to transportation. Neighborhoods that provide safe infrastructure for walking, biking, and the use of transit encourage increased physical activity, which yields positive health benefits. However, many neighborhoods have been designed primarily for automobile travel and do not provide opportunities for many trips to be made by walking or biking and are not designed for public transit to be an effective option. In addition to the physical activity benefits, a reduction in car trips would also decrease air pollution and prevent many serious health problems caused by harmful emissions.

Finally, the social and community context impacts health and well-being. As described by the U.S. Department of Health and Human Services (n.d.), positive relationships with friends, family, co-workers, and community members can help people face challenges and reduce the negative impacts of those

challenges. Transportation again plays a role. Those who cannot drive or do not have access to a vehicle take fewer trips (Mattson and Molina 2022) and face increased risk of social isolation. Nearly all rural transit users surveyed by Mattson et al. (2020) reported that the transit service helps to keep them connected to their town, and a majority agreed that it increases social interaction with other people. Being mobile changes the individual's ability to connect socially and engage in the community, improving health and well-being.

Transportation impacts health by providing access to employment, education, health care, healthy food, and other activities and reducing social isolation. People who cannot drive or do not have access to a vehicle are at risk of missing important health care trips, not being able to keep a job, or not being able to access other activities that will impact their health, and they have a greater risk of social isolation. Chihuri et al. (2016) reviewed the literature on health outcomes of driving cessation among older adults. They found that driving cessation was associated with declines in general health and physical, social, and cognitive function and that driving cessation almost doubled the risk of depressive symptoms. They concluded that driving cessation contributed to a variety of health problems and that intervention programs are needed to ensure that the mobility and social needs of older adults are met.

Public transportation plays an important role in ensuring that those needs are met. Many of the users of transit services in rural areas and small communities are older adults, people with disabilities, and people with low income (Mattson et al. 2020; Mattson, Mistry, and Hough 2020). Transit, therefore, helps to promote health equity by providing access and opportunities to those who cannot drive and are not well served by other transportation options. A shift in trips from the automobile to transit could also have health benefits by reducing emissions of harmful pollutants and encouraging increased physical activity. The remaining sections of the literature review will provide greater detail for many ways that public transportation impacts health.

## 2.2 Access to Health Care

### 2.2.1 Missed Health Care Trips Due to Lack of Transportation

Wolfe et al. (2020) estimated that 5.8 million people in the United States delayed medical care because of a lack of transportation in 2017. This finding was the result of a data analysis from the National Health Interview Survey (NHIS) and was an update from a previous analysis of 2001 and 2002 NHIS data by Wallace et al. (2005) that found 3.6 million Americans do not obtain medical care each year because of a lack of transportation. Both studies found that transportation is more likely to be a barrier for obtaining medical care for people from certain population groups. Wolfe et al. (2020) found that Hispanic people, those living below the poverty line, Medicaid recipients, and people with functional limitations are more likely to miss health care because of a lack of transportation. Wallace et al. (2005) similarly found that those who are poorer or are members of a minority group, as well as women, older adults, and those with less education, are more likely to miss medical care because of a lack of transportation.
Transportation to health care is an issue for both young and old. Survey data reported by Grant et al. (2016) showed that 4% of children in the United States and 9% of children from lower-income households missed at least one health care appointment each year because transportation was not available. The researchers further analyzed the risk of transportation barriers to health care in Mississippi and Tennessee and found that the counties with the highest risk of transportation barriers, where residents were more likely to miss health care trips because of lack of transportation, were significantly more rural and had significantly higher child poverty rates.

In rural areas, long travel distances and lack of alternative transportation options can make access to health care especially challenging. Several studies have shown that as the distance to health care services

increases, the use of those services decrease (Arcury et al. 2005; Nemet and Bailey 2000; Goodman et al. 1997; Winters et al. 2006; Gregory et al. 2000; Harris, Aboueissa, and Hartley 2008; Littenberg et al. 2006; Monnet et al. 2006; Baker and Liu 2006). Although many of these studies examine specific geographic regions and different health care issues, the general conclusion is that distance to health care services and the use of those services is negatively related.

The ability to drive and access to other transportation options are also important determinants of the use of health care services. Research has shown that those who have a driver's license make more health care trips than those who do not (Arcury et al. 2005). Those who cannot drive make more health care trips if someone else in the household can drive or if family or a friend is available to provide transportation (Arcury et al. 2005; Mattson 2011). Arcury et al. (2005) found that those who used public transit in rural North Carolina made significantly more chronic care visits per year than those who did not. In a survey of rural transit riders in Minnesota by Mattson et al. (2020), about a third of respondents said they would miss at least some health care trips if transit were not available.

A study of rural older adults in Western Canada found that transportation was a top priority for improving access to health care (Mirza and Hulko 2022). As explained by Mirza and Hulko (2022) older adults in rural areas face several transportation challenges for accessing health care, which include:

- Coordinating medical appointments with the transportation provider's schedule
- The need to reserve rides ahead of time
- Language and communication barriers for people with disabilities
- The need to depend on others for transportation
- Difficult driving conditions, and other factors

Mattson (2010) also found that the need to match transit and medical schedules and inconvenient schedules were significant problems with using public transportation for medical trips in rural areas. Other problems included lack of door-to-door service and infrequent service.

### 2.2.2 Benefits of Providing Non-Emergency Medical Transportation

As the research shows, providing transportation to health care services for those who lack it increases the use of those services. The benefits are improved health and well-being and potential cost savings as well. Missing a trip for routine care or preventive services often results in a medical trip that is costlier than the trip that was missed. While providing non-emergency medical transportation (NEMT) for those who lack it may be expensive, it has the potential to provide cost savings. Access to NEMT can reduce emergency room and hospital expenditures. Grant et al. (2016) found that 31% of those children who missed a health care appointment subsequently went to the ER for a condition associated with the missed appointment. They concluded that more than 750,000 pediatric ER visits could be avoided nationwide per year with improved transportation access to primary care sites.

A Transit Cooperative Research Program (TCRP) report published by Hughes-Cromwick et al. (2005) found the provision of NEMT to those who lack access to transportation has net societal benefits. The results were also published by Wallace et al. (2006). They defined the benefit from providing a trip for health care as the difference between well-managed and poorly managed care, which can include a reduction in more costly care and improved quality of life. For the seven chronic conditions and five preventive conditions analyzed in their study, they found that the net health care benefits of increased access to NEMT for those transportation-disadvantaged individuals exceeded the additional costs of transportation for all of these conditions. For some of the conditions they found net cost savings, and for the others, the improvements in quality of life or life expectancy were sufficient to justify the added expense.

Hughes-Cromwick et al. (2005) estimated the number of health care visits required for various chronic diseases by examining the disease management literature. They determined the number of trips a patient with a specific disease would be required to take per year so their condition would be considered well managed. They determined the characteristics of a poorly managed patient so they could estimate the benefit of moving from poorly managed to well-managed care. Having well-managed care means that complications are minimized, costly care is avoided, and quality of life is enhanced. Poorly managed care could be a result of patient noncompliance, but lack of transportation can also play a significant role. Impacts of a treatment on quality of life can be measured using the quality adjusted life-year (QALY) measure. QALY was developed to combine quality of life and length of life into a single measure and is often used to compare the cost effectiveness of treatments (Prieto and Sacristán 2003). It assumes that one year of life lived in perfect health is equal to one QALY, and one year of life lived with less than perfect health is worth less than one QALY. Hughes-Cromwick et al. (2005) cited research from health economics showing that investments that provide one additional QALY are valued at $50,000.

The benefits of NEMT are calculated as the cost difference between well-managed and poorly managed care, plus improvements in quality of life, minus costs of additional medical treatment incurred, divided by the number of trips required.

Other studies have used the methods and tools developed by Hughes-Cromwick et al. (2005) to estimate the benefits of providing medical trips to those who otherwise would not have made the trips, and they found the benefits to be substantial (Godavarthy, Mattson, and Ndembe 2014; Mattson et al. 2020; Ducote and Ducote 2016). Mattson and Peterson (2021) studied rural and small urban transit agencies in Minnesota and found that the benefits from improving access to health care alone were more than enough to justify the cost of providing transit services in these communities.

### 2.2.3 How to Improve Transportation for Health Care Services

As suggested by the previous sections, efforts to improve transportation services to health care could have significant health benefits. Several studies have highlighted best practices or described strategies for improving access to health care for those who do not drive (KFH Group. and NORC at the University of Chicago 2021; Health Research & Educational Trust 2017; Schwartz et al. 2022; Oluyede et al. 2022; Zafian 2000).

Streamlining and integrating transportation with health care is critical. Mirza and Hulko (2022) concluded that transportation providers need to advocate for system-wide solutions such as integrating transportation into the health care system. Oluyede et al. (2022) described software that can book health care appointments and transportation simultaneously. The use of streamlining transportation made it easier for health workers to assign patients for transportation options such as vehicles and available drivers that fit into their scheduled appointment times (Oluyede et al. 2022).

Care coordinators can play a key role in providing support to individuals to overcome transportation challenges. Oluyede et al. (2022) interviewed several care coordinators, which include nurses, social workers, and other professionals who address health-related social needs, in North Carolina. They found that care coordinators provide a range of support to help their patients address transportation challenges. This support included direct involvement in trip planning and scheduling as well as educating patients about their options and encouraging them to be proactive (Oluyede et al. 2022).

Partnerships are critical for improving access. TCRP Report 223, *Guidebook and Research Plan to Help Communities Improve Transportation to Health Care Services*, (KFH Group. and NORC at the University of Chicago 2021) described several strategies to address transportation needs and improve health care

access, many of which relied on partnerships and collaborative practices. The report outlined the following strategies:

- Initiate organized community planning efforts between public transportation and health care providers to prioritize needs assessments and information on transportation impediments to health treatment.
- Ensure well-designed public transportation, which will lessen the need for more expensive specialized transportation services.
- Prioritize transportation infrastructure to enable access to the patients' population, information sharing, and coordination between the health care and transportation operators.
- Build coordination and relationships to provide financial support to innovative programs and projects for those who are constrained by transportation (e.g., the Innovative Coordinated Access and Mobility [ICAM] pilot program.)
- Provide free bus passes for demand response or fixed/flex bus route users to travel to medical appointments.
- Secure public-private sponsorships and partnerships to ensure continued support of transportation services.

The Health Research & Educational Trust (2017) also described several strategies and provided examples of practices relying on partnerships, such as:

- In a partnership with Lyft, Denver Health Medical Center offers vulnerable patients access to transportation to and from the hospital.
- A volunteer driver program was established in cooperation with Grace Cottage Family Health and Hospital and the Green Mountain RSVP. It assists patients in traveling to and from appointments.
- Taylor Regional Hospital provides patients in Taylor County, Kentucky, and the surrounding regions with hospitality van services.
- Mobile clinics or direct transportation services can be provided through a partnership with communities to help bridge the accessibility barriers between patients and medical facilities.

Schwartz et al. (2022) found that collaboration between drivers and case managers enhanced patients' transportation access to health care. Patients felt safe in the hands of drivers, who were able to tell care managers ahead of time what was happening to patients. Also, case managers could call drivers and request transportation services for patients. This boosted patients' confidence and encouraged them to attend medical appointments with the same driver.

Funding for transportation to health care is a major issue. Oluyede et al. (2022) concluded that costs could be subsidized or funded by health care providers through foundation (funds for cancer and children's hospital patients) or philanthropic (for specific patients) funds. The transportation subsidies could include the provision of buses and paying for ride-hailing, discounted parking, and gas cards to reduce travel costs (Schwartz et al. 2022; Oluyede et al. 2022). In a study conducted in the Boston area to improve transportation access to health care, Zafian (2000) found that for patients without access to other forms of transportation, hospitals offer programs that pay for taxi fares. Subsidized fares or free bus rides provide a stress-free option to improve access to health care and other activities that promote health. The Health Research & Educational Trust (2017) argued that hospitals could contribute significantly to patients' access to health care by supporting policy and infrastructure programs that target improving transportation access and creating safer and healthier transportation options.

The need for health care travel can also be minimized through various approaches such as streamlined health care access, mobile clinics, and telehealth. Oluyede et al. (2022) described the benefits of streamlining health care access through the shared care model and appointment blocking. The shared care model identifies health care services closest to the patient's home to reduce travel distance. This requires

a coordinated system where the patient is co-managed. Travel can also be reduced by combining multiple appointments or appointment blocking, if possible. Bringing health care services to the patient, instead of the patient to the health care services, is another option for improving access. Some heath care providers operate mobile clinics or mobile health centers (Health Research & Educational Trust 2017). Increasingly, health care visits can be conducted virtually through telehealth, improving access to care, and reducing the need for travel (Oluyede et al. 2022; Health Research & Educational Trust 2017).

Tables 2.1 and 2.2 describe several examples of strategies for improving access to health care that were detailed in reports by Health Outreach Partners (HOP) (2016) and the Health Research & Educational Trust (2017). The strategies in Table 2.2 were provided by the Health Research & Educational Trust (2017) from the perspective of how hospitals could address transportation issues and improve access to care.

**Table 2.1** Strategies for Improving Health Care Access (Health Outreach Partners 2016)

| **Strategy** | **Description** |
|---|---|
| Transportation services | Transportation services are provided based on the needs of the community, location, and funds available to suit their medical conditions. The transportation services cover round trips to and from health centers or the social services from a patient's home or work site. |
| Door-to-door transportation services | The door-to-door services provide patients with free rides from their homes or workplace to see a physician for a medical appointment at a health facility. The patients do not pay for the services of the door-to-door operators. |
| Vouchers and reimbursement | Patients are given free vouchers that allow them to board public transportation or taxis for free, at a subsidized cost, and reimbursements are also given to cover the mileage used in transporting a patient to a health facility for medical attention by a family or friend who volunteers to give a patient a ride. |
| Fixed-route shuttle service | Fixed-route services directly serve medical centers and social services with stops conveniently located near the residences of patients. |
| Mobile clinics | Mobile clinics operate where patients live and their workplace to offer medical services to them. This is similar to the door-to-door services except that here, the medical supplies are brought to administer services/care to patients. It could include a van, bicycle, or people with backpacks who come to the homes of the patients to administer services. |
| Telehealth services | Medical information and education are disseminated through the use of telecommunication to provide medical care at a distance. Guidance is transmitted to an off-site direct service provider with the skills and the resources to give such education. Patients could easily access such information via their smartphones, computers, or on television. Outreach workers play a pivotal role in telehealth services. |
| Community-based point of care | The community-based point of care is the local site where a patient receives medical treatment. The facility is close to the patient to make it easy for them to receive timely care through health products and services. This helps to curb the time and distance patients need to travel to receive health care. |

Source: Health Outreach Partners (2016)

**Table 2.2** Strategies for Hospitals to Address Transportation Issues (Health Research & Educational Trust, 2017)

| Strategy | Description | Examples |
|---|---|---|
| Understand and assess how transportation can affect overall community health | There are different indicators to assess how the transportation environment affects health in communities. Use data to understand the health impact of transportation. | Use the CDC Transportation Health Impact Assessment Toolkit; the toolkit is geared toward community planners and health professionals to engage with all stakeholders and account for future transportation initiatives that have health impacts. Review data from the Transportation and Health Tool to understand the health impact of an existing transportation system or proposed transportation project. |
| Integrate access to transportation with organization's mission and practices | A strong organizational commitment will help provide solutions to transportation barriers. | Make a financial and personnel commitment to building, executing, and growing transportation services externally (patients) and internally (employees); Seattle Children's Hospital offers employees free transit passes, shuttle links to transit hubs, free bikes, and on-site bike-sharing. |
| Expand partnerships to support addressing transportation issues | Partnerships with government agencies, health and social service providers, elected officials, transportation authorities, private transportation providers, volunteers, and educational institutions can create new opportunities to address transportation issues. | Participate in local or regional transportation planning initiatives and educate decision-makers about how health can be affected by transportation. |
| Support policy and infrastructure programs aimed to improve transportation access and address other social determinants of health | Many of these programs are multinational and focus on improving transportation access and increasing safe, healthy, and equitable mobility for all. | Become involved with programs and policies such as Vision Zero, Complete Streets, livable community initiatives, and smart growth approaches. Invest in transit systems to improve health; MetroHealth System sponsored a bus rapid transit route and the return on investment has been significant. |
| Invest resources in understanding patients' transportation needs | Transportation barriers and gaps may differ from patient to patient so there is not a one-size-fits-all solution. | Use methods such as a health impact assessment, SWOT analysis, or environmental scans; with such knowledge, hospitals and health systems are in a better position to measure transportation impacts and develop solutions. |
| Use a screening tool to help identify patients with transportation needs | Patients may be hesitant or may not mention transportation issues. They may be unaware that transportation is a need to | Screen by using tools or checklists such as the Social Needs Screening Toolkit from Health Leads to identify patients' transportation needs and other social determinants of health. |

| | | |
|---|---|---|
| | discuss during an appointment. | |
| Provide direct transportation services through community partnerships or programs | When transportation is unavailable, health care systems may need to provide transportation directly to patients and staff. | Establish volunteer-driver programs (e.g., Grace Cottage Family Health & Hospital case example). Partner with ride-sharing companies like Uber or Lyft (e.g., Denver Health Medical Center). Operate door-to-door shuttle services (e.g., Taylor Regional Hospital). |
| Educate staff about transportation issues | Knowledgeable staff who build trust and offer services in a respectful, culturally competent manner are key to successfully addressing patients' transportation issues. | Use care coordinators, community health workers or other staff to help patients identify and apply for transportation assistance through patient insurance.<br>Provide cultural sensitivity training for drivers and staff. |
| Promote transportation options and increase awareness through outreach | Partnerships with community-based organizations promote interest in shared mobility systems. Many patients who are eligible do not enroll or are not aware of the program's transportation benefits. | Provide assistance in multiple languages and in promotional materials that speak to the concerns of target communities.<br>Increase efforts in Medicaid non-emergency medical transportation benefit enrollment and focus on outreach, informing eligible patients of transportation services. Provide travel vouchers or transit passes for patients. |
| Support or invest in programming or infrastructure to reduce travel for patients | Some areas have extremely limited travel options. It may be beneficial to bring programming or services to patients instead of patients traveling to providers and other services. | Create a prescription mail service. Provide telehealth options. Offer pharmacy and other services on site to reduce travel.<br>Establish mobile health clinics (e.g., CalvertHealth Medical Center). Operate door-to-door shuttle services. |

Source: Health Research & Educational Trust (2017)

## 2.3 Physical Activity Benefits

The oldest form of transportation is walking. For thousands of years, humans have been traveling through physical activity. Today, walking and bicycling are referred to as active transportation. As a form of physical activity, walking and bicycling provide important health benefits, and they also have environmental benefits by reducing pollution and emissions of greenhouse gases.

Staying active is important for health. The World Health Organization guidelines state that everyone should get at least 150 minutes of moderate or vigorous activity per week. Several studies have shown meeting these guidelines for physical activity has the potential to reduce chronic diseases, boost muscle fitness, and improve the cognitive functioning of the elderly (Rambaldini-Gooding et al. 2021; Besser and Dannenberg 2005; Saelens et al. 2014; Lee et al. 2012). However, many people do not get enough physical activity. Abildso et al. (2023) found that in most regions of the United States, less than half of adults aged 18 or older met the aerobic activity guidelines of at least 150 minutes per week of moderate or vigorous aerobic activity. They also found that in non-metro areas, only 38% met the aerobic activity guidelines. They found physical activity to be highest in the west region (52% met guidelines) and large metro areas (50% met guidelines).

Individuals are more likely to meet those physical activity guidelines if they make more trips by active transportation. Active transportation, therefore, can improve physical health. Other benefits of active transportation include maintaining social connections and increasing interactions with others, which can boost the physical and cognitive functioning of the elderly (Rambaldini-Gooding et al. 2021; Bauman et al. 2016; Barnes et al. 2016; Shrestha et al. 2017).

The level of active transportation varies between populations. Studies have found that people of lower socioeconomic (low education, low income) levels met or achieved the highest level of transport related physical activity either because they had no personal vehicles or resided in urban areas with good transit systems that required them to walk to and from transit stops to access transit (Besser and Dannenberg 2005; Chang et al. 2017).

Public transportation contributes to increased physical activity because many riders walk or bike to and from transit stops. Besser and Dannenberg (2005) studied 2001 National Household Travel Survey (NHTS) data and found that those who use transit spent a median of 19 minutes per day walking to and from transit and that 29% get at least 30 minutes of physical activity per day by walking to and from transit. In a systematic review by Rissel et al. (2012) on estimating the minutes spent in accessing public transport by means of walking, a common trait found in studies conducted in the United States (Edwards 2008), the United Kingdom (Davis et al. 2011), and elsewhere was that seniors gained an extra eight to 11 minutes walking compared with those who used private cars. Using statistical modeling, Rissel et al. (2012), stated from their studies that increasing the amount of time people spend walking for transportation in New South Wales (NSW) by just eight minutes per day would result in considerable gains in physical activity and better population health.

Miller et al. (2015) showed that new light rail service in Salt Lake City, Utah, increased physical activity among passengers. Lachapelle et al. (2016) analyzed active transportation by transit-dependent and choice riders. Their study found that a more active lifestyle is often associated with lower automobile ownership and transit use. Public transit users engage in activities such as walking to bus stops and train stations and end their trips with walking from transit stops to homes, which increases transit users' physical activity and potentially improves health (Besser and Dannenberg 2005; Saelens et al. 2014; Sener, Lee, and Elgart 2016; Liao et al. 2017). Furthermore, several studies have found that, after controlling for sociodemographic features, transit users engage in more multimodal journeys that entail walking, and they frequently walk long distances between destinations, both of which are beneficial to their health and reduce blood pressure (Lachapelle and Frank 2009; Besser and Dannenberg 2005; Saelens et al. 2014).

Bicycling as a physical activity that links users to transit can be paramount in supporting daily physical activity goals by reducing diabetes and boosting the immune system while riding around a station (Sener, Lee, and Elgart 2016; Ensor, Slason, and Vallyon 2010). Fuller et al. (2011) asserted that there is a positive relationship between public bicycling and physical activity, which is because public bikes are common, cheap, and accessible in urban areas for public use. This means that having daily access to bikes impacts people's health conditions.

In a study that focuses on the introduction of new rapid transit on physical activities, two articles (Hirsch et al. 2018; Chang et al. 2017) indicated that there was a significant increase in transport-related physical activity. Additionally, while expanded transit may reduce the need for active travel, initial data revealed that transportation-related physical activity would increase. Interestingly, in the study by Chang et al. (2017), it was found that male employees with higher education took advantage of the appealing and improved streetscape to do more walking. These findings support the earlier position that transportation-related physical activity impacts health in ways that reduce obesity.

A study conducted by Freeland et al. (2013) focused on non-white (Asian/Pacific Islanders) populations and revealed that people who resided in a city with a population of one million or more and had a rail system in their neighborhood were able to exceed the 30-minute physical activity threshold. In the same study and considering the socioeconomic status of the respondents, it was also found that individuals with lower incomes (less than $15,000/year), lower educational qualifications (less than a high school degree), and had no family vehicle were more likely to meet the 30 minutes of physical activity.

Physical activities positively impact health, and people must try to maintain the 30 minutes of walking or cycling activities per day to help improve their health, such as reducing the risk of diabetes, high blood pressure, and other chronic diseases. Also, objective data analysis could be done to investigate the impact of physical activities on health while at the same time, a similar study could be conducted to investigate the multi-modal transit system's attempt to maximize transit-related physical activities.

## 2.4 Social Isolation and Health

A sense of belonging promotes health and ensures a strong social cohesion between families and friends and promotes quality of life. When this sense of belongingness is broken, people feel lonely and isolated. Isolation has negative consequences on health and well-being (Berkman 1995). Social isolation and loneliness are two terms often used interchangeably and have received considerable attention in the literature on health. There have been past studies on the relationship between social isolation and health (Pantelaki, Maggi, and Crotti 2021; Miyawaki 2015; Hawton et al. 2011). Social isolation is seen as a problem that affects people of all age groups, including the unemployed, single parents, people who do not own cars, and the older population (Delbosc and Currie 2011). According to Ravulaparthy et al. (2013), elderly people who engage in activities outside their neighborhood have greater well-being than those who do not engage in any activity outside their homes. Studies have shown there are higher chances of mortality when older adults are isolated and do not participate in social activities (Mackett and Thoreau 2015; House, Landis, and Umberson 1988).

Crotti et al. (2021) studied public transport use and health status in later life and found that, as people age (65-74 years), they are less likely to drive, and those who drive only a few times in a month faced psychological harms such as anxiety and melancholy. This implies that having increased access to private or public transportation influences social engagement positively and boosts the mental health of older people (Rambaldini-Gooding et al. 2021). Transportation is a major engine that promotes social inclusion and contributes significantly to people's health conditions.

Transportation serves as a medium that connects people to facilities, families, and friends and positively impacts health. For example, Reinhard et al. (2018) submitted in their studies that transport use is directly related to decreased depressive symptoms. Using the Center for Epidemiological Study – Depression (CES-D) score, Reinhard et al. (2018) found a decrease, on average, across all ages in the use of public transport. Boniface et al. (2015) and Cochran (2020) found from their studies that transportation has impacts on social interactions in ways such as accessing transport and influencing feelings of self-efficacy, reduced stress, and connectivity among persons with disabilities to prevent social exclusion and building social capital. Access to transportation encourages social cohesion. People who are socially isolated are more likely to be the elderly, poor, and physically and mentally challenged individuals, who are also transportation disadvantaged (Delbosc and Currie 2011; Hine and Mitchell 2003; Clifton and Lucas 2004).

Cochran (2020) also indicated that adults who rely on their strength and refuse to ask for assistance to get to their destination experience anxiety, which had a negative impact on their psychological well-being. Keeping social connections and belonging to a welcoming community or society and staying active has positive health benefits on the individuals residing in that community, and this prolongs the life of the elderly. Another way of keeping social connections is by traveling, which is seen as a social tool for the elderly as they interact with drivers, friends, and passengers on a trip (Marsden et al. 2007). Lack of access to transportation could hinder people with disabilities and older adults as they do not make enough trips where they interact with people (Cochran 2020; Mackett and Thoreau 2015). Providing and using rides is imperative for positive impacts on physical and psychological health.

Jackson et al. (2019) found that individuals aged 62 or older who had (concessionary) bus passes were less likely to experience social isolation. Their bus passes gave them access to local public transportation, which greatly improved their well-being and quality of life.

## 2.5 Transportation and Mental Health

Having access to transportation on a daily and regular basis allows individuals to embark on several trips, interact with people, and participate in social activities (Reinhard et al. 2018). These activities have a positive effect on improving the physical and mental health conditions of older people and reduce feelings of loneliness (Yang et al. 2020; Reinhard et al. 2018; Rambaldini-Gooding et al. 2021; Yang et al. 2019). However, as one ages, driving abilities gradually decline. Many older adults limit their driving to certain conditions, and some eventually cease driving. For them, access to public transportation is critical.

Reinhard et al. (2019) maintained that frequent use of public transport due to free bus passes was positively related to better cognitive function and increased memory, and a lack of transportation was said to have a negative consequence on the autonomy of people with mental health conditions and the ease with which they could access mental health treatment (Garg et al. 2022). The lack of transportation could be a major setback that contributes to mental health patients' inability to complete treatment and experience worsened cognitive abilities to function properly (Behavioral Health Network of Greater St. Louis 2018). A person's autonomy is largely related to his or her ability to access conducive, safe, and dependable transportation (Musselwhite and Haddad 2010).

Studies have concluded that the frequent use of public transportation provides cognitive benefits from physical activity and quality time spent outside interacting with people, which has been attested to be positive for mental health (Bowler et al. 2010; Strawbridge et al. 2002; Reinhard et al. 2018). Reinhard et al. (2018) and Rambaldini-Gooding et al. (2021) showed that transportation access can improve the mental health of older people by improving their mood and decreasing suicides.

As a way of enhancing social participation, the UK government introduced a free and subsidized bus pass for older people with no access to private vehicles either personal or from friends and family. Using data from the English Longitudinal Study of Ageing (ELSA), Reinhard et al. (2019) discovered that higher usage of public transportation as a result of the free bus pass led to an increased chance of attending cultural events (theater, exhibitions, galleries, and movies), which might be advantageous for mental health, at least monthly. Using a free bus pass for frequent transit is associated with improving one's mental health.

## 2.6 Conclusions

Research shows the wide-ranging impacts that transportation has on health. For those who cannot drive or do not have access to a vehicle, public transportation is critical for improving access to care. A few studies have shown that many Americans miss or delay health care trips every year due to lack of transportation (Wolfe, McDonald, and Holmes 2020). Hughes-Cromwick et al. (2005) showed the benefits of providing non-emergency medical transportation to transportation-disadvantaged populations in terms of reduced health care costs and improved quality of life. While this research was very valuable and has been used in other studies to estimate the health benefits of transit, it is outdated and needs to be updated with more recent data. Furthermore, this study focuses just on access to health care, while research shows that transit impacts health in many other areas.

The scope and magnitude of transit's impact on health in rural and small urban areas have not been fully estimated. While Mattson et al. (2020) estimated the impacts from improving access to health care, they also noted other potential health benefits that they could not quantify or measure in dollar terms. This includes the benefits of greater physical activity, reduced social isolation, and improved mental health. Several studies have shown the positive impact transit can have on increasing physical activity, though most of this research has been conducted in larger urban areas. Many studies have also shown the positive impacts transit has on reducing social isolation and improving mental health. Quantifying these benefits in dollar terms would be helpful for highlighting the benefits of transit and making the case for increased investment, especially in rural areas where services are limited. Transit also impacts health in many other ways, such as by improving access to employment, education, healthy food, and other activities that promote health. Quantifying these benefits in dollar terms is a complicated task.

# 3. METHODS

While public transportation has been shown to impact health in many ways, the analysis in this study focuses on access to health care. A survey of older adults in rural areas was conducted to learn about the following:

- Frequency of health care trips
- Distance traveled for health care
- Method of travel to health care appointments
- The role that public transportation plays in providing trips to health care
- How many older adults in rural areas miss or delay health care trips due to lack of transportation
- Whether the COVID-19 pandemic had any impact on the ability of older adults to access health care

Survey data were analyzed using a binary logit model to identify factors that lead to an increased probability of an individual missing or delaying a health care trip. Further analysis was conducted of the Medical Expenditure Panel Survey (MEPS) to understand factors related to delayed health care as well as the impact of delayed care on total health care expenditures. The methodology is predicated on the hypothesis that transit reduces the number of health care trips that are missed or delayed, and that delayed care can result in increased health care costs for the individual.

## 3.1 Survey of Older Adults

An online survey of older adults across the country was conducted using Qualtrics survey software. The sample was purchased from Qualtrics, which recruited participants for the survey. The survey was distributed by Qualtrics to individuals aged 65 or older living in non-metro areas across the United States. The survey was conducted in January 2023, and a total of 429 completed responses were obtained.

The survey asked respondents if they use public transportation. If they did, they were given a series of questions about their use of transit, such as for what purposes they use transit, how often they use transit, the importance of transit, and the impacts that COVID-19 has had on their use of transit. All respondents were asked questions about the impact of the pandemic on their daily travel and social contacts and a series of questions related to social isolation and loneliness. Molina (2023) conducted an analysis of these survey responses regarding social isolation and loneliness and the impact of the pandemic. The survey then asked a series of questions related to health care, including:

- How many trips they made for health care during the previous year
- The modes of transportation they used for accessing health care
- The purposes of their health care appointments
- Whether they missed or delayed any health care trips during the previous year because of a lack of transportation, and the importance of public transportation for accessing health care
- The impact of a reduction in transit services during the pandemic on access to health care
- Issues with using transit for health care trips
- The distance that respondents live from health care services
- Interest in telehealth

Finally, the survey collected demographic information, such as age, income, whether they have a disability, whether they can drive or have access to a car, and their home ZIP Code. The complete survey is shown in Appendix A.

## 3.2 Understanding Factors Contributing to Missed or Delayed Health Care Trips

Responses from the survey were analyzed to understand the characteristics of individuals more likely to miss or delay a health care trip due to lack of transportation. Ability to drive, access to a car, and use of transit could reduce the likelihood of missing a health care trip. Longer distances to health care providers could also contribute to increased missed trips. Using data from the survey, a binary logit model was developed to understand these relationships. The variables used are described in Table 3.1.

**Table 3.1** Description of Variables

| Variable | Survey question | Measurement |
|---|---|---|
| Missed trip | In the past 12 months, did you miss or delay any health care trips because of a lack of transportation? | 1= yes, 0 = no |
| No car | Do you have access to a car to drive? | 1= no, 0 = yes |
| Transit frequency | How many days per week do you currently use public transit? | 1-5 scale; 1=less than weekly, 2=1 or 2, 3=3 or 4, 4=5, 5=6 or 7 |
| Transit difficulty | Has it been more difficult to use public transit since the COVID-19 pandemic began (March 2020)? | 1= yes, 0 = no or yes but became easier once mask mandate was removed or vaccines became available |
| Distance | What is the distance (in miles) that you live from the health care service you would go to for each of the following? - Routine health checkups, chronic health care visits, emergency care | Average miles reported |
| Age | What is your age? | Reported age |
| Income | What is your annual household income? | 1-5 scale; 1=less than $25,000, 2=$25,000 to $49,999; 3= $50,000 to $74,999; 4= $75,000 to $99,999; 5= $100,000 or more |
| Disability | Do you consider yourself to have a disability or physical impairment? | 1= yes, 0 = no |

Whether or not a respondent has missed or delayed a health care trip during the previous year because of a lack of transportation was modeled as a function of transportation variables, effects of the pandemic, distance to health care, and other individual characteristics. The transportation variables include whether the individual has access to a car to drive and how often they use public transit. It is expected that not having access to a car increases the likelihood of missing a health care trip and that frequent use of transit would reduce missed trips. The pandemic could have made it more difficult to make trips and therefore increased the likelihood of missing a health care trip. This is captured in the model by a variable indicating if it has been more difficult for the respondent to use public transit since the pandemic began. As discussed in the literature review, travel distance has been shown to be negatively related to health care use. Therefore, the model includes the distance respondents reported that they must travel to health care. Individual characteristics include age, income, and whether the respondent has a disability. Age and disability are hypothesized to be positively related to missed trips, and income is negatively related because travel may become more difficult for those with a disability, older adults, and those with low income.

To further study missed or delayed medical trips, data from the Medical Expenditure Panel Survey (MEPS) were analyzed. MEPS is an annual national survey that collects detailed information on health care use, expenditures, sources of payment, health insurance coverage, health conditions, and other data. Data from the 2017 MEPS were used. This survey asked respondents if they had delayed getting necessary medical care for any reason or if they were unable to get necessary medical care. The survey also asked respondents to identify reasons for delaying medical care or not being able to get necessary care. One of the choices was problems getting to the doctor's office. MEPS surveys for 2018-2020 asked respondents if they had delayed medical care for cost reasons, but they did not include the questions from the 2017 survey. Therefore, the 2017 data were used.

Unfortunately, MEPS does not include data on transportation or geographic characteristics. However, it does include a question that asks respondents to identify how long it takes to get to their usual source of care. These data could be analyzed to further study impacts of geography and travel on health care use. Two binary logit models were estimated. The dependent variable for the first model is a binary variable indicating whether the individual either delayed getting necessary medical care or was unable to get necessary medical care. The dependent variable in the second model is a binary variable indicating if the individual delayed or was unable to get necessary medical care specifically because of problems getting to the doctor's office. Explanatory variables include how long it takes to get to their usual source of care, demographic factors such as age, income, and gender, whether they have health insurance, and the number of health care trips taken during the previous year. A description of the variables is shown in Table 3.2.

**Table 3.2** Description of MEPS Variables for Model of Missed Health Care Trips

| Variable | Description | Measurement |
|---|---|---|
| Missed care | Delayed in getting or unable to get necessary medical care | 1=yes, 0=no |
| Missed care transportation | Delayed in getting or unable to get necessary medical care because of problems getting to doctor's office | 1=yes, 0=no |
| Travel time | How long it takes to get to usual source of care | 1-6 scale; 1=less than 15 minutes, 2=15 to 30 minutes; 3=31 to 60 minutes, 4=61 minutes to 90 minutes, 5=91 minutes to 120 minutes, 6=more than 120 minutes |
| Age | Age | Age measured in years |
| Income | Family's total income | Income measured in thousands of dollars |
| Gender | Dummy variable for male | 1=male, 0=female |
| Uninsured | Health insurance indicator | 1=no insurance, 0=any type of health insurance |
| Total visits | Number of health care visits during previous 12 months | 0-6 scale; 0=none, 1=1, 2=2, 3=3, 4=4, 5=5 to 9, 6=10 or more |

It is expected that travel time is positively related to the likelihood of missing necessary medical trips, especially for trips missed because of problems getting to the doctor's office. Age may also be positively related to missed medical trips because older adults may have greater difficulties accessing transportation and making trips. Income is expected to be negatively related to the likelihood of missing health care trips. Those with low income may be more likely to skip needed health care trips because of cost, and they may also have greater difficulties accessing transportation to health care. The effect of gender is uncertain. It is expected that those without insurance are more likely to delay or not get needed health care because of cost. The total number of health care visits during the previous year is included as an explanatory variable because it is an indicator of need for care, and someone who makes more trips may be more likely to miss a needed trip simply because of the larger number of needed trips.

## 3.3 Impact of Delayed Care on Health Care Expenditures

MEPS data can be analyzed to show the relationship between delayed health care trips and individual health care expenditures. As discussed in the literature review, if someone misses or delays a medical trip, their health conditions may not be as well managed, which could lead to more expensive care later. MEPS collects data on total health care expenditures during the year. A regression model was developed that estimated total expenditures as a function of missed care, total visits, income, insurance, age, and gender. These variables are described in Table 3.2. In addition, dummy variables were included for various diagnoses, including arthritis, asthma, cancer, coronary heart disease, high cholesterol, diabetes, emphysema, high blood pressure, heart attack, other heart disease, and stroke.

It is hypothesized that if an individual delays or is unable to make a necessary medical trip their total medical expenditures will be higher. Someone who makes more visits is also expected to have higher expenses. Those with higher income are expected to have higher expenditures because they can afford higher costs, and those without insurance are expected to have lower expenditures because of inability to pay. It is expected that health care costs increase with age. The effect of gender is uncertain. People who have been diagnosed with various conditions are expected to have higher medical costs.

# 4. RESULTS

## 4.1 Survey of Older Adults

### 4.1.1 Characteristics of Respondents

Complete responses were received from 429 participants. Figure 4.1 shows the number of respondents for each state. There was at least one respondent from most states, except for a few states with low population, such as North Dakota. The largest number of responses came from Florida, New York, Ohio, Pennsylvania, California, and Texas.

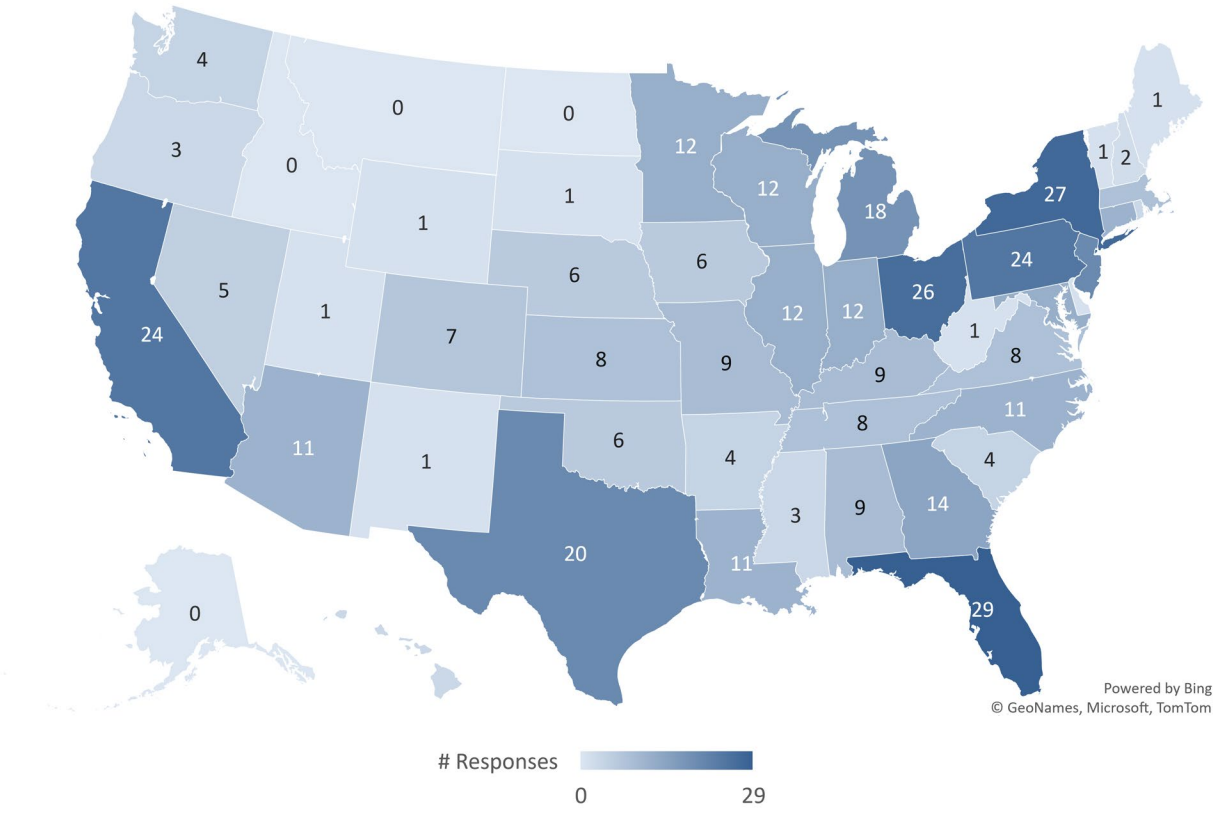


**Figure 4.1** Number of Responses by State

Table 4.1 shows the characteristics of survey respondents. Their ages ranged from 65 to 94, with the average age being 72. More than two-thirds were under age 75, and 10% were 80 or older. Among respondents, 17% have household income below $25,000, and 46% have income below $50,000; 22% considered themselves to have a physical disability or physical impairment. Most (96%) of the respondents were able to drive a car (legally, physically, and mentally), and most (95%) also have access to a car. About a quarter of respondents have used public transportation, though few were frequent transit users.

**Table 4.1** Characteristics of Survey Respondents

| | Number of respondents | Percentage of respondents |
|---|---|---|
| Age | | |
| 65-69 | 154 | 36% |
| 70-74 | 144 | 34% |
| 75-79 | 88 | 21% |
| 80-84 | 36 | 8% |
| 85+ | 7 | 2% |
| Annual Household Income | | |
| Less than $25,000 | 71 | 17% |
| $25,000 to $49,999 | 126 | 29% |
| $50,000 to $74,999 | 107 | 25% |
| $75,000 to $99,999 | 61 | 14% |
| $100,000 or more | 64 | 15% |
| Disability or Physical Impairment | | |
| Yes | 95 | 22% |
| No | 334 | 78% |
| Able to Drive a Car | | |
| Yes | 411 | 96% |
| No | 18 | 4% |
| Have Access to a Car | | |
| Yes | 408 | 95% |
| No | 21 | 5% |
| Have Used Public Transit | | |
| Yes | 108 | 25% |
| No | 321 | 75% |

### 4.1.2 Trips to Health Care

Respondents took an average of 7.4 trips for health care during the previous 12 months. Of respondents, 10% took one or fewer trips during the year, and 10% took 15 or more trips, with the median number of trips being five. Respondents most commonly drove themselves to their health care appointments. A majority reported that they make all of their health care trips by driving themselves. The next most common choice was to get a ride from someone. Also, 7% reported using public transportation for at least some of their health care trips, including 2% that use transit for all or most of their health care appointments. There was no significant difference in mode shares between those aged 65-74 and those 75 or older. Respondents reported making health care trips for several different conditions and purposes, as shown in Figure 4.2.

**Table 4.2** Use of Different Modes for Accessing Health Care

| | No trips | Some trips | Many trips | Most trips | All trips |
|---|---|---|---|---|---|
| | ----------Percentage of respondents---------- | | | | |
| Public transportation | 93% | 5% | 0% | 1% | 1% |
| Drive yourself | 12% | 7% | 3% | 15% | 63% |
| Get a ride from someone | 71% | 20% | 2% | 2% | 5% |
| Take a Taxi, Uber, or Lyft | 95% | 4% | 0% | 1% | 0% |
| Walk or bike | 95% | 4% | 1% | 0% | 0% |

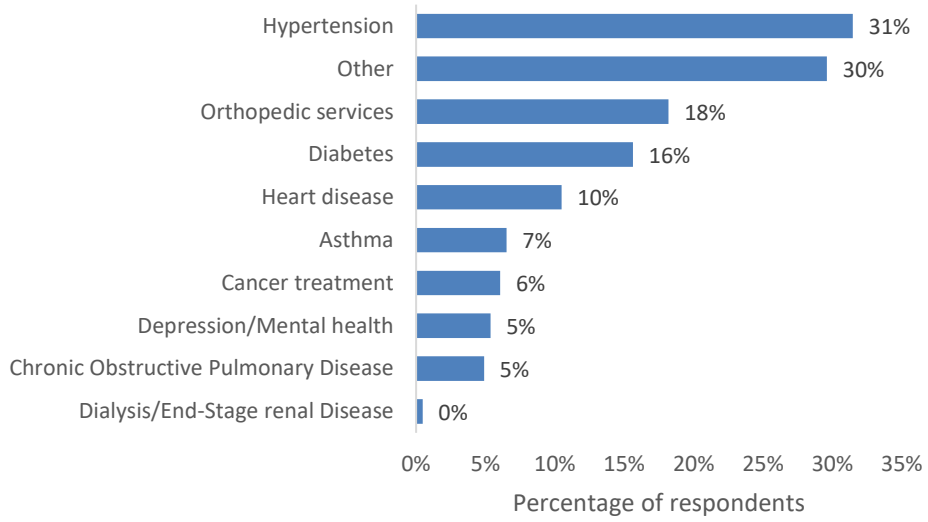


**Figure 4.2** Purposes of Health Care Trips

Because the respondents lived in non-metro areas, they may need to travel greater distances to access health care. On average, respondents reported traveling 10.0 miles for routine health checkups, 12.6 miles for chronic care visits, and 8.2 miles for emergency care (Table 4.3). There is significant variation, however, in the distances that individuals travel. On the low end, 10% live no more than two miles from routine health services and one mile from chronic health care and emergency care services. On the high end, 10% must travel at least 20 miles for routine health checkups, 25 miles for chronic health care visits, and 18.2 miles for emergency care. The 95$^{th}$ percentile distances increase to 30 miles, 45 miles, and 25 miles for routine, chronic, and emergency care, respectively, while the median distances are six miles, eight miles, and five miles.

**Table 4.3** Distance in Miles to Health Care Service

| Purpose | Average | 10th Percentile | Median | 90th Percentile |
|---|---|---|---|---|
| Routine health checkups | 10.0 | 2.0 | 6.0 | 20.0 |
| Chronic health care visits | 12.6 | 1.0 | 8.0 | 25.0 |
| Emergency care | 8.2 | 1.0 | 5.0 | 18.2 |

As noted, most of the respondents can drive themselves and have access to a car, and a significant majority drive themselves for many or all of their health care appointments. However, for a minority of respondents, lack of transportation can create a challenge in accessing health care, and this challenge

could have been exacerbated during the COVID-19 pandemic as transit services were disrupted, or people felt uncomfortable traveling by transit. Of respondents, 6% reported that they had missed or delayed a health care trip during the past 12 months because of a lack of transportation (Figure 4.3). In addition, 4% said they would miss health care trips if public transportation was not available (Figure 4.3), and 11% thought that access to medical services was affected by a reduction in public transit during the pandemic.

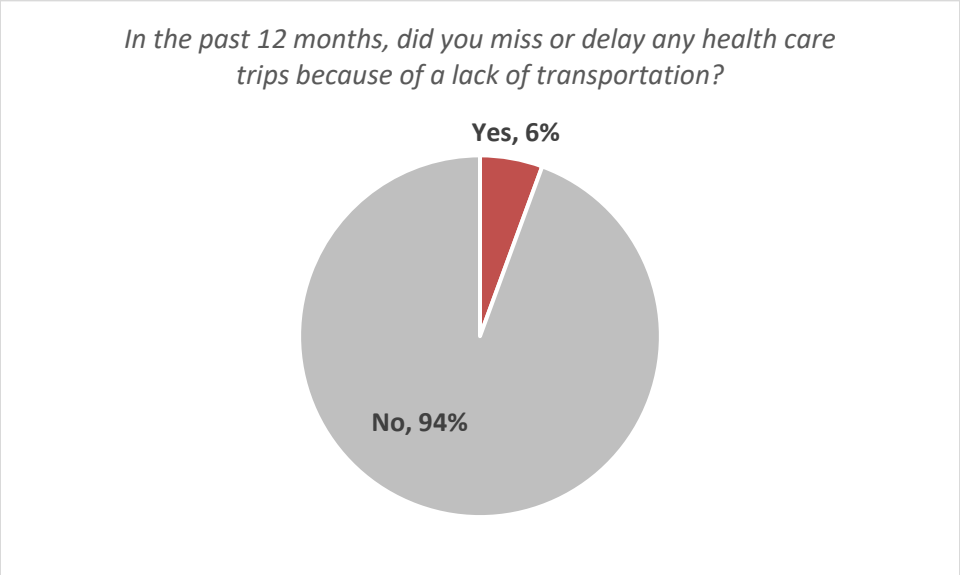


**Figure 4.3** Percentage of Respondents Reporting Missing or Delaying a Health Care Trip Because of Lack of Transportation

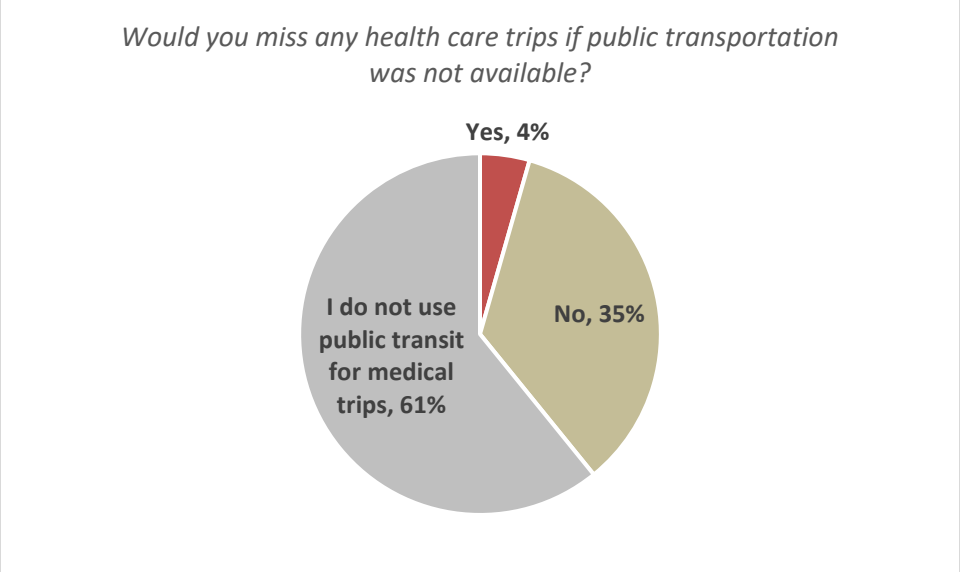


**Figure 4.4** Percentage of Respondents that Would Miss Health Care Trips if Public Transportation was not Available

The survey asked respondents to identify problems with using public transportation for health care trips. The most common response identified by almost half of respondents was that transit does not go where they need to go. Other common responses were inconvenient schedules, lack of door-to-door service, the need to match transit and medical schedules, infrequent services, lack of information, and unreliable services.

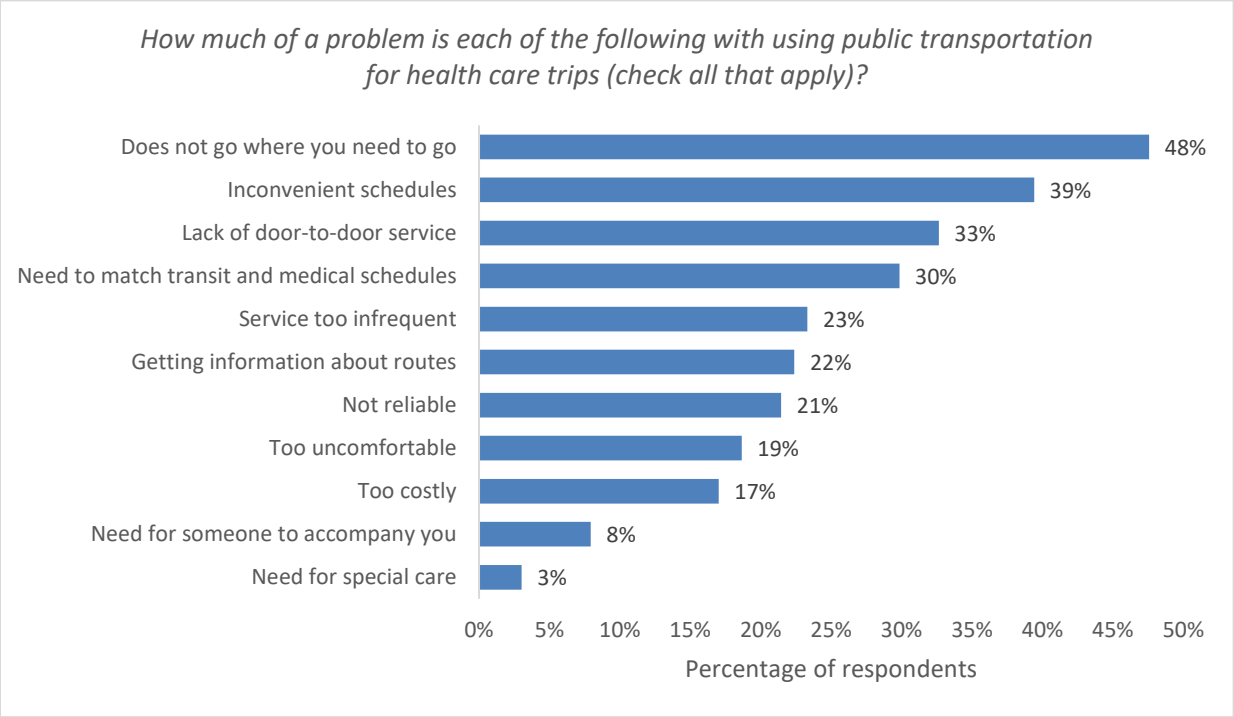


**Figure 4.5** Problems Identified by Respondents for Using Public Transportation for Health Care Trips

Telehealth, which grew in popularity during the COVID-19 pandemic, can be an option for accessing some health care services. It may be especially useful for improving access to health care for people who lack transportation or need to travel long distances. However, while telehealth reduces the need for travel, many older adults still prefer to travel to the medical provider for appointments. As shown in Figure 4.6, 63% of respondents would still want to travel to the medical provider even if the appointments or prescriptions could be possible without travel. Respondents gave several reasons for why they would prefer to travel to the medical provider. Many said that they prefer in-person visits or do not like telehealth. Respondents commonly said they prefer face-to-face interaction with doctors and medical professionals. They feel more comfortable with in-person visits and believe they get better care. Many feel more connected to the doctor with in-person visits and believe they have better interactions. Some commented on how they like getting out of the house. Others mentioned that some things need to be done in person.

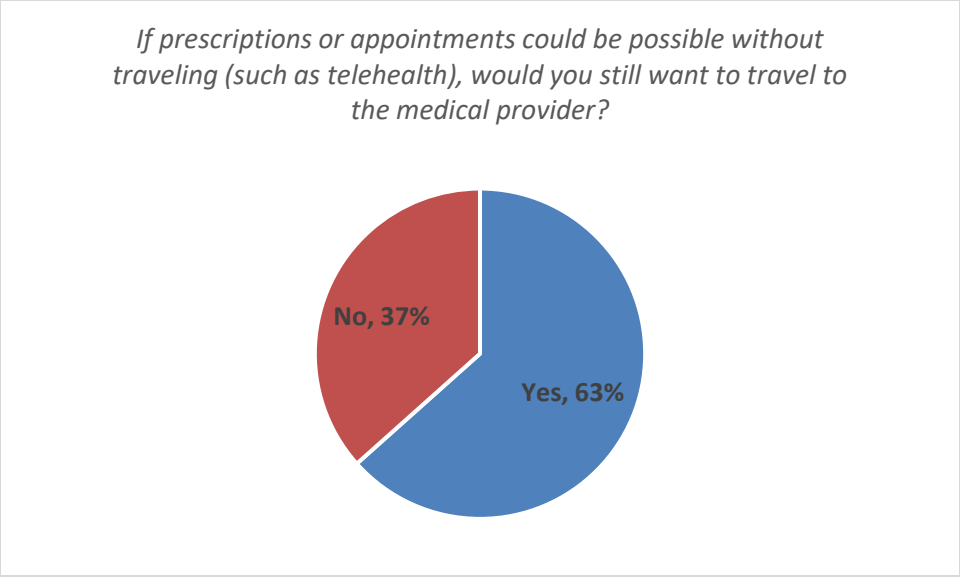


**Figure 4.6** Preferences for Telehealth by Survey Respondents

Still, 37% said that they would not want to travel to the medical provider if appointments or prescriptions could be done remotely. The results suggest that while in-person visits are often preferred and sometimes needed, telehealth could be useful for a significant number of older adults in some situations for improving access to health care.

## 4.2 Analysis of Missed Trips

The first model analyzes data from the survey of older adults. The dependent variable is whether the respondent reported missing or delaying a health care trip during the previous 12 months because of a lack of transportation. Descriptive statistics for the variables included in the model are shown in Table 4.4. Results of the binary logit model are shown in Table 4.5.

**Table 4.4** Descriptive Statistics

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Missed trip | 0.06 | 0.23 | 0 | 1 |
| No car | 0.05 | 0.21 | 0 | 1 |
| Transit frequency | 0.33 | 0.68 | 0 | 5 |
| Transit difficulty | 0.07 | 0.26 | 0 | 1 |
| Distance | 10.29 | 10.15 | 0 | 80 |
| Age | 72.14 | 4.98 | 65 | 94 |
| Income | 2.82 | 1.29 | 1 | 5 |
| Disability | 0.22 | 0.42 | 0 | 1 |

**Table 4.5** Binary Logit Model Results for Missed Trips from Survey of Older Adults

| Variable | Parameter Estimate | Standard Error | p-value | Odds Ratio |
|---|---|---|---|---|
| Intercept | -0.30 | 3.69 | 0.934 | |
| No car | 1.96 | 0.67 | 0.003** | 7.13 |
| Transit frequency | -0.06 | 0.33 | 0.853 | 0.94 |
| Transit difficulty | 1.89 | 0.68 | 0.005** | 6.62 |
| Distance | 0.02 | 0.02 | 0.362 | 1.02 |
| Age | -0.05 | 0.05 | 0.340 | 0.95 |
| Income | -0.10 | 0.20 | 0.618 | 0.90 |
| Disability | 1.45 | 0.53 | 0.006** | 4.27 |

n=426
*p-value <0.05, **p-value <0.01

Three variables were found to be statistically significant. These include car access, transit difficulty, and disability. Those with no access to a car, those who reported difficulties with using transit since the pandemic began, and those with a disability were significantly more likely to have missed or delayed a medical trip. These results are as expected.

The magnitude of these effects is also large. The estimated odds ratio for not having car access is 7.13, meaning that the odds of missing a health care trip due to lack of transportation were 7.13 times higher for those without access to a car. The odds of missing a health care trip were 6.62 times higher for those who reported difficulties in using transit since the pandemic and 4.27 times higher for those with a disability. These results highlight the importance of providing options to people who cannot drive or do not have access to a vehicle. They also suggest that impacts of the pandemic on transit operations and use had a negative impact on some older adults for accessing health care, and people with disabilities also face additional challenges in accessing transportation to health care.

Other results were not statistically significant. While frequent use of transit might be expected to reduce delayed medical trips, this result was not significant. Note that a few of the survey respondents were frequent transit users. While previous research has shown that the number of health care trips for rural residents decrease with travel distance (Arcury et al. 2005; Nemet and Bailey 2000), this model found no significant relationship between distance and the likelihood of delaying a trip. Age and income were also not found to be significant.

The next models analyzed MEPS data to study the effects of travel time on the likelihood of missing a needed medical trip. Descriptive statistics for the MEPS data used in these models are shown in Table 4.6. Note that data are included only if the respondent had a usual source of care, because respondents without a usual source of care did not report a travel time to health care.

**Table 4.6** Descriptive Statistics for MEPS Data Used in Model of Missed Health Care Trips

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Missed care | 0.04 | 0.20 | 0 | 1 |
| Missed care transportation | 0.002 | 0.048 | 0 | 1 |
| Travel time | 1.60 | 0.74 | 1 | 6 |
| Age | 38.58 | 24.55 | 1 | 85 |
| Income | 71.91 | 67.15 | -6.7 | 604.1 |
| Gender | 0.46 | 0.50 | 0 | 1 |
| Uninsured | 0.05 | 0.21 | 0 | 1 |
| Total visits | 1.52 | 1.96 | 0 | 6 |

Results from the binary logit models are shown in Tables 4.7 and 4.8. Table 4.7 shows the results of the model for health care trips delayed or not made due to any reason, and Table 4.8 shows the results of the model for health care trips missed specifically because of difficulties getting to the doctor's office.

**Table 4.7** Binary Logit Model Results for Missed Health Care Trips from MEPS Data

| Variable | Parameter Estimate | Standard Error | p-value | Odds Ratio |
|---|---|---|---|---|
| Intercept | -3.696 | 0.112 | <.0001 | |
| Travel time | 0.081 | 0.042 | 0.0554* | 1.08 |
| Age | 0.000 | 0.002 | 0.7983 | 1.00 |
| Income | -0.004 | 0.001 | <.0001*** | 1.00 |
| Gender | -0.113 | 0.069 | 0.0994* | 0.89 |
| Uninsured | 0.595 | 0.137 | <.0001*** | 1.81 |
| Total visits | 0.308 | 0.018 | <.0001*** | 1.36 |

n=23,774

* p-value<0.1, **p-value <0.05, ***p-value <0.01

**Table 4.8** Binary Logit Model Results for Missed Health Care Trips Because of Transportation Difficulties from MEPS Data

| Variable | Parameter Estimate | Standard Error | p-value | Odds Ratio |
|---|---|---|---|---|
| Intercept | -7.311 | 0.455 | <.0001*** | |
| Travel time | 0.561 | 0.117 | <.0001*** | 1.75 |
| Age | 0.005 | 0.007 | 0.4974 | 1.01 |
| Income | -0.012 | 0.004 | 0.0012*** | 0.99 |
| Gender | -0.091 | 0.281 | 0.7469 | 0.91 |
| Uninsured | -0.892 | 1.014 | 0.3791 | 0.41 |
| Total visits | 0.298 | 0.070 | <.0001*** | 1.35 |

n=23,762

* p-value<0.1, **p-value <0.05, ***p-value <0.01

Travel time is shown to be positively related to the likelihood of missing a needed health care trip. This result is statistically significant in both models, though the magnitude of the effect is much greater in the model of trips missed specifically because of transportation difficulties. This result differs from the analysis of the survey data of older adults, but it is consistent with findings from other research (Mattson 2011). The odds ratio in the second model (Table 4.8) shows that the odds of missing a health care trip because of transportation difficulties increases 75% as travel time increases by 1 unit along the 1-6 scale.

Income is significant and negative, as expected, in both models. People with lower income are more likely, in general, to miss needed medical trips. This could be due largely to the cost of medical care. Results in Table 4.8 show that those with lower income also face greater transportation difficulties in getting to the medical appointments, increasing the likelihood of missing a needed trip. The uninsured are more likely to miss a needed health care trip in general, but not specifically, because of transportation difficulties. The effect of age was insignificant. Gender was marginally significant in the first model, suggesting men are slightly less likely to miss a trip. Total health care trips taken in the previous year was positive and significant. This is expected because the likelihood of missing a single health care trip within the year increases as the number of needed trips increases.

## 4.3 Analysis of Health Care Expenditures

MEPS data were further analyzed to show the relationship between missed health care trips and total health care expenditures. Descriptive statistics for variables used in the model are presented in Table 4.9. The analysis was limited to individuals aged 18 or older.

**Table 4.9** Descriptive Statistics for MEPS Data Used in Model of Health Care Expenditures

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Total expenditures | 6012 | 16949 | 0 | 552898 |
| Missed care | 0.05 | 0.21 | 0 | 1 |
| Total visits | 1.77 | 1.98 | 0 | 6 |
| Income | 71.37 | 66.46 | -7.6 | 604.1 |
| Uninsured | 0.11 | 0.31 | 0 | 1 |
| Age | 47.68 | 18.18 | 18 | 85 |
| Gender | 0.46 | 0.50 | 0 | 1 |
| Arthritis | 0.26 | 0.44 | 0 | 1 |
| Asthma | 0.12 | 0.33 | 0 | 1 |
| Cancer | 0.09 | 0.29 | 0 | 1 |
| Chronic heart disease | 0.05 | 0.22 | 0 | 1 |
| High cholesterol | 0.30 | 0.46 | 0 | 1 |
| Diabetes | 0.12 | 0.33 | 0 | 1 |
| Emphysema | 0.02 | 0.14 | 0 | 1 |
| High blood pressure | 0.34 | 0.47 | 0 | 1 |
| Heart attack | 0.04 | 0.19 | 0 | 1 |
| Other heart disease | 0.10 | 0.30 | 0 | 1 |
| Stroke | 0.04 | 0.20 | 0 | 1 |

Results from the regression model are shown in Table 4.10. The dependent variable is the log transformation of total expenditures (the log of [expenditures +1] because of many zero values). The variables are all statistically significant, though emphysema and heart attack are only marginally significant, and the signs are all as expected. The $R^2$ is 0.42.

**Table 4.10** Regression Model Results for Medical Expenditures from MEPS Data

| Intercept | Parameter estimate | Standard error | p-value |
|---|---|---|---|
| Intercept | 3.888 | 0.060 | <.0001*** |
| Missed care | 0.746 | 0.081 | <.0001*** |
| Total visits | 0.570 | 0.010 | <.0001*** |
| Income | 0.003 | 0.000 | <.0001*** |
| Uninsured | -2.073 | 0.056 | <.0001*** |
| Age | 0.019 | 0.001 | <.0001*** |
| Gender | -0.643 | 0.035 | <.0001*** |
| Arthritis | 0.456 | 0.046 | <.0001*** |
| Asthma | 0.613 | 0.053 | <.0001*** |
| Cancer | 0.387 | 0.061 | <.0001*** |
| Chronic heart disease | 0.224 | 0.093 | 0.0162** |
| High cholesterol | 0.426 | 0.045 | <.0001*** |
| Diabetes | 0.670 | 0.057 | <.0001*** |
| Emphysema | 0.203 | 0.120 | 0.0913* |
| High blood pressure | 0.531 | 0.044 | <.0001*** |
| Heart attack | 0.182 | 0.103 | 0.0788* |
| Other heart disease | 0.327 | 0.061 | <.0001*** |
| Stroke | 0.287 | 0.088 | 0.0012*** |

$R^2 = 0.42$
n=22,975
* p-value<0.1, **p-value <0.05, ***p-value <0.01

The results show that, everything else being constant, someone who delayed or did not make a necessary medical trip had higher medical expenses. This shows there is a benefit to making needed health care trips in terms of reduced expenses. There is also a cost of making more health care trips because, as the results show, someone who made more trips also had higher expenses. However, the magnitude of the effects suggest that missed care is more important. In many cases, the benefits of reduced health care costs from not missing a trip outweigh the costs of the trip itself, so total costs would be lower even if they make more trips. This result is suggested by the higher coefficient for missed care than for total visits. The estimated coefficient for missed care indicates that someone who delayed or was unable to make a health care trip has medical expenses that were 111% higher, everything else being equal ((exp(0.746)-1)*100%=111%). An increase in the number of visits by 1 unit along the 0-6 scale increased medical expenses by 77% ((exp(0.570)-1)*100%=77%).

There are some limitations to the data because we do not know if an individual missed more than one trip, and total visits are also lumped into groups for those who have made more than four health care trips. However, results suggest there are net cost benefits from not missing any necessary health care trips, which is consistent with findings from Hughes-Cromwick et al. (2005). Further, this analysis does not include the positive quality of life benefits from improved care.

Other results were as expected. Those with higher income spend more on health care and those without insurance spend less. Men were found to spend less. Expenses increased with age, and those diagnosed with various chronic conditions had higher medical expenses.

# 5. CONCLUSIONS

The literature review revealed the many ways that public transportation impacts health and why transportation is referred to as a social determinant of health. One important way transit impacts health is by improving access to health care. Wolfe et al. (2020) estimated that 5.8 million people in the United States delayed medical care because of a lack of transportation in 2017. To further analyze delayed medical care, its relationship with transportation, and its impact on health care expenditures, this study analyzed data from a survey conducted of older adults and data from the Medical Expenditure Panel Survey (MEPS).

A survey was conducted of adults aged 65 or older living in non-metro areas, with responses from 429 participants. Most of the respondents were able to drive and had access to a car. A majority of respondents drove themselves to their health care appointments. However, some respondents were transit users. About 7% reported that they use transit to access health care for at least some trips, and 2% reported using transit for most or all of their health care trips. While this is a small percentage, previous research has shown that many transit users in rural and small urban areas are reliant on transit for accessing health care. For example, in surveys of rural and small urban transit users in Minnesota conducted by Mattson et al. (2020), 17% of riders reported that they would miss many health care trips if transit was not available, and 27% reported that they would miss at least some trips. Among those who frequently use transit for health care trips, a higher percentage reported that they would miss trips without transit. Health care is one of the more common trip purposes among rural transit users. Surveys of rural transit users across North Dakota showed that a majority of riders use transit to get to health care appointments (Mattson, Mistry, and Hough 2020).

Travel distance to health care can be a barrier in rural areas, as found in the literature. The survey of older adults in non-metro areas found that the average travel distance was 10.0 miles for routine health checkups, 12.6 miles for chronic care visits, and 8.2 miles for emergency care. The variation in results, however, showed that some respondents travel much greater distances. In rural areas such as North Dakota, health care appointments often require long trips. A survey of stakeholders in North Dakota conducted by Mattson, Mistry, and Hough (2020) found a need for better transportation options for people traveling from rural areas and smaller communities to larger cities for services, especially for medical care.

The survey of older adults found that 6% had missed or delayed any health care trips during the previous year because of a lack of transportation. This is a small percentage, but it is still significant because any missed trips could have significant negative consequences. Further, 4% of respondents reported that they would miss health care trips if transit was not available. Notably, unlike the rider surveys conducted in other studies, a majority of respondents never used transit, and few were frequent transit users.

These responses were analyzed to identify factors related to missed health care trips. While most respondents had access to a car and could drive, those who did not were significantly more likely to miss a health care trip. The study found that the odds of missing a health care trip due to lack of transportation were 7.13 times higher for those without access to a car. This result shows the negative impact driving cessation can have on older adults. Previous research has shown driving cessation to be associated with declines in general health (Chihuri et al. 2016). To reduce combined health care/transportation costs, additional transportation options need to be made available to those who do not drive or have access to a vehicle. The study did not find frequent transit use to reduce the probability of missing a health care trip, but few respondents were frequent transit users.

On the other hand, the results do suggest the important role transit plays as well as negative effects from the pandemic. The results showed that the odds of missing a health care trip were 6.6 times higher for those who reported difficulties in using transit since the pandemic. This suggests that some respondents were reliant on using transit to access health care and that the effects of the pandemic made it more difficult for them to travel to their appointments.

Public transit could play a greater role in improving access to health care, but there have been many factors identified in the literature review and the survey of older adults that limit the usefulness of transit. In rural areas and small communities, transit services are often limited and may not go where or when it is needed. Schedules may be inconvenient, and the need to match transit and medical schedules can be a challenge. The literature review identified several strategies and successful practices for improving transportation to health care. Often this involves partnerships between transportation and health care providers and community planning efforts.

The analysis of the survey data did not show travel distance to be associated with the likelihood of missing a health care trip. However, analysis of MEPS data found travel time to health care to be positively associated with the likelihood of missing or delaying a trip, which is consistent with findings from previous studies (Mattson 2011; Arcury et al. 2005; Nemet and Bailey 2000).

Making needed health care trips is important for maintaining good health, and it also can reduce health care costs by avoiding the need for more costly care. Hughes-Cromwick et al. (2005) found that for several conditions, the net health care benefits of increased access to NEMT for transportation-disadvantaged individuals exceeded the additional costs of transportation. Their cost-benefit analysis was based on 2001 MEPS data.

Using newer data from the 2017 MEPS, this study analyzed total medical expenditures and the effect of missing or delaying needed medical care. The results show that, everything else being constant, someone who delayed or did not make a necessary medical trip had higher medical expenses. Someone who delayed or missed a health care trip was estimated to have medical expenses that were 111% higher, which was greater than the increase in medical expenditures resulting from an additional health care trip. The results suggest net cost benefits from not missing any necessary health care trips. Further analysis similar to the cost-benefit estimation by Hughes-Cromwick et al. (2005) with updated MEPS data could show the net benefit from medical trips provided by transit agencies.

Further cost-benefit analysis that considers other health benefits of transit, such as physical activity benefits and effects on reducing social isolation and improving mental health, would be valuable, especially for agencies operating in rural or small urban areas. The scope and magnitude of the impact that transit in rural and small urban areas has on health has not been fully estimated.

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# APPENDIX A: SURVEY

**Part A. Your Use of Transit**

1. Do you ever use public transit?
   □ Yes □ No (skip to Part B)

2. For what purpose do you use public transit? (Check all that apply)
   □ Work □ Medical appointments □ Social or recreation
   □ School or training □ Shopping □ Other

3. Has it been more difficult to use public transit since the COVID-19 pandemic began (March 2020)?
   □ Yes
   □ Yes, but it became easier once vaccines were available
   □ Yes, but it became easier once mask mandates were removed
   □ No (skip to question #4)

4. What factors do you consider make it harder to ride public transit? (Check all that apply)
   □ Travel restrictions □ Safety concerns
   □ Decreased routes □ None of these
   □ Limited hours of service □ Other: _____

5. Before the pandemic, how many days per week did you use public transit?
   □ Less than weekly □ 1 or 2 □ 3 or 4 □ 5 □ 6 or 7

6. During the first year of the pandemic, before vaccines were available for almost everyone (March 2020 - March 2021), how many days per week did you use public transit?
   □ Less than weekly □ 1 or 2 □ 3 or 4 □ 5 □ 6 or 7

7. How many days per week do you currently use public transit?
   □ Less than weekly □ 1 or 2 □ 3 or 4 □ 5 □ 6 or 7

8. What are your safety concerns when riding public transit? (Check all that apply)
   □ Health related (like getting infected with a disease) □ Don't trust the drivers
   □ Being victim of crime □ None
   □ Don't trust the current conditions of buses □ Other: _____

9. How important is the transit service in your daily life?
   □ Very important □ Somewhat important □ Slightly important □ Not important

10. Please rate how strongly you agree or disagree with the following statements regarding riding transit:

| Public transit: | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| Allows me to make more trips | ☐ | ☐ | ☐ | ☐ | ☐ |
| Increases my social interaction with other people | ☐ | ☐ | ☐ | ☐ | ☐ |
| Reduces my stress level | ☐ | ☐ | ☐ | ☐ | ☐ |
| Allows me to live independently | ☐ | ☐ | ☐ | ☐ | ☐ |
| Improves my overall quality of life | ☐ | ☐ | ☐ | ☐ | ☐ |

**Part B. Social Interactions**

11. Do you think your daily travel has decreased since the pandemic started?
    - ☐ Yes
    - ☐ Yes, only before vaccines were available
    - ☐ Yes, only before mask mandates were removed
    - ☐ No (skip to question #13)

12. How much do you think the decrease in your daily travel is linked to the availability of public transit?
    - ☐ Not much/Remain almost the same
    - ☐ Quite a bit
    - ☐ Moderately
    - ☐ Extremely

13. How often do you feel that you lack companionship?
    - ☐ Hardly ever or never
    - ☐ Some of the time
    - ☐ Often

14. How often do you feel left out?
    - ☐ Hardly ever or never
    - ☐ Some of the time
    - ☐ Often

15. How often do you feel isolated from others?
    - ☐ Hardly ever or never
    - ☐ Some of the time
    - ☐ Often

16. How often do you feel lonely?
    - ☐ Often/always
    - ☐ Some of the time
    - ☐ Occasionally
    - ☐ Hardly ever
    - ☐ Never

17. From questions 13-16, do you think your response is related to less chances of travel because of the pandemic?
    - ☐ Yes
    - ☐ No

18. During the first year of the pandemic, before vaccines were available, did you feel depressed or sad?
    - ☐ Not at all
    - ☐ A little bit
    - ☐ Moderately
    - ☐ Quite a bit
    - ☐ Extremely

19. Since the pandemic started, have you lost interest in some activities? ☐ Yes ☐ No

20. Before the pandemic, how many days per week did you have social contact with people outside your household?
    - ☐ Less than weekly
    - ☐ 1-2
    - ☐ 3-4
    - ☐ 5-6
    - ☐ 7 or more

21. During the first year of the pandemic, before vaccines were available (March 2020 - March 2021) how many days per week did you have social contact with people outside your household?
□ Less than weekly □ 1-2 □ 3-4 □ 5-6 □ 7 or more

22. Do you have to go out to stay connected with your social network? □ Yes □ No

23. Do you feel you belong and are part of your neighborhood? □ Yes □ No

24. How active are you when it comes to group activities (going to church, clubs, classes, therapies, etc.)?
□ Very active □ Fairly active □ Not very active □ Not active at all

**Part C. Health Care Trips**

25. In the past 12 months, approximately how many trips have you made for health care (including routine health checkups, chronic health care visits, or emergency care)? _____

26. How many of these health care trips did you make using the following modes (select one choice for each row)?

| | No trips | Some trips | Many trips | Most trips | All trips |
|---|---|---|---|---|---|
| Public transportation | ☐ | ☐ | ☐ | ☐ | ☐ |
| Drive yourself | ☐ | ☐ | ☐ | ☐ | ☐ |
| Get a ride from someone | ☐ | ☐ | ☐ | ☐ | ☐ |
| Take a Taxi, Uber, or Lyft | ☐ | ☐ | ☐ | ☐ | ☐ |
| Walk or bike | ☐ | ☐ | ☐ | ☐ | ☐ |

27. For which of the following do you make health care appointments? (Check all that apply.)
□ Asthma
□ Cancer treatment
□ Chronic Obstructive Pulmonary Disease (COPD)
□ Depression/Mental health
□ Diabetes
□ Other: _____
□ Dialysis/End-Stage Renal Disease
□ Heart disease
□ Hypertension
□ Orthopedic services
□ None of the above

28. Do you think access to medical services was affected by a reduction in public transit during the pandemic?
□ Yes □ No □ I do not use public transit for medical trips

29. In the past 12 months, did you miss or delay any health care trips because of a lack of transportation?
□ Yes □ No

30. Would you miss any health care trips if public transportation was not available?
□ Yes □ No □ I do not use public transit for medical trips

31. If prescriptions or appointments could be possible without traveling (such as telehealth), would you still want to travel to the medical provider?
    □ Yes, explain: _____
    □ No

32. How much of a problem is each of the following with using public transportation for health care trips (check all that apply)?
    □ Inconvenient schedules
    □ Need to match transit and medical schedules
    □ Service too infrequent
    □ Does not go where you need to go
    □ Getting information about routes, schedules, fare
    □ Need for someone to accompany you
    □ Need for special care
    □ Too uncomfortable
    □ Not reliable
    □ Too costly
    □ Lack of door-to-door service

33. What is the distance (in miles) that you live from the health care service you would go to for each of the following?
    Routine health checkups _____ miles
    Chronic health care visits _____ miles
    Emergency care _____ miles

**Part D. About You**

34. What is your age? _____

35. Are you retired from work?
    □ Yes (If so, how long? _____) □ No

36. Do you consider yourself to have a disability or physical impairment? □ Yes □ No

37. What is your annual household income?
    □ Less than $25,000
    □ $25,000 to $49,999
    □ $50,000 to $74,999
    □ $75,000 to $99,999
    □ $100,000 or more

38. How many people live in your household? _____

39. Are you able to drive a car (legally, physically, mentally)? □ Yes □ No

40. Do you have access to a car to drive? □ Yes □ No

41. How many people in your household (including yourself) have access to a vehicle and can drive? _____

42. What is your home ZIP code? _____