HHS Public Access

Author manuscript

J Appl Gerontol. Author manuscript; available in PMC 2020 September 01.

Published in final edited form as:

J Appl Gerontol. 2020 September ; 39(9): 935–943. doi:10.1177/0733464818806834.

Driving Status and Transportation Disadvantage Among Medicare Beneficiaries

Miriam Ryvicker[1], **Evan Bollens-Lund**[2], **Katherine A. Ornstein**[2]

[1]Visiting Nurse Service of New York, New York City, USA

[2]Icahn School of Medicine at Mount Sinai, New York, NY, USA

Abstract

Transportation disadvantage may have important implications for the health, well-being, and quality of life of older adults. This study used the 2015 National Health Aging Trends Study, a nationally representative study of Medicare beneficiaries aged 65 and over (N = 7,498), to generate national estimates of transportation modalities and transportation disadvantage among community-dwelling older adults in the United States. An estimated 10.8 million community-dwelling older adults in the United States rarely or never drive. Among nondrivers, 25% were classified as transportation disadvantaged, representing 2.3 million individuals. Individuals with more chronic medical conditions and those reliant on assistive devices were more likely to report having a transportation disadvantage ($p < .05$). Being married resulted in a 50% decreased odds of having a transportation disadvantage ($p < .01$). Some individuals may be at higher risk for transportation-related barriers to engaging in valued activities and accessing care, calling for tailored interventions such as ride-share services combined with care coordination strategies.

Keywords

transportation; access to care; service utilization; care coordination

Introduction

Inadequate access to transportation is recognized as a significant barrier to older adults' social participation, utilization of services in the community, well-being, and quality of life (Chihuri et al., 2016; Dickerson, Molnar, Bedard, Eby, Classen, & Polgar, 2017; Mezuk & Rebok, 2008; Wallace, Hughes-Cromwick, Mull, & Khasnabis, 2005). The concept of transportation disadvantage has been used by state and municipal governments in the United States to identify vulnerable populations who may experience transportation barriers in getting to work, medical appointments, groceries, social activities, and other vital activities

Corresponding Author: Miriam Ryvicker, Center for Home Care Policy and Research, Visiting Nurse Service of New York, 5 Penn Plaza, 12th Floor, New York, NY 10001, USA. Miriam.ryvicker@vnsny.org.

This study used the public use files of the National Health and Aging Trends Study (NHATS), which was conducted by Johns Hopkins University. The Johns Hopkins University Institutional Review Board approved the NHATS protocol, and all participants provided informed consent.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

(The Florida Legislature, 2016; Lane, Bert, & Heller, 2014). Although definitions vary (Wallace et al., 2005), transportation disadvantage occurs when mobility needs are not being met, due to disability, low income, or social and environmental factors.

Several factors are associated with increased transportation disadvantage. Low-income individuals are at greater risk of missing medical appointments due to transportation problems (Hughes-Cromwich & Wallace, 2006). Individuals with low income and without personal vehicles may be at a particular disadvantage if they live in areas where the supply of public transit or paratransit services is inadequate in meeting the demand (U.S. Department of Transportation & Bureau of Transportation Statistics, 2003b). Residents of rural areas—especially older adults—are at particular risk due to a lack of public transportation (Long et al., 2013; Narva & Sequist, 2010; Probst, Laditka, Wang, & Johnson, 2007; Rosenbloom, 2003). Racial minorities are also more likely to have a transportation disadvantage (Hughes-Cromwich & Wallace, 2006; King, Chen, Dagher, Holt, & Thomas, 2015; Peipins et al., 2011; Probst et al., 2007). Health status affects a person's ability to obtain transportation. Research from the 2001 National Household Travel Survey indicated that 9% of Americans ages 14 and over have a medical condition that limits their travel (U.S. Department of Transportation & Bureau of Transportation Statistics, 2003b). Almost 2 million Americans with disabilities never leave their homes (U.S. Department of Transportation & Bureau of Transportation Statistics, 2003a).

Ability to drive is a primary focus of transportation research in the United States, with the main focus on safety issues related to decline in functional, visual, and cognitive status as people age, risk factors for driving cessation, and the transition to nondriving status (Bird et al., 2017; Dickerson, Meuel, Ridenour, & Cooper, 2014; Ross, Freed, Edwards, Phillips, & Ball, 2017; Vivoda, Heeringa, Schulz, Grengs, & Connell, 2017). As the predominant form of daily transportation in the United States, driving fulfills a variety of needs for older adults, such as facilitating social engagement and a need for independence and self-identity, as well as practical needs such as shopping and medical appointments (Chihuri et al., 2016; Sanford et al., 2018). There is also growing interest in expanding access to alternative transportation for older adults such as paratransit services, specialized transportation and shuttle services, and on-demand ride-share services such as Uber (Chaiyachati et al., 2018; Dickerson, Molnar, Bedard, Eby, Berg-Weger, et al., 2017; MacLeod et al., 2015; Vivoda, Harmon, Babulal, & Zikmund-Fisher, 2018). Volunteer driver programs also fill a gap for individuals living in areas where the supply of paratransit or on-demand ride services is lacking, as well as for individuals with physical or cognitive limitations (Dickerson, Molnar, Bedard, Eby, Berg-Weger, et al., 2017).

Although a less common focus of research, the use of public transportation among older adults is increasing (Lynott & Figueiredo, 2011). Moreover, public transit may be especially important for the mobility of those who never drove throughout their adult lives. While only 2% of older adults reported never driving in 2008, this group had a higher proportion of women, racial/ethnic minorities, immigrants, and individuals with less education and wealth than older adults with a history of driving (M. Choi & Mezuk, 2013).

Older adults may experience changes in transportation use in a variety of ways, depending on their physical and cognitive health, social support, economic resources, and the geographic contexts in which they live. Prior research has identified health factors that increase the risk for driving restriction or cessation, including cognitive impairment, vision loss, diabetes, and heart failure (Croston, Meuser, Berg-Weger, Grant, & Carr, 2009; Dugan & Lee, 2013; Keay et al., 2009; Kowalski et al., 2012; Seiler et al., 2012; Sims et al., 2011; van Landingham et al., 2013). Driving cessation represents a significant life transition that challenges social participation and preservation of self-identity (Sanford et al., 2018). In addition, driving cessation is linked to an increased risk of depression and nursing home admission (Chihuri et al., 2016; Fonda, Wallace, & Herzog, 2001; Freeman, Gange, Munoz, & West, 2006; Ragland, Satariano, & MacLeod, 2005; Windsor, Anstey, Butterworth, Luszcz, & Andrews, 2007). Given the impact of driving cessation on health and well-being, it is important to consider how social support and other factors could moderate the experience of mobility changes (Silverstein & Turk, 2016). A recent study found that the use of public transportation moderated the impact of driving cessation on well-being in a sample of older adults with vision loss and their social partners, although the impact was more evident among the partners than the ex-drivers (Schryer, Boerner, Horowitz, Reinhardt, & Mock, 2017). A qualitative study on driving cessation among older adults with dementia found that caregivers made efforts to engage the individuals for whom they provide care in meaningful social roles and activities to mitigate the negative emotional impact of driving cessation (Sanford et al., 2018).

Whether brought about by driving cessation, inadequate access to alternative transportation, or a lack of social support, transportation barriers represent a significant risk to older adults' health and well-being. Given the rapid growth of the aging population—and the functional, visual, and cognitive impairments experienced by many individuals as they age—a comprehensive program of research is needed to understand and address the transportation barriers among older adults at risk for unmet needs for services (Dickerson et al., 2014). Establishing current national estimates of the prevalence of transportation disadvantage among older adults is a key first step to addressing this issue. We use data from the National Health and Aging Trends Study (NHATS; Johns Hopkins School of Public Health & Westat, 2015) to achieve the following aims: (a) generate national estimates of the modes of transportation used by older community-dwelling adults in the United States,; (b) generate national estimates of nondriving older adults with a transportation disadvantage, and (c) identify factors associated with having a transportation disadvantage.

Design and Method

Sample

Data are drawn from the 2015 wave of the NHATS (Kasper & Freedman, 2014), a population-based survey of late-life disability trends and trajectories. NHATS drew a random sample of individuals ages 65 years and older living in the contiguous United States from the Medicare enrollment file on September 30, 2010, with oversampling of those over age 90 and non-Hispanic Blacks. The enrollment file represents 96% of all older adults in the United States. In-person interviews were completed between May and November 2011

and yielded a sample of 8,245 persons, a 71% response rate. Individuals are followed annually and in 2015 the cohort was replenished. Study participants were asked detailed questions about how they performed daily activities in the month before the interview as well as their medical comorbidities, socioeconomic status, and home environment. Among older adults who received assistance with daily activities, information about who provides help, their relationship with the respondent, and what specific assistance they provide was obtained. Our analytic sample included 7,498 community-dwelling participants who reported on their driving status.

Measures

Driving frequency was determined based on report (self or via proxy) of how often participants drove themselves places in the last month (every day, most days, some days, rarely or never). Nondrivers were those who stated they never drove in the last month. Drivers reported whether there were driving situations they avoided (nighttime, bad weather, alone, or highways). Participants also reported on their use of nondriving modes of transportation to get to places in the last month (walked, got ride, taxi, public transportation, van services) and how they got to their regular doctor in the last year. We defined transportation disadvantage as whether the person was unable to participate in social activities due to a transportation problem over the last month; these activities included attending religious services, clubs, classes or other groups, visiting friends or family, or going out for enjoyment (e.g., dinner or a movie).

Older adults' demographic characteristics included age, gender, race, education, marital status, income, and living arrangements. Clinical data were based on self-report and included whether a doctor had ever told a subject that they had specific health conditions. We created a count of 13 self-reported chronic conditions to reflect multimorbidity: heart attack, heart disease (including angina, congestive heart failure), high blood pressure, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia/Alzheimer's disease (AD), cancer, depression, anxiety, and broken or fractured hip. Dementia status was based on criteria established by NHATS (Kasper, Freedman, & Spillman, 2013), which incorporated self-report of dementia, the AD-8 screening tool (Galvin et al., 2005), and a cognitive interview that assessed memory, orientation, and executive function. Study participants are asked whether they receive help with basic (eating, getting out of bed, showering, toileting, dressing) and instrumental (laundry, shopping, meal preparation, medication management, getting around outside, bills, and banking) activities of daily living in the month before the interview.

Analysis

We used NHATS sample weights to generate national estimates of driving status, alternate modes of transportation used for general activities, and the presence of transportation disadvantage (Freedman & Spillman, 2016). We examined transportation disadvantage among nondrivers, as the questions about transportation problems were asked of nondrivers only. We compared the demographic, clinical, and functional characteristics of nondrivers who did and did not report a transportation disadvantage. We also compared the modes of transportation used to get to doctor's appointments by transportation disadvantage. To

identify predictors of transportation disadvantage, we estimated a multivariable logistic regression model. The demographic, clinical, and functional measures included in the model reflect an adaptation of the behavioral model of health service use (Andersen, 1995; Andersen et al., 2002) to frame the potential array of factors that might inform how older adults use transportation. We examined potential determinants of transportation disadvantage—namely, predisposing factors (e.g., age, sex, race), need factors (e.g., number of medical conditions, ADL function, and cognition), and enabling factors (e.g., income, education level, use of assistive devices). To determine which variables would be included in the final model, bivariate associations between transportation disadvantage and factors were assessed. Variables that showed a statistically significant effect on the outcome at the 0.10 level and were not highly correlated with other variables (correlation >0.5) in the bivariate analysis were included in the final model. In our regression model, we excluded 157 individuals with missing values. To control for possible biases associated with the use of proxy report, we performed regressions in sensitivity analyses that controlled for proxy status and that excluded all proxy respondents. We also performed analyses that controlled for the importance of engaging in the social activities asked. All analyses were conducted using Stata version 15.

Our analysis used the public use files of the NHATS, which was conducted by Johns Hopkins University. The Johns Hopkins University Institutional Review Board approved the NHATS protocol, and all participants provided informed consent (Johns Hopkins School of Public Health & Westat, 2015).

Results

General Transportation Use

The majority of participants drove themselves to places two or more times per week, whereas 25% rarely or never drove (Table 1). This nondriving group represents an estimated 10.8 million community-dwelling older adults in the United States. One third of all individuals who drove in the previous month reported that they avoided driving alone, at night, on highways and/or in bad weather, representing an additional 10.9 million older adults. Alternative modes of transportation used by driving status are shown in Table 2. Among participants who never drove within the past month (heretofore referred to as “nondrivers”), the most common modes of transportation were getting a ride from a family member or friend (86%, or 7.6 million older adults) and walking (49%, or 4.3 million), followed by 17% using public transit (1.5 million), 10% taxis and 13% van/shuttle for seniors (participants could check multiple response options). Drivers also made use of alternate forms of transportation. More than half of drivers (52%, 17.6 million individuals) reported walking, one third got rides from family or friends, representing 11 million older adults, and 6% used public transportation, representing 2.1 million individuals.

Transportation Disadvantage

Approximately one quarter of the nondrivers reported a transportation disadvantage, representing an estimated 2.3 million community-dwelling older adults nationally. Table 3 reports the characteristics of the nondriving sample for those with and without transportation

disadvantage. Relative to those without any reported disadvantage, disadvantaged individuals were slightly older (mean age 80.0 vs. 79.3), more likely to be unmarried (78% vs. 62%), White (67% vs. 61%), and more educated (69% vs. 63% >High school). The disadvantaged group had a greater proportion receiving help with at least one instrumental activities of daily living (IADL; 66% vs. 59%), using assistive devices for ADLs (90% vs. 80%), and a lower proportion with probable dementia (22% vs. 30%). Transportation disadvantage was not associated with living in a metropolitan area or geographic region.

Modes of Transportation to the Doctor by Transportation Disadvantage

Modes of transportation to the doctor differed by transportation disadvantage (Table 4). A lower proportion of those with disadvantage relied on family or friends for a ride (60% vs. 66%). Of the 2.3 million older adults estimated to have a transportation disadvantage, 1.4 million (60%) relied on family or friends for a ride to doctor's appointments, while roughly 253,000 relied on a van or shuttle service for seniors.

Predictors of Transportation Disadvantage

Table 5 reports the results of a logistic regression examining predictors of transportation disadvantage among nondrivers. Controlling for age, sex, race, income, education levels, functional status and other factors, individuals who were married or lived with a partner had a lower odds of transportation disadvantage, OR = 0.46; 95% confidence interval (CI) = [0.34, 0.63]. Black participants had a lower odds of transportation disadvantage (OR=0.72; 95% CI = [0.52, 0.995]). The odds of transportation disadvantage increased with each additional self-reported medical condition (OR = 1.10; 95% CI = [1.03, 1.17]) and with the use of any assistive devices for ADLs (OR = 1.64; 95% CI = [1.10, 2.46]). Individuals with probable dementia had a lower odds of transportation disadvantage (OR = 0.53; 95% CI = [0.36, 0.76]). Age, sex, education level, income, and receiving help with ADLs and IADLs were not significant predictors of transportation disadvantage in the multivariable analysis.

Discussion

This study estimated that 2.3 million nondriving, community-dwelling older adults in the United States have a transportation disadvantage. This group relies more heavily on transportation from family and friends to attend medical appointments, potentially placing them at greater risk for transportation barriers in accessing medical care. This risk may be of particular concern for those with weaker social support systems. These findings are consistent with a prior NHATS study which found an association between relying on family and friends for rides and restriction in social activities, especially among those with Medicaid (Lehning, Kim, Smith, & Choi, 2018). Our findings expand upon this work by establishing national estimates of transportation disadvantage, and by examining socioeconomic and geographic correlates of transportation disadvantage. In the multivariable model, independent predictors of transportation disadvantage included being unmarried and the use of an assistive device for ADLs.

It is also noteworthy that an estimated 10.9 million older adults who drive at least occasionally avoid driving alone, at night, on highways, and/or in bad weather. As NHATS

did not administer the transportation barrier questions to drivers, it is not possible to estimate how many of these 10.9 million driving-avoidant individuals experience a transportation disadvantage using our current measure. Nevertheless, this group may be at risk for a transportation disadvantage that could affect their ability to engage in social activities and/or access medical care and other services in the community. Prior research suggests that avoiding challenging driving situations is part of a gradual process of self-regulation in which many drivers transition to driving cessation (Dickerson, Molnar, Bedard, Eby, Berg-Weger, et al., 2017; Molnar et al., 2013).

It is worth noting that we found an unexpected inverse association between dementia status and transportation disadvantage. Participants with probable dementia had significantly lower odds of disadvantage in our adjusted model. Because individuals with cognitive impairment often rely on proxy report, in a sensitivity analysis we included proxy status in our model to account for the potential subjectivity of the proxy respondents and limited our analysis to nonproxy survey respondents (data not shown). The persistent protective effect of dementia status against transportation disadvantage is unexpected and warrants further investigation, in light of previous research on the relationship between dementia and driving, including the onset of driving difficulties throughout the AD trajectory and the transition to nondriving status (Brown & Ott, 2004; Roe et al., 2017; Stout et al., 2018; Velayudhan et al., 2018).

Our results expand upon prior research that estimated that each year millions of people in the United States do not obtain necessary medical care due to a lack of transportation. This group is disproportionately older, female, non-White, and of lower socioeconomic status (SES; Wallace et al., 2005). Our results focused on older adults differed somewhat from these previous findings. Age and sex were not significant independent predictors of transportation disadvantage. Furthermore, low SES was not a predictor of disadvantage in our analysis. In addition, the transportation disadvantaged group had a greater concentration of White participants in our analysis, with Black participants having lower odds of disadvantage in multivariable analysis. This finding diverges from prior research which suggests that older adults who belong to racial and ethnic minority groups in the United States are at heightened risk of mobility restriction and driving cessation (Babulal, Williams, Stout, & Roe, 2018). Marital status was the strongest demographic predictor in our model; being married or living with a partner reduced the odds of transportation disadvantage by a half. This suggests that the social support associated with living with a spouse or partner may be a protective factor, regardless of other demographic or socioeconomic characteristics. Given differences in our findings from prior literature, more research is needed to further develop the measure and identify predictors of transportation disadvantage in a national sample.

Some study limitations should be noted. Our measure of transportation disadvantage is based on source questions that ask about transportation barriers related to social activities only; the NHATS does not ask about barriers related to other types of activities such as shopping. NHATS also does not specifically ask about transportation barriers to accessing medical care; thus we do not have a more direct measure of disadvantage related to medical appointments. A more comprehensive measure of transportation disadvantage would also capture whether medical needs were unmet due to transportation disadvantage, such as

missed medical appointments or inability to get to a pharmacy. Moreover, our measure of transportation disadvantage applied to nondrivers only due to skip patterns in the data. Furthermore, as respondents might value some social activities more than others, we conducted additional analyses to determine whether the extent to which individuals rated these activities as important to them affected our results. Importance of individual types of activities was not substantively different by presence of transportation disadvantage. Moreover, controlling for importance in the logistic regression did not substantially change the results (data not shown). Finally, participants who responded to the NHATS during winter months may have been biased toward reporting a transportation barrier due to recent experience with inclement weather, reflecting a potentially spurious factor unrelated to their individual characteristics. Prior research indicates that inclement weather is one of the conditions in which older drivers reduce their driving (Molnar et al., 2014); it is possible that transportation disadvantage in our nondriving sub-sample was also influenced by seasonal factors. Future work should examine seasonal variability in transportation patterns as it relates to transportation disadvantage.

We have documented that a substantial number of older adults in the United States experience a transportation disadvantage, which may result in a lack of engagement in social activities, missed medical care, adverse health outcomes, and diminished quality of life. Our work points to the need to prioritize transportation barriers for nondriving older adults. State governments should continue efforts to assess the scope of transportation disadvantage in their localities (The Florida Legislature, 2016; Lane et al., 2014), while designing local policies that target unmet transportation needs among older adults. Further innovation is needed to better support older adults in utilizing new transportation services to participate in social activities and reduce the detrimental impact of social isolation (H. Choi, Irwin, & Cho, 2015; Shaw et al., 2017; Taylor, Taylor, Nguyen, & Chatters, 2018). This represents both a challenge and an opportunity to develop new approaches to meeting this need for older adults in the community and improving their quality of life while aging in place.

Conclusion

A sizable group of older adults experience transportation disadvantage which may be due to inadequate social support as well as physical and functional impairment. Future work is necessary to document long-term implications of these disadvantages for older adults' social engagement, health, and wellbeing. Tailored interventions combining ride services with care coordination strategies (Onyekere, Ross, Namba, Ross, & Mann, 2016; Powell, Doty, Casten, Rovner, & Rising, 2016) may be needed to overcome transportation barriers that prevent older adults from effectively accessing health care and other essential services in the community.

Acknowledgments

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Dr. Ryvicker was supported by the National Institute on Aging (K01AG039463). Dr. Ornstein was supported by the National Institute on Aging (K01AG047923). The content is solely the responsibility of the author and does not necessarily represent the official views of the National Institutes of Health.

References

Andersen RM (1995). Revisiting the behavioral model and access to medical care: Does it matter? Journal of Health and Social Behavior, 36, 1–10. [PubMed: 7738325]

Andersen RM, Yu H, Wyn R, Davidson PL, Brown ER, & Teleki S (2002). Access to medical care for low-income persons: How do communities make a difference? Medical Care Research and Review, 59, 384–411. [PubMed: 12508702]

Babulal GM, Williams MM, Stout SH, & Roe CM (2018). Driving outcomes among older adults: A systematic review on racial and ethnic differences over 20 years. Geriatrics, 3(1), 12. [PubMed: 29657944]

Bird DC, Freund K, Fortinsky RH, Staplin L, West BA, Bergen G, & Downs J (2017). Driving self-regulation and ride service utilization in a multicommunity, multistate sample of U.S. older adults. Traffic Injury Prevention, 18, 267–272. [PubMed: 27574778]

Brown LB, & Ott BR (2004). Driving and dementia: A review of the literature. Journal of Geriatric Psychiatry and Neurology, 17, 232–240. [PubMed: 15533995]

Chaiyachati KH, Hubbard RA, Yeager A, Mugo B, Lopez S, Asch E, … Grande D (2018). Association of rideshare-based transportation services and missed primary care appointments: A clinical trial. JAMA Internal Medicine, 178, 383–389. [PubMed: 29404572]

Chihuri S, Mielenz TJ, DiMaggio CJ, Betz ME, DiGuiseppi C, Jones VC, & Li G (2016). Driving cessation and health outcomes in older adults. Journal of the American Geriatrics Society, 64, 332–341. [PubMed: 26780879]

Choi H, Irwin MR, & Cho HJ (2015). Impact of social isolation on behavioral health in elderly: Systematic review. World Journal of Psychiatry, 5, 432–438. [PubMed: 26740935]

Choi M, & Mezuk B (2013). Aging without driving: Evidence from the health and retirement study, 1993 to 2008. Journal of Applied Gerontology, 32, 901–912.

Croston J, Meuser TM, Berg-Weger M, Grant EA, & Carr DB (2009). Driving retirement in older adults with dementia. Topics in Geriatric Rehabilitation, 25, 154–162. [PubMed: 20161565]

Dickerson AE, Meuel DB, Ridenour CD, & Cooper K (2014). Assessment tools predicting fitness to drive in older adults: A systematic review. American Journal of Occupational Therapy, 68, 670–680. [PubMed: 25397762]

Dickerson AE, Molnar LJ, Bedard M, Eby DW, Berg-Weger M, Choi M, … Silverstein NM (2017). Transportation and aging: An updated research agenda to advance safe mobility among older adults transitioning from driving to non-driving. The Gerontologist, gnx120. Advance online publication. doi:10.1093/geront/gnx120

Dickerson AE, Molnar LJ, Bedard M, Eby DW, Classen S, & Polgar J (2017). Transportation and aging: An updated research agenda for advancing safe mobility. Journal of Applied Gerontology. Advance online publication. doi:10.1177/0733464817739154

Dugan E, & Lee CM (2013). Biopsychosocial risk factors for driving cessation: Findings from the Health and Retirement Study. Journal of Aging and Health, 25, 1313–1328. [PubMed: 24067290]

The Florida Legislature. (2016). The 2016 Florida statutes. Special transportation and communications services. Retrieved from http://www.leg.state.fl.us/STATUTES/index.cfm?App_mode=Display_Statute&Search_String=&URL=0400-0499/0427/Sections/0427.011.html

Fonda SJ, Wallace RB, & Herzog AR (2001). Changes in driving patterns and worsening depressive symptoms among older adults. The Journals of Gerontology, Series B: Psychological Sciences & Social Sciences, 56(6), S343–351.

Freedman VA, & Spillman BC (2016). *Making national estimates with the National Health and Aging Trends Study* (NHATS Technical Paper #17). Retrieved from https://www.nhats.org/scripts/documents/Making_National_Population_Estimates_in_NHATS_Technical_Paper.pdf

Freeman EE, Gange SJ, Munoz B, & West SK (2006). Driving status and risk of entry into long-term care in older adults. American Journal of Public Health, 96, 1254–1259. [PubMed: 16735633]

Galvin JE, Roe CM, Powlishta KK, Coats MA, Muich SJ, Grant E, … Morris JC (2005). The AD8: A brief informant interview to detect dementia. Neurology, 65, 559–564. [PubMed: 16116116]

Hughes-Cromwich P, & Wallace R (2006). Cost benefit analysis of providing non-emergency medical transportation. Transportation Research Record: Journal of the Transportation Research Board, 1956, 86–93.

Johns Hopkins School of Public Health & Westat. (2015). The National Health & Aging Trends Study. Available from http://www.nhats.org/

Kasper JD, & Freedman VA (2014). Findings from the 1st round of the National Health and Aging Trends Study (NHATS): Introduction to a special issue. The Journals of Gerontology, Series B: Psychological Sciences & Social Sciences, 69(Suppl. 1), S1–S7.

Kasper JD, Freedman VA, & Spillman B (2013). *Classification of persons by dementia status in the National Health and Aging Trends Study* (NHATS Technical Paper #5). Retrieved from http://www.nhats.org/scripts/documents/NHATS_Dementia_Technical_Paper_5_Jul2013.pdf

Keay L, Munoz B, Turano KA, Hassan SE, Munro CA, Duncan DD, … West SK (2009). Visual and cognitive deficits predict stopping or restricting driving: The Salisbury Eye Evaluation Driving Study (SEEDS). Investigative Ophthalmology & Visual Science, 50, 107–113. [PubMed: 18719088]

King CJ, Chen J, Dagher RK, Holt CL, & Thomas SB (2015). Decomposing differences in medical care access among cancer survivors by race and ethnicity. American Journal of Medical Quality, 30, 459–469. [PubMed: 24904178]

Kowalski K, Love J, Tuokko H, MacDonald S, Hultsch D, & Strauss E (2012). The influence of cognitive impairment with no dementia on driving restriction and cessation in older adults. Accident Analysis & Prevention, 49, 308–315. [PubMed: 23036411]

Lane LB, Bert SA, & Heller AE (2014). Defining North Carolina's transportation disadvantaged populations. Retrieved from https://connect.ncdot.gov/projects/research/RNAProjDocs/2013-12%20Final%20Report.pdf

Lehning A, Kim K, Smith R, & Choi M (2018). Does economic vulnerability moderate the association between transportation mode and social activity restrictions in later life? Ageing & Society, 38, 2041–2060.

Long D, Blandford BL, Dailey PJ, Dayan S, Matthews J, & Sowards K (2013). *The future of transit in West Virginia* (Reports with Contribution from KTC Researchers). Retrieved from http://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1000&context=ktc_externalreports

Lynott J, & Figueiredo C (2011). How the travel patterns of older adults are changing: Highlights from the 2009 National Household Travel Survey (Fact Sheet, Vol. 218). Washington, DC: AARP Public Policy Institute.

MacLeod KE, Ragland DR, Prohaska TR, Smith ML, Irmiter C, & Satariano WA (2015). Missed or delayed medical care appointments by older users of nonemergency medical transportation. The Gerontologist, 55, 1026–1037. [PubMed: 24558264]

Mezuk B, & Rebok GW (2008). Social integration and social support among older adults following driving cessation. The Journals of Gerontology, Series B: Psychological Sciences & Social Sciences, 63(5), S298–S303.

Molnar LJ, Charlton JL, Eby DW, Bogard SE, Langford J, Koppel S, … Man-Son-Hing M (2013). Self-regulation of driving by older adults: Comparison of self-report and objective driving data. Transportation Research Part F: Traffic Psychology and Behavior, 20, 29–38.

Molnar LJ, Charlton JL, Eby DW, Langford J, Koppel S, Kolenic GE, & Marshall S (2014). Factors affecting self-regulatory driving practices among older adults. Traffic Injury Prevention, 15, 262–272. [PubMed: 24372498]

Narva AS, & Sequist TD (2010). Reducing health disparities in American Indians with chronic kidney disease. Seminars in Nephrology, 30, 19–25. [PubMed: 20116644]

Onyekere C, Ross S, Namba A, Ross JC, & Mann BD (2016). Medical student volunteerism addresses patients' social needs: A novel approach to patient-centered care. The Ochsner Journal, 16(1), 45–49. [PubMed: 27046404]

Peipins LA, Graham S, Young R, Lewis B, Foster S, Flanagan B, & Dent A (2011). Time and distance barriers to mammography facilities in the Atlanta metropolitan area. Journal of Community Health, 36, 675–683. [PubMed: 21267639]

Powell RE, Doty A, Casten RJ, Rovner BW, & Rising KL (2016). A qualitative analysis of interprofessional healthcare team members' perceptions of patient barriers to healthcare engagement. BMC Health Services Research, 16, Article 493.

Probst JC, Laditka SB, Wang JY, & Johnson AO (2007). Effects of residence and race on burden of travel for care: Cross sectional analysis of the 2001 U.S. National Household Travel Survey. BMC Health Services Research, 7, Article 40.

Ragland DR, Satariano WA, & MacLeod KE (2005). Driving cessation and increased depressive symptoms. The Journals of Gerontology, Series A: Biological Sciences & Medical Sciences, 60, 399–403.

Roe CM, Babulal GM, Head DM, Stout SH, Vernon EK, Ghoshal N, … Morris JC (2017). Preclinical Alzheimer's disease and longitudinal driving decline. Alzheimer's & Dementia, 3, 74–82.

Rosenbloom S (2003). The mobility needs of older Americans: Implications for transportation reauthorization. Retrieved from https://www.brookings.edu/research/the-mobility-needs-of-older-americans-implications-for-transportation-reauthorization/

Ross LA, Freed SA, Edwards JD, Phillips CB, & Ball K (2017). The impact of three cognitive training programs on driving cessation across 10 years: A randomized controlled trial. The Gerontologist, 57, 838–846. [PubMed: 28329859]

Sanford S, Rapoport MJ, Tuokko H, Crizzle A, Hatzifilalithis S, Laberge S, … Dementia T (2018). Independence, loss, and social identity: Perspectives on driving cessation and dementia. Dementia. Advance online publication. doi:10.1177/1471301218762838

Schryer E, Boerner K, Horowitz A, Reinhardt JP, & Mock SE (2017). The social context of driving cessation: Understanding the effects of cessation on the life satisfaction of older drivers and their social partners. Journal of Applied Gerontology. Advance online publication. doi:10.1177/0733464817741683

Seiler S, Schmidt H, Lechner A, Benke T, Sanin G, Ransmayr G, … Group PS (2012). Driving cessation and dementia: Results of the prospective registry on dementia in Austria (PRODEM). PLoS ONE, 7(12), e52710. [PubMed: 23300746]

Shaw JG, Farid M, Noel-Miller C, Joseph N, Houser A, Asch SM, … Flowers L (2017). Social isolation and medicare spending: Among older adults, objective social isolation increases expenditures while loneliness does not. Journal of Aging and Health, 29, 1119–1143. [PubMed: 29545676]

Silverstein NM, & Turk K (2016). Students explore supportive transportation needs of older adults. Gerontology & Geriatrics Education, 37, 381–401. [PubMed: 25621827]

Sims RV, Mujib M, McGwin G Jr., Zhang Y, Ahmed MI, Desai RV, … Ahmed A (2011). Heart failure is a risk factor for incident driving cessation among community-dwelling older adults: Findings from a prospective population study. Journal of Cardiac Failure, 17, 1035–1040. [PubMed: 22123368]

Stout SH, Babulal GM, Ma C, Carr DB, Head DM, Grant EA, … Roe CM (2018). Driving cessation over a 24-year period: Dementia severity and cerebrospinal fluid biomarkers. Alzheimer's & Dementia, 14, 610–616.

Taylor HO, Taylor RJ, Nguyen AW, & Chatters L (2018). Social isolation, depression, and psychological distress among older adults. Journal of Aging and Health, 30, 229–246. [PubMed: 28553785]

U.S. Department of Transportation & Bureau of Transportation Statistics (2003a). Freedom to travel. Retrieved from https://www.bts.gov/archive/publications/freedom_to_travel/index

U.S. Department of Transportation & Bureau of Transportation Statistics (2003b). Highlights of the 2001 National Household Travel Survey. Retrieved from https://www.bts.gov/archive/publications/highlights_of_the_2001_national_household_travel_survey/index

van Landingham SW, Hochberg C, Massof RW, Chan E, Friedman DS, & Ramulu PY (2013). Driving patterns in older adults with glaucoma. BMC Ophthalmology, 13, Article 4.

Velayudhan L, Baillon S, Urbaskova G, McCulloch L, Tromans S, Storey M, … Bhattacharyya S. (2018). Driving cessation in patients attending a young-onset dementia clinic: A retrospective cohort study. Dementia and Geriatric Cognitive Disorders, 8, 190–198.

Vivoda JM, Harmon AC, Babulal GM, & Zikmund-Fisher BJ (2018). E-hail (rideshare) knowledge, use, reliance, and future expectations among older adults. Transportation Research Part F: Traffic Psychology and Behavior, 55, 426–434.

Vivoda JM, Heeringa SG, Schulz AJ, Grengs J, & Connell CM (2017). The influence of the transportation environment on driving reduction and cessation. The Gerontologist, 57, 824–832. [PubMed: 27342439]

Wallace R, Hughes-Cromwick P, Mull H, & Khasnabis S (2005). Access to health care and nonemergency medical transportation. Transportation Research Record: Journal of the Transportation Research Board, 1924, 76–84.

Windsor TD, Anstey KJ, Butterworth P, Luszcz MA, & Andrews GR (2007). The role of perceived control in explaining depressive symptoms associated with driving cessation in a longitudinal study. The Gerontologist, 47, 215–223. [PubMed: 17440126]

Table 1.

Driving Frequency and Avoidance Among Community-Dwelling Older Medicare Beneficiaries, 2015 (*N* = 7,498).

	N	Weighted %	National estimate
Driving Frequency			
Every day (7 days a week)	2,452	39.44	16,879,925
Most days (5-6 days a week)	1,580	23.74	10,159,028
Some days (2-4 days a week)	922	11.67	4,994,034
Rarely (<1 day a week)	296	3.72	1,590,661
Never	2,248	21.42	9,169,304
Avoids driving alone/at night/in weather[a]	2,027	32.31	10,866,924

[a]Among those who reported driving in the past month.

Table 2.

Modes of Transportation Other Than Driving Used by Older Adults.

	Drivers (*N* = 5,250)			Nondrivers (*N* = 2,248)		
	N	**Weighted %**	**National estimate**	***N***	**Weighted %**	**National estimate**
Walked	2,572	52.47	17,632,258	950	48.99	4,335,546
Got ride from family/friends	1,855	33.00	11,084,317	1,896	85.77	7,583,178
Van or shuttle provided by place of residence	34	0.55	184,160	141	6.90	611,697
Van or shuttle for seniors	68	0.87	293,586	297	12.62	1,116,936
Public transportation	297	6.12	2,058,575	317	17.04	1,509,455
Taxi	173	3.53	1,186,731	206	10.30	912,201
Other	338	7.66	2,574,840	57	3.68	325,983

Note. Multiple modes of transportation may be reported per participant.

Table 3.

Sample Characteristics Among Nondriving Older Adults, by Transportation Disadvantage.

	All	Disadvantaged	No disadvantage	*p* value
n	2,248	581	1,667	
Estimate	9,177,518	2,346,978	6,830,540	
Age at interview or death, mean	79.44	79.98	79.26	0.21
Age category, %				
Age <75	33.22	32.20	33.58	0.68
Age 75-84	35.79	32.59	36.89	0.15
Age 85 +	30.99	35.21	29.54	0.04*
Female, %	70.98	77.44	68.76	0.00**
Race, %				
White Non-Hispanic	62.63	67.15	61.05	0.07
Black Non-Hispanic	14.61	12.67	15.28	0.08
Other (American Indian/Asian/Native Hawaii)	7.11	8.25	6.72	0.50
Hispanic	15.65	11.93	16.95	0.03*
Income category, %				
<$15,000	38.23	42.46	36.78	0.06
$15,000-$29,999	30.81	31.97	30.40	0.53
$30,000-$59,999	19.63	16.34	20.76	0.03*
>$60,000	11.33	9.24	12.05	0.21
Medicaid, %	32.59	33.34	32.33	0.74
Education level, %				
< High School	35.34	31.33	36.76	0.02*
High School/GED	30.78	27.77	31.84	0.12
Some college	20.57	26.35	18.52	0.00**
⩾ Bachelors	13.31	14.54	12.88	0.42
Marital status, %				
Married or living with partner	34.08	21.98	38.24	0.00**
Separated, divorced, or widowed	59.57	73.21	54.89	0.00**
Never married	6.16	4.81	6.62	0.26
Residential care, excluding nursing home, %	15.40	16.26	15.10	0.57
Lives in metropolitan area, %	85.95	85.52	86.09	0.80
Geographic region, %				
Northeast	24.48	22.55	25.14	0.25
Midwest	17.09	17.04	17.11	0.98
South	35.57	37.50	34.91	0.28
West	22.86	22.92	22.84	0.98
Help with 1 + ADL, %	42.45	43.42	42.12	0.59
Help with 1 + IADL, %	61.04	66.13	59.30	0.02*

	All	Disadvantaged	No disadvantage	*p* value
Uses any assistive device for ADLs, %	82.87	89.85	80.47	0.00**
Count of self-reported medical conditions, mean	3.86	4.22	3.74	0.00**
Count of self-reported medical conditions, category, %				
0-1 self-reported conditions	12.87	8.79	14.27	0.02*
2-4 self-reported conditions	49.98	48.16	50.61	0.52
5+ self-reported conditions	37.15	43.05	35.12	0.01*
Selected chronic conditions (self-reported), %				
Diabetes	34.93	38.70	33.64	0.12
Ever had heart attack	18.62	20.82	17.87	0.17
Lung disease	21.62	23.44	21.00	0.23
High blood pressure	73.92	77.08	72.84	0.09
Probable dementia, %	28.26	22.14	30.35	0.01**
Number in social network (max. 5), mean	2.07	2.16	2.04	0.14
Had someone sit in with them on doctor's visits, %	62.11	60.84	62.55	0.46
Responded to NHATS via proxy, %	16.01	10.07	18.06	0.00**

Note. GED = General Educational Development; ADL = activities of daily living; IADL = Instrumental activities of daily living; NHATS = National Health and Aging Trends Study.

* $p < .05$.

** $p < .01$.

Table 4.

Mode of Transportation to the Doctor Among Nondrivers, by Transportation Disadvantage (N = 2,248).

	No transportation disadvantage		Transportation disadvantage	
	%	Population estimate	%	Population estimate
No regular doctors visit reported	5.69	385,649	5.57	130,447
Got ride	66.26	4,492,203	60.38	1,413,787
Van/Shuttle from home or for seniors	9.92	672,659	10.78	252,529
Public transit	5.78	391,777	4.21	98,494
Taxi	1.85	125,454	4.20	98,236
Walked	4.31	292,278	1.95	45,640
Home visit	3.13	211,977	6.62	154,939
Other	1.60	108,330	3.94	92,365

Table 5.

Predictors of Transportation Disadvantage Among Nondriving Older Adults (N = 2,091).

	Odds ratio	95% CI
Age category (ref = 74 and younger)		
75-84	0.812	[0.567, 1.164]
85 +	0.937	[0.650, 1.352]
Female	1.235	[0.895, 1.706]
Race (ref = White)		
Black non-Hispanic	0.721	[0.522, 0.995]*
Hispanic	0.748	[0.455, 1.229]
Education high school or greater	1.169	[0.880, 1.551]
Income less than US$15,000	1.065	[0.785, 1.445]
Married or living with partner	0.462	[0.337, 0.633]**
Probable dementia	0.525	[0.364, 0.760]**
Receives help with 1 + ADL	0.907	[0.692, 1.188]
Receives help with 1 + IADL	1.281	[0.902, 1.820]
Uses any assistive device for ADLs	1.644	[1.100, 2.456]*
Count of self-reported medical conditions	1.096	[1.030, 1.165]**

Note. CI = confidence interval; Ref = reference group; ADL = activities of daily living; IADL = Instrumental activities of daily living.

* $p < .05$.

** $p < .01$.