Daily Urban Trip Mobility and Perceptions of Mobility among Older Adults in the Denver (USA) Region

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Abstract: Perceptions of individual mobility for daily in-town trips may reveal more insight to life satisfaction of older adults than traditional measures of mobility, such as frequency of trips. Primary data were collected through three focus groups (n = 29) and survey questionnaires (n = 691) in the Denver (Colorado, USA) metropolitan area, and analyzed with descriptive statistics, bivariate analyses of significant categorical differences, and thematic highlights of qualitative open responses. Despite changes and declines in actual daily out-of-home mobility, individual perceptions and satisfaction with mobility remains quite high. Social networks are a possible source for transportation assistance for older adults, but this is not a desirable option, as there is a strong dislike in feeling dependent upon others. For older adults accustomed to independence in driving, volunteer driver programs appear to be a more attractive alternative.

Keywords: Older Adults, Mobility, Perceptions of Mobility, Urban Transportation

Introduction and Background

For older adults, mobility is a cornerstone to successful independence in aging and for maintaining higher levels of well-being and quality of life (Banister and Bowling 2004; Rosenbloom 2004; Webber, Porter, and Menec 2010; Mollenkopf, Hieber, and Wahl 2011). The term "mobility" is complex with multiple uses and meanings (Metz 2000; Kwan and Schwanen 2016). But in following the conventions in the older adult mobility research literature (e.g., Webber, Porter, and Menec 2010; Schwanen and Ziegler 2011), "mobility" here is understood as the ability to move beyond one's home for everyday life activities. There are many complex linkages between well-being, independence, and mobility among older adults that are unique to geographic setting, the individual, and phase within the lifecourse (Schwanen and Ziegler 2011). But across contexts and life situations, quality of life is impacted by mobility in many ways including: achieving access to desired people and places; psychological benefits of movement; exercise benefits; involvement within one's community; and knowing one has the capacity to go out of the house and run an errand if needed (Metz 2000). As such, this ability and opportunity to walk, drive, cycle, use public transportation, or receive lifts exists within a built urban environment that contains supportive infrastructures and appropriate opportunities and destinations.

But in car-dependent cities, driving cessation among older adults (due to loss of a driver's license, health limitations, or the loss of a partner as primary driver) can have deep and detrimental effects on their well-being. Individuals suddenly lose their sense of independence and autonomy, face challenges in meeting basic needs and getting to important appointments, and no longer are freely able to connect with their social networks. In these contexts, older adults are not likely to transition to public transportation options when they no longer drive (Rosenbloom 2009, 2012). Therefore, the aging and mobility body of literature seeks to understand the unique transportation needs of older adults, the implications of their changing mobility, and how cities and society can make adaptations.

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The global population of older adults (aged 65 and over) is growing faster than at any other time in history (Davies and James 2011), and is currently estimated at 8.5 percent of the total population with an expected growth to 12.0 percent by 2030 and 16.7 percent in 2050 (He, Goodkind, and Kowal 2016). And in some countries the over-80 age cohort is the fastest growing age demographic. This overall growth, accompanied by the trends of active aging and aging in place, underscores the complexity of issues and a broad range of considerations for research on the mobility of older adults. People are reaching old age in better health, causing the rates of biological deterioration (senescence) to be delayed by as much as a decade (Vaupel 2010). While 65 is the traditional retirement age in the United States (US), a point when researchers have typically expected mobility and activity patterns to change dramatically (Coughlin and D'Ambrosia 2012), in reality, older adults are more healthy and likely to experience active aging livelihoods for decades after retirement (Rosenbloom 2004). As the Baby Boomer generation (born 1946–1964) reaches old age, many countries face an unprecedented large older adult cohort that is highly mobile (Coughlin and D'Ambrosia 2012). Thus, the demands for transportation will not likely decline upon retirement age, and higher expectations of mobility in retirement may actually occur (D'Ambrosio et al. 2012). At the same time, aging in place, a trend of older adults deciding to remain living in their home or neighborhood for as long as possible to best maintain their independence and quality of life, poses particular concerns as older adults in the US are more concentrated in low-density, auto dependent suburban spaces (Rosenbloom 2012; Frey 2011). On the one hand the increased traffic demands, emissions, and accidents will challenge cities and their transportation sustainability objectives. On the other hand, when reduced independence in mobility among older adults does occur, the declines in mobility can lead to feelings of isolation, loneliness, and diminished well-being and quality of life, likely exacerbated for car-dependent individuals living in these low-density suburban landscapes.

To better understand older adult mobility patterns and changes, researchers often examine individual travel behaviors as a proxy indicator for mobility independence. Typically these measure the number of daily (out of home) trips, the transportation mode, trip purpose, time of day, or trip distance. Changes and variations within these measures can inform theoretical understandings of how mobility evolves in old age and provide transportation policy recommendations. As numerous review articles and special issues highlight (Cui, Loo, and Lin 2017; Musselwhite, Holland, and Walker 2015; Murray 2015; Schwanen and Ziegler 2011; Schwanen and Páez 2010; Rosenbloom 2004; Metz 2003), to date the empirical research is dominated by studies in societies within advanced economies where older adults experience very high levels of automobile dependence and low levels of public transportation usage or active transportation such as walking and biking. Within this broader aging and mobility literature, there are two areas to which this study makes specific contributions: exploring the relationship of perceptions of mobility with measured mobility and the need for more locally specific empirical analyses.

Perceptions of Mobility

Much of the existing literature on older adult mobility focuses upon measured outcomes of travel behaviors (e.g., number of daily trips, transport mode, trip purpose), or any barriers or changes to trip-making. It is argued, however, that mobility is a hard concept to quantify and that such measures are not always an effective method to assess mobility (Rosenbloom 2012). Scholars are therefore increasingly looking beyond such measured indicators of mobility to examine *perceptions of mobility* as an important and realistic marker of life satisfaction, well-being, and the ability to meet (changing) daily needs (Coughlin 2001).

In a metasynthesis of qualitative based studies on perceptions of older adult mobility, Goins et al. (2015) identified three dominant themes within the research literature. First, for older

adults mobility is integral to the sense of self, feeling whole, keeping busy, building confidence, remaining independent, and life enjoyment. As such, the ability to travel can be central to personal quality of life (Banister and Bowling 2004). And beyond utilitarian trips that facilitate meeting everyday needs, there are numerous benefits of mobility that is "destination-independent" (Metz 2000). These include a sense of belonging and being a part of the community, the pleasure of just moving about, general physical exercise through active movement, and the sense of autonomy that comes with knowing the *potential* for trip making is possible (Metz 2000; Musselwhite and Haddad 2010; Mollenkopf, Hieber, and Wahl 2011). Second, assisted mobility, including devices such as electric scooters (May, Garrett, and Ballantyne 2010) or alternative transport modes such as public transportation (Banister and Bowling 2004), can help persons maintain—or even enhance—their lives through "renewed access or interests and supported social interaction" (Goins et al. 2015, 938). Third, adaptability is key to moving forward for older adults in navigating their declines in mobility over time. This can include mechanisms to remain connected to one's community (May, Garrett, and Ballantyne 2010), drawing upon strong social networks (Banister and Bowling 2004), or recognizing possibilities of other mobilities (Ziegler and Schwanen 2011) to help compensate when out-of-home mobility diminishes.

Thus, as articulated by Mollenkopf, Hieber, and Wahl (2011), what should be recognized across all these studies is that more subjective perceptions of mobility are perhaps better predictors of health and well-being than actual metric-based mobility. Since most empirical studies examine mobility as measured by travel behaviors, there is a need for more research to better understand perceptions of mobility and possible variations within subsets of the older adult population.

Local Specificity

The geographies of aging are highly place specific (Davies and James 2011). Health and well-being is contextual, impacted by local access to opportunities, and influenced by different places (geographic contexts) and the people and opportunities individuals come in contact with as they move about in their daily life (Kwan and Schwanen 2016). Similarly, there is great diversity within the older adult cohort in relation to lifestyles and preferences, especially regarding travel behaviors and mobility needs (Cui, Loo, and Lin 2017). Research is needed that further unravels the non-homogenous nature of mobility among the older adult cohort at more disaggregate levels (Alsnih and Hensher 2003; Schwanen and Páez 2010; Musselwhite, Holland, and Walker 2015), as the experiences of mobility and well-being can vary drastically by social groups (Kwan and Schwanen 2016), and determinants of mobility are multiple and interrelated (Webber, Porter, and Menec 2010). Given that much of the aging and mobility research utilizes large datasets of national-level household surveys (e.g., Collia, Sharp, and Giesbrecht 2003; Scott et al. 2009) or citywide travel diaries (e.g., Hildebrand 2003; Boschmann and Brady 2013) where the researcher does not have input on instrument research design to address specific research questions, there are calls for basic empirical studies that explore the travel behaviors and needs of older adults (Schwanen and Páez 2010) to reveal any unique locally specific characteristics (Kwan and Schwanen 2016).

Survey-based Research

Primary data collection through survey questionnaires is one useful approach to address both these needs of understanding perceptions of mobility as well as provide a locally specific detailed analysis of older adult mobility. Small-scale surveys are a quick and effective way to collect data specific to a topic of interest, giving the researcher complete control over the instrument design, with options for enumerated data variables derived from closed (forced

response) questions, as well as open ended responses to capture nuances and insights beyond the closed questions (de Vaus 2014). In aging and mobility research, the survey methodology can help move "beyond instrumental notions of travel" (Musselwhite, Holland, and Walker 2015, 2) toward "more subjective and motivational aspects of travel behavior" (Mollenkopf, Hieber, and Wahl 2011, 784). Some recent examples of primary data on aging and mobility collected through surveys include studies examining motivations for public transport and non-car transportation (Truong and Somenahalli 2015; King and Scott-Parker 2017; May, Garrett, and Ballantyne 2010) and bicycle usage (Winters et al. 2015), driving decisions (Hess et al. 2016), changes in perceptions of mobility (Mollenkopf, Hieber, and Wahl 2011), and well-being (Hjorthol, 2013). These studies are all focused on cities within Australia, USA, Canada, Germany, and Norway, with sample sizes as small as n = 67, as large as n = 4,723, and most with less than n = 200.

Study Purpose

The purpose of this research, therefore, is to address these two calls in the literature on aging and mobility. First, this study reports findings of basic mobility characteristics of older adults collected through focus groups and a survey questionnaire; the findings are specific to the Denver (US) metropolitan area. Second, this study explores older adults' attitudes on non-car transportation alternatives, perceptions of individual mobility as compared to actual experienced mobility, and how mobility might be impacted by housing, social networks and trip replacement options. The population of interest in this research is persons over age 64 who are living in a private residence (excluding all assisted living or health care institutions) within the Denver metropolitan area.

Study Area and Data Collection

The data for this research were collected in Denver, Colorado, a major metropolitan area in the Rocky Mountain region of the United States containing approximately 2.6 million residents. In comparison with the largest metropolitan areas in the US, Denver ranked 14th with a 32 percent growth of 65 and over adults during the 2000s and 2010s, but ranked 11th for its 75 percent growth of 55–64 year-olds (Frey 2011). In fact, the aging Baby Boomer generation (born 1946–1964) constitutes 25 percent of the state population and by 2030, the over-64 population will increase by 77 percent. Much of the fastest growth of older adults in Colorado is occurring in Denver and surrounding counties (CSDO 2017). Although light- and commuter-rail transit systems have recently been built, the region is decidedly automobile centric and older adults remain largely dependent on private automobile in sprawling low-density residential environments, with some instances of new mixed-use higher density transit friendly developments (Goetz and Boschmann 2018; Boschmann and Brady 2013).

Two phases of data collection, focus groups and a survey questionnaire, were used to gather information on the mobility experiences, perceptions of mobility, attitudes of non-car transportation, and other factors impacting the mobility of older adults. Both phases were reviewed and approved for human subjects research by the Institutional Review Board.

The first phase of data collection was a series of focus groups with older adults in order to collect diverse and richly detailed stories of individuals' experiences and opinions about urban mobility issues. The approach was broad and exploratory to help define a range of perspectives and acquire information not readily available from other data sources. Additionally, these focus groups were a pre-piloting exercise for developing a meaningful survey research instrument (Krueger and Casey 2015). Three focus groups were conducted with twenty-nine older adults in central Denver during summer 2016. Each session was approximately ninety minutes in

duration, facilitated by the author and a student assistant. The sessions were recorded and transcribed by the author.

The second phase of data collection was a survey questionnaire that captured responses from a larger sample. The survey instrument design drew upon the focus groups and existing research literature. Early versions were piloted and the final survey contained thirty-four questions designed to acquire demographic information, transportation availability and usage, current levels of mobility, residential characteristics, attitudes on non-car transportation alternatives, perceptions of individual mobility, social networks, and trip replacement options. Most were closed questions, with opportunities for open-ended responses.

The survey sample was derived by a marketing vendor that utilized supplementary demographic information to customize and target the distribution of surveys to households with older adult residents. The sampling frame was the household-residing population with at least one resident age 65 or older. Eighty seven ZIP codes (postal mailing areas) within the contiguous urbanized area of the Denver metropolitan area were selected, which contained over 224,000 possible households with older adults. In December 2016, surveys were mailed out to 5,000 randomly selected households from this subset. The surveys were paper based and self-administered, with a business reply envelope provided. An online Spanish-language survey was available.

There were 735 envelopes returned (14.7% response rate). Six were returned blank or empty, and one contained responses for two people in the same household. The responses for 730 surveys were manually entered into a survey response software for digital analysis. Once entered and filtered, eight were eliminated for errors. This analysis excluded any 60- to 64-year-olds, resulting in a sample size of n = 691. Due to small levels of intermittent item non-response, not all variables in the analyses sum to 691.

It is not known if non-respondents differ in meaningful ways from the respondents. But there are indications of how sampling bias was manifest. The survey sample was 53.8 percent male and 46.2 percent female (Table 1). When compared to 2010 U.S. Census data for the Denver region, women comprise 56.7 percent of the 65+ population and men 43.3 percent; this ratio shifts slightly (55.7% female/44.3% male) for the 2012–2016 American Community Survey 5-Year estimate for the same region (Table 2). In two-person households, men appear oversampled and women under sampled, indicating a flaw in the mechanism to randomize the respondent in multi-person households. This sample bias will be addressed as follows. First, all analyses are conducted within the survey sample and conclusions are made only about this sample. Inferences about the larger population are not made, nor is this data assumed to be representative. Second, the bivariate analyses are limited to differences between percentage of the female sample and percentage of male sample, not in relation to total sample, unless noted otherwise.

Table 1: Survey Sample Demographics

Gender				*Age*	
	n	%		Mean	74
Male	364	53.8%		Median	73
Female	312	46.2%		Standard Deviation	6.8
				Min	65
				Max	97

Source: Boschmann

Table 2: Sample Age Groups with Census Comparisons

		Total	*Male*	*Female*
Age Group		*Survey Sample*		
Young Old	65–74	59.8%	34.1%	25.7%
Old Old	75–84	30.3%	15.5%	14.5%
High Longevity	85+	9.9%	4.1%	5.6%
		ACS 2012-2016		
Young Old	65–74	60.6%	28.5%	32.1%
Old Old	75–84	27.7%	11.9%	15.8%
High Longevity	85+	11.7%	4.0%	7.7%
		2010 Census		
Young Old	65-74	56.3%	26.2%	30.1%
Old Old	75-84	31.0%	13.0%	18.0%
High Longevity	85+	12.8%	4.2%	8.6%

Source: Survey Data; U.S. Census 2010; American Community Survey (ACS) 2012 -2016

Data Sample Demographics

Across the three focus group sessions (n = 29) the participants were mostly female (90%) with a median age of 80. Most lived by themselves (75.8%), drove their own car (65.5%), and the median length of time living in the Denver area was 55.5 years. Racial/ethnic identity was not captured and this group generally represented middle- to upper-middle-class incomes. Given the small sample, the findings are not representative of the entire older adult population of Denver. Summary findings from the focus group discussions are integrated with the survey results in the next section. The remainder of this section discusses the demographics of the survey sample.

Survey respondents ranged in age from 65 to 97; the mean was 74 and median 73. For purposes of bivariate categorical analyses, age is aggregated into three age groups: "Young Old" (65–74 years old), "Old Old" (75–84 years old), and "High Longevity" (age 85 and above) for consistency with some research literature. Table 2 shows the distributions of the sample within the age groups, by gender, with comparison statistics from the U.S. Census (2010) and American Community Survey (ACS) data (2012–2016 5-year estimate) for the Denver Metropolitan Area population. Two differences between the survey sample and Census and ACS data are noted. First, the High Longevity age group is underrepresented in this sample, nearly a full three points lower than both the Census and ACS. Capturing the oldest populations is a noted challenge of survey research. Second, as noted earlier the female-to-male ratio in the sample does not fully represent the population. The proportional difference is larger in the Young Old age group, but less dramatic for the other two age groups.

In terms of generations,[2] 39 percent of this sample are from the leading edge of Baby Boomers (born 1946–1964), and 58.4 percent are from the Silent Generation (born 1928–1945). There is a small representation (2.6%, n = 18) from the Greatest Generation (born 1901–1927). These cohorts do not exactly match the aggregated age groups described above. But they can inform some interpretations of the findings as generational cohorts often adopt different attitudes, including perspectives on relevant topics such as independence/autonomy and transportation.

[2] The generational date ranges used here are as defined by The Pew Research Center.

The responses for household structure were aggregated into four possible scenarios: living alone; living with a spouse/partner; single, living with others; partnered, living with others. Half of the sample (51.2%) lives with their partner/spouse, a third (36%) live alone, and 12.3 percent live with others—in most cases it is with grown children or grandchildren.

The median household income for individuals aged 65+ in the Denver region (2013–2017 ACS 5-year estimate) is $50,975 (2017 inflation-adjusted). Thirty-five percent of the sample has a household income that is below or well below the regional median household income for persons aged 65 and over; and 37.7 percent of the sample has a household income that is above or well above this regional median. Since 16.4 percent declined to answer the question about household income, further analysis based on income is not feasible.

In terms of employment, most (79.1%) currently do not work, 8.3% work full-time, and 12.6 percent are part-time employed. Only 31.8 percent volunteer regularly (monthly) out of the home, and a higher percentage of females (37.9%) volunteer than males (26.2%) ($p < 0.001$).

Nearly 84 percent of the sample reported their current health status as "excellent" or "good." Women were more likely to rate their health as "good" (54.9%) than "excellent" (29.9%), where as 37.5 percent of men rated their health as "excellent" and 46 percent as "good" (in both cases the differences are significant [$p < 0.04$]). Less than 2 percent reported their health as "poor." Only 8.6 percent reported having a disability.

Denver is generally not a destination location for new retirees migrating in from elsewhere, yet the older adult population is growing rapidly due to natural aging and is expected to grow 77 percent by 2030 (CSDO 2017). When considering the aging in place phenomena, there are two diverse trends within this sample (Table 3).

Table 3: Aging in Place

Duration of Current Residence (years)			
0-9 years	161	23.9%	Mean = 22.02 Std. Dev. = 15.12 Min = less than 1 Max = 86
10-19 years	176	26.1%	
20-29 years	122	18.1%	
30-39 years	109	16.2%	
40-49 years	75	11.1%	
50+ years	31	4.6%	
	N = 674		
Length of Time in Denver (years)			
0-9 years	49	7.2%	Mean =44 Std. Dev. = 20.3 Min = less than 1 Max = 97
10-19 years	52	7.6%	
20-29 years	55	8.1%	
30-39 years	95	13.9%	
40-49 years	174	25.5%	
50-59 years	100	14.6%	
60-69 years	84	12.3%	
70+ years	74	10.8%	
	N = 683		

Source: Boschmann

Most respondents have lived within the Denver region for a long time (mean = 44 yrs.; standard deviation = 20.3 yrs.), with 63 percent having lived in Denver for forty years or more,

and only 15 percent for fewer than twenty years. Yet at the same time, only 50 percent have lived in their current residential location for more than twenty years. Thus, among this sample the older adults are remaining in place long after retirement, but actively move to other housing locations. Less than a third (29%) stated that they have downsized their home, and only 8.5 percent live within an age-restricted housing community for older adults.

Results and Discussion

The results in this section are divided into two primary parts. First is a discussion of current mobility measures, including frequency of trips, primary and alternative forms of transportation, changes to driving habits, and trip replacement practices. Second, is a discussion of perceptions of individual mobility, the role of residential location in facilitating individual mobility, perceptions and attitudes about Denver-area transportation for older adults. Attitudes towards volunteer driver programs are also explored. Bivariate analyses of categorical differences between Age Group ("Young Old," "Old Old," "High Longevity"), Gender ("Male, Female"), or Mobility ("Daily," "Weekly," "Infrequent") are used to explore the variations within the survey results. Integrated into the discussion are participant comments from open-ended survey questions or the focus group sessions.

Current Mobility, Transportation Usage, and Trip Replacement

Frequency of Trips

Frequency of out-of-home trips is the most common proxy measure for mobility of older adults, as it suggests freedom and flexibility to move about. In terms of the number of in-town trips for purposes of regular everyday life activities, among the survey responses, 17.6% make numerous daily trips (three or more) and an additional 51% make one or two daily trips. One quarter (26.6%) only make trips a few times a week, and 4.9 percent have very infrequent trip making (once a week or less). For purposes of bivariate categorical analyses, the survey responses on trip frequency were aggregated into three Mobility groups (Table 4): "Daily" (at least once daily), "Weekly" (at least once weekly), and "Infrequent" (less than once weekly). The differences in Mobility between Age Group ($p < 0.0001$) and Gender ($p < 0.0004$) are significant. Females are more likely to not make a daily trip (38.6%) than males (25%). Daily trips decline with Age Group, as 57 percent of High Longevity make only weekly or infrequent trips. Given that over two-thirds (68.4%) of this sample does make an out-of-home trip at least once daily, these findings are consistent with the larger trend of active aging among older adults, particularly in cities of advanced economies (Rosenbloom 2004).

Table 4: Mobility Categories

				Age Groups				*Gender*	
MOBILITY	*Sample n %*			*Young Old*	*Old Old*	*High Longevity*		*Female*	*Male*
Daily	466	68.4%		75.6%	61.8%	43.1%		61.4%	75.1%
Weekly	182	26.7%		21.3%	32.4%	44.6%		31.8%	21.9%
Infrequent	33	4.9%		3.2%	5.9%	12.3%		6.8%	3.1%
				$chi^2 = 35.4$; $p<0.0001$				$chi^2 = 15.7$; $p<0.0004$	

Source: Boschmann

Driving: The Primary Form of Transportation

For 89.9 percent of the survey sample, independent driving is the primary mode of transportation (Table 5). Nine percent of females are dependent upon someone else (spouse, neighbor, family member) driving them (only 2.5% of males), and 14.7 percent of High Longevity persons are dependent on other drivers. Only half (51.5%) of the Infrequent mobility group drives independently, and otherwise rely on other persons to drive them (39.4%) or use a senior shuttle (9.1%). Of the Weekly mobility group, 80 percent drive independently, and 13.3 percent rely on others to drive them. The use of bus/light rail, taxi, walking, or senior transportation service as the primary mode of transportation only occurs for 4 percent of the sample. Most individuals have access to either one household car (36.9%) or two household cars (42.4%). Only 4.7 percent of respondents do not have a car, 4.3 percent do not have a driver's license, and 7.2 percent currently do not drive independently. These findings are largely consistent with existing research on older adults in car-dependent cities (Cui, Loo, and Lin 2017).

Table 5: Primary Form of Daily Transportation for Daily Trips

	1		*2*	*3*	*4*	*5*
			(second highest response)			
Sample	89.9%		2.8%			
Age Group						
Young Old	92.9%		2.0%			
Old Old	87.4%		3.9%			
High Longevity	79.4%			8.8%		
Gender						
Female	84.8%		4.9%			
Male	95.0%				1.7%	
Mobility Group						
Daily	97.0%					1.1%
Weekly	80.1%		5.5%			
Infrequent	51.5%		18.2%			
1. I drive myself.						
2. Another family member drives me.						
3. A neighbor or friend drives me.						
4. I primarily rely on my partner/spouse to drive me.						
5. I take bus or light rail						

Source: Boschmann

Alternative Transportation-mode Usage

Survey respondents were asked to identify frequency of use of alternative (non-private automobile) transportation modes (on a "never," "occasionally," and "frequently" scale). Biking and walking options were specified for utilitarian trip purposes, not for leisure or exercise. The rates of "never" using an alternative transportation option is high (Table 6) across the sample for city bus (85.2%), taxi service (89%), Uber/Lyft (ride hailing apps) (89.1%), biking (86.9%), and senior shuttles (94.3%). The rates of "occasionally" or "frequently" using these modes is higher among Young Old and Old Old for bus, biking, and riding hailing apps. Males are more likely to "occasionally"/"frequently" use biking (18.5%) than females (6.7%). But females are

more likely to "occasionally"/"frequently" use city bus (18.3%, 12.6% for males), taxi service (16.1%, 8% for males), and senior shuttles (8.1%, 4% for males). The Infrequent mobility group is least likely to use any alternative mode except Senior Shuttles, in which they are the most likely.

Table 6: Use of Alternative Modes of Transport

	City Bus	*Rail*	*Taxi*	*Walking*	*Biking*	*Uber/Lyft*	*Senior Shuttle*
(% responding "never")							
Sample	85.2%	57.9%	89.0%	59.7%	86.9%	89.1%	94.3%
Age Group							
Young Old	82.4%	51.7%	89.0%	54.2%	81.1%	86.5%	96.7%
Old Old	87.3%	63.3%	89.5%	67.9%	95.2%	92.6%	91.5%
High Longevity	95.4%	80.7%	87.1%	67.2%	95.1%	95.1%	88.7%
Gender							
Female	81.8%	55.7%	85.0%	61.0%	93.4%	90.7%	92.0%
Male	87.4%	59.0%	92.1%	57.7%	81.5%	87.7%	96.0%
Mobility Group							
Daily	84.3%	52.2%	89.4%	56.9%	84.5%	86.4%	96.4%
Weekly	85.2%	67.3%	88.3%	61.9%	90.1%	93.9%	92.6%
Infrequent	93.6%	83.3%	86.2%	80.0%	100.0%	100.0%	76.7%

Source: Boschmann

The two modes of alternative transportation that showed higher "occasionally"/"frequently" usage among the sample were rail (42.2%) and walking (40.3%). Rail was most common among Young Old (48.4%) and Old Old (36.8%), and less used by High Longevity (20%). Walking, however, was highest among the Young Old (45.8%), but equally common among Old Old and High Longevity (32.1%, 32.8%). There were little differences between genders in the use of rail and walking. The research shows that non-car usage among older adults in car dependent cities is uncommon. In many instances, the use of public transportation or active transport modes (walking/biking) among older adults is highly dependent upon their adoption of these practices earlier in life (Rosenbloom 2009, 2012; Winters et al. 2015; Truong and Somenahalli 2015).

Additionally, several important comments on alternative transportation were raised in the focus groups and open-ended survey questions. First, while walking to destinations is an ideal, it pragmatically depends greatly upon weather, distance, condition of sidewalks, crossing busy intersections, and the need to carry bulky items such as groceries. Second, door-to-door transportation service is nearly essential. Public transportation appears only practical with better connectivity between home and transit stops, better service in the suburbs, and reductions in transfers, travel/wait time, and amount of walking. The cost of public transit is also seen as too high. Taxi service can be a great alternative that is cheaper than owning a car, but most found them to be unreliable or sometimes unfriendly to older adults. The ride hailing app option (e.g., Uber or Lyft) is seen favorably; many know about it but have not used it, and find the need for a smartphone for access a limiting factor. Senior shuttles, including the local dial-a-ride door-to-door bus transportation for seniors or the disabled, are not seen favorably as they are inflexible, often require seven-day advance reservation, and can be expensive.

Changing Driving Habits

Changing driving habits is one strategy for maintaining independence in transportation while avoiding increasingly risky situations. Survey respondents were asked if they avoid driving in: nighttime, bad weather, unfamiliar places, rush hour, and busy places/traffic congestion. Most common was the avoidance of rush hour and bad weather (both over 68% yes/sometimes). Only 21% to 27% said "yes" to avoiding any of these situations, except only 12% said "yes" to avoiding unfamiliar places (most, 65.8%, do not avoid unfamiliar places). Instances of avoiding these driving situations increased across the Age Groups, and the differences between ages in each situation is significant ($p < 0.0448$ to $p < 0.0001$). Females are more likely to avoid these driving situations than males, and the difference between genders is significant across all situations ($p < 0.0400$ to $p < 0.0001$). As would be expected, the daily mobility group is less likely to avoid these driving situations than the Weekly or Infrequent group; the differences are significant ($p < 0.0001$, all situations).

Lengthy discussions on the challenges of not driving emerged across all the focus groups. In particular, the participants noted that the transition from independence in mobility to feeling more dependent upon others for getting around is difficult, especially for a generation with a strong work ethic and do-it-yourself attitude. Asking for help is challenging and they do not want to be a burden upon others (Coughlin 2001). Most participants also expressed that being able to get out most days of the week is not only "vital," but "it's what makes you a whole person." In terms of well-being and quality of life, "getting out is a '15' on a scale of 1-to-10!" and if unable to drive themselves, "just staying home" is the least preferred alternative, a finding that is largely consistent with the literature on the importance of mobility for quality of life and well-being (Metz 2000; Banister and Bowling 2004; Goins et al. 2015). Medical appointment trips are very important but frequently are the most difficult type of trip when mobility dependent: they occur during regular business hours when social networks are unavailable to provide a ride, are often at more distant locations beyond the neighborhood of residence, sometimes require frequent follow-up visits, and appointments may be rescheduled at the last minute. Trips to the emergency room are the most challenging, as they are unplanned and can be quite expensive.

Trip Replacement

The survey asked if individuals used certain home-delivery or on-line services, to see if newer services and technologies help replace out of home trips. Grocery and meal delivery services were "never" used by nearly all the survey sample (98%). The usage of mail order medical prescriptions was consistent across age group, gender, and mobility, with approximately 33 percent using this "frequently." However, several indicated that this service was used due to cheaper prices, not trip convenience. Nearly 50 percent of the sample uses online shopping "occasionally" and an additional 18 percent are "frequent" users. The differences in online shopping usage between mobility groups is significant ($chi^2 = 23.9$; $p < 0.001$), as 62 percent to 71 percent of the more mobile groups "frequently"/"occasionally" shop online, while 61 percent of the infrequent mobility group "never" shop online. This trend is consistent across the age groups, as the Young Old are more likely to use online shopping than the Old Old or High Longevity ($chi^2 = 77.1$; $p < 0.001$). For online banking, 40.4 percent use it "frequently," while 46 percent "never" use it. There are significant differences in the Age Groups ($chi^2 = 46.2$; $p < 0.001$). For example, only 37 percent of Young Old "never" use online banking, where as 76 percent of High Longevity "never" do. Women are less likely to use online banking than men ($chi^2 = 13.6$; $p < 0.008$), and those with higher mobility use online banking more than those with low measured mobility ($chi^2 = 17.8$; $p < 0.001$). Many of these trends are likely explained by digital commerce as more prevalent among the younger populations of older adults.

Perceptions of Individual Mobility

As noted above, for many, the ability to get out most days of the week is essential to quality of life and well-being. But how do individual perceptions of mobility compare with a standard metric of mobility? This section presents these findings and includes analysis of the role of social networks, attitudes about residential decisions and mobility, and perceptions of Denver area transportation.

In response to the question "I am freely able to get to all the places I need around the Denver area," 93.0 percent of survey respondents marked "agree"/"strongly agree," and only 6.1% "disagree"/"strongly disagree" (Table 7). This suggests an overwhelmingly positive perception of personal mobility and autonomy across the sample. This perception is highest among Young Old (95.5%) and Old Old (91.2%) and lower among the High Longevity age group (82.0%). Females express lower rates of agreement (88.6%) than males (97.4%). And as expected, levels of agreement declines with decreased measured mobility: Daily (97.3%), Weekly (84.9%) and Infrequent (79.3%). Lower levels of measured mobility (Infrequent) does lead to declines in perceptions of freedom in mobility. But the indications here suggest that even among individuals who leave their home less than weekly, nearly 80 percent still consider themselves free to get to the places they need. This suggests that traditional measures of mobility (e.g., number of trips made) should be used cautiously as a direct indicator of in/sufficient individual mobility (Mollenkopf, Hieber, and Wahl 2011).

Table 7: "I Am Freely Able to Get to All the Places I Need around the Denver Area"

	Strongly Agree	*Agree*	*Disagree*	*Strongly Disagree*	*I Don't Know*
n					
Sample %	51.7%	41.3%	5.4%	0.8%	0.9%
Age Group					
Young Old	56.8%	38.7%	4.0%	0.3%	0.3%
Old Old	47.9%	43.2%	6.3%	1.0%	1.6%
High Longevity	27.9%	54.1%	11.5%	3.3%	3.3%
					chi2=31.392, p<0.0001
Gender					
Female	43.5%	45.2%	8.0%	1.7%	1.7%
Male	59.4%	38.0%	2.6%	0.0%	0.0%
					chi2=30.2, p<0.0001
Mobility Group					
Daily	58.7%	38.7%	2.2%	0.2%	0.2%
Weekly	40.5%	44.5%	12.1%	1.2%	1.7%
Infrequent	24.1%	55.2%	6.9%	6.9%	6.9%
					chi2=69.966, p<0.0001

Source: Boschmann

Perception of mobility was also explored through the role of social networks in (potentially) providing transportation assistance. Focus group discussants noted that, especially for a generation with a strong work ethic and do-it-yourself attitude, asking for help is challenging as people do not want to be a burden upon others. However, 78.5 percent of the survey sample indicate they "agree"/"strongly agree" with the statement "I have a strong support network of friends and family to help me when I need" (though only 28.5% "strongly agree"). This level was consistent across the Mobility and Gender category, and highest (85.3%) for the Old Old age group.

In terms of being "okay with occasionally asking friends, family, neighbors, or volunteers to help me get around town," 64.4 percent "strongly agree"/"agree," though again, only 14.2 percent "strongly agree" (Table 8). Being willing to ask for help is higher among women (70.4%) than men (58.8%), and it is highest (72.4%) among the Infrequent mobility group. The focus groups raised the concern about unexpected trips to the emergency room as being particularly challenging. Among the survey sample, 77.7 percent "strongly agree"/"agree" that is would be easy to get a ride to the ER if needed. The highest level of disagreement was among women, 17.5 percent who feel it would not be easy.

Table 8: "I Am Okay with Occasionally Asking Friends, Family, Neighbors, or Volunteers to Help Me Get around Town"

	Strongly Agree	*Agree*	*Disagree*	*Strongly Disagree*	*I Don't Know*
n					
sample %	14.2%	50.2%	20.0%	7.9%	7.7%
Age Group					
Young Old	12.5%	48.9%	21.1%	8.8%	8.8%
Old Old	17.4%	51.8%	20.5%	6.2%	4.1%
High Longevity	14.3%	54.0%	12.7%	7.9%	11.1%
					chi2=10.567, p<0.2274
Gender					
Female	17.3%	53.2%	16.6%	7.6%	5.3%
Male	11.3%	47.5%	23.2%	8.4%	9.6%
					chi2=12.5, p<0.0141
Mobility Group					
Daily	14.7%	47.3%	21.2%	7.8%	8.9%
Weekly	13.1%	56.3%	17.6%	8.0%	5.1%
Infrequent	17.2%	55.2%	13.8%	10.3%	3.4%
					chi2=7.295, p<0.5052

Source: Boschmann

Family members also often serve as a crucial support in providing transportation to older adults. Within the survey sample, about half (48.4%) have family members nearby that can help, 32.4 percent do not, and 19.2 percent say "it depends." There is not much variation across the comparative groups. Though nearly two-thirds can potentially receive help from family, many comments noted that "they work," "they are busy with their own lives," and "don't want to be a burden upon them."

Asking for help in getting rides to places is a challenge for older adults who are accustomed to a life of independence and autonomy in mobility. One alternative solution explored in this study was volunteer driver programs. In these programs community members volunteer transportation services to older adults which can serve as a viable alternative that fills an important gap in transportation needs (Kerschner and Silverstein 2018) and is the preferred transportation alternative for older adults who no longer drive independently (Rahman et al. 2016).

Some focus group participants utilized a volunteer driver program for seniors (provided by the *A Little Help* non-profit organization). Many expressed extreme gratitude for the transportation services, calling it a "blessing" or a "godsend." They see it as a very flexible service that requires limited advance planning, is a service provided specifically for older adults, and it alleviates the challenge of "asking for help" or "being a burden" to neighbors,

friends, or family. At its current level of high demand and limited volunteer driver supply, *A Little Help* is only able to provide members with one ride per week. There was strong positive response to the idea of an on-demand driver service for a small fee—much like Uber or Lyft ride-hailing—but specifically designed for older adults. This, and volunteer drivers, were the most preferred alternative form of transportation for the focus group participants.

In the survey responses, 71 percent said they would find a volunteer driver program helpful if/when they are no longer able to drive independently. There was no variation by age, but a smaller percentage of males (64.5%) than females (78.5%, $p < 0.0003$) said this service would be helpful. Interestingly, only 57.7 percent of the least mobile (Infrequents) said this would be a helpful service, approximately 15 percent lower than the other mobility groups. This could be interpreted a few ways: the Infrequents have already adjusted to their current lower mobility status and do not have specific needs for volunteer drivers; there may be resistance to trying something new and different; and for still-independently mobile, they can imagine relying on such a service at some point in the future to maintain a higher level of mobility.

In terms of how frequently survey respondents might use such a service the average response was 2.55 times per week. There were no significant differences between the age groups or gender; but differences in expected frequency of volunteer driver usage do exist in the Mobility category. The Infrequent group only estimated using this service 1.5 times per week, which is significantly less than the Daily (2.93), and Weekly (1.84) groups (ANOVA, $F = 20.11$, $p < 0.0001$).

Residential

A series of survey questions were asked that explored the relationship of residential location and individual mobility. In response to the question, "based on where I live now, it is convenient for me to get to the places I need during the week," 94.7 percent of the sample "strongly agree"/"agree," with some decreased agreement as age increases. The response was highest among the most mobile (Daily, 96.9%), and lowest for the Infrequents (87.5%). Furthermore, 91.3 percent "strongly agree"/"agree" in wanting to "stay in my home because I like what my community has to offer me," and 89.7 percent "strongly agree"/"agree" with the statement "I am confident in my ability to age in my current home" (though much higher in males (93.4%) than females (85.3%) [$p < 0.01$]). Together these responses suggest that people find their residential location to be sufficient in meeting their mobility needs and corroborate the national trend of aging in place among older adults. This is further substantiated by responses to questions about moving to new locations.

When asked if individuals would "move to a new residential location if it improved the convenience of getting places you need?" only 13.4 percent said "Yes,"46.3 percent "No," and 40.2 percent "It Depends" (Table 9). Males were more likely to say "No" than females (52%/39%, $p < 0.0044$), and the least mobile (Infrequents) had the highest "No" response rate (59.4%). As Denver's urban transportation infrastructure has changed dramatically in the past two decades, the survey asked if they desired to "live near any of the light rail stations in the Denver area?" Only 21.1 percent said "Yes," 55.6 percent "No," and for 23.3 percent "It Depends." This option is least desired among the oldest (High Longevity, 9.1% "Yes") and those with lowest mobility (Infrequent, 9.4% "Yes"). Many people are content where they currently live, and several expressed primary concerns about housing affordability in this scenario.

Table 9: "Would You Move to a New Residential Location if It Improved the Convenience of Getting to Places You Need?

	Yes	*No*	*It Depends*
n	90	311	270
sample %	13.4%	46.3%	40.2%
Age Group			
Young Old	15.1%	42.2%	42.7%
Old Old	10.5%	53.0%	36.5%
High Longevity	12.3%	53.8%	33.8%
			chi2 = 8.339, p<0.0799
Gender			
Female	15.1%	39.1%	45.7%
Male	12.1%	52.0%	35.9%
			chi2=10.9, p<0.0044
Mobility Group			
Daily	14.1%	42.4%	43.5%
Weekly	11.9%	54.6%	33.5%
Infrequent	9.4%	59.4%	31.3%
			chi2 = 9.874, p<0.0426

Source: Boschmann

In terms of residential decision-making, other criteria outweigh mobility options, particularly downsizing to communities that offer a new social element and maintenance-free housing, or the preference to remain in their homes. Participants noted that while newly built "55 and over" condominiums at various light rail stations (with traditional transit oriented developments of higher density mixed-use residential, shopping, and business districts) look appealing and "seem wonderful," they do not appear practical at this stage, are likely too expensive, and would need the "right combination of shops to be worth it." Denver's increased housing costs and the strain of moving does not allow many older adults to consider relocating to more convenient locations within the city.

Perceptions of the Denver Area Transportation

Finally, several questions were asked to gauge individual perceptions and attitudes specifically about transportation for older adults in the Denver region. The personal experiences of focus group participants highlighted a general feeling that transportation for older adults in Denver area is poor or lacking, but better than most cities. They see Denver as a car-oriented city with numerous transportation challenges; though diverse transport options exist, some can be expensive and access really depends on where one lives in the city. Denver is otherwise an attractive place to retire.

Table 10: "Driving Has Become More Challenging in the Denver Area"

	Strongly Agree	*Agree*	*Disagree*	*Strongly Disagree*	*I Don't Know*
n					
sample %	36.2%	46.8%	10.6%	3.6%	2.7%
Age Group					
Young Old	34.9%	45.7%	12.1%	4.3%	3.0%
Old Old	38.1%	46.7%	10.2%	2.5%	2.5%
High Longevity	37.1%	54.8%	3.2%	3.2%	1.6%
chi2=6.874, p<0.5503					
Gender					
Female	40.7%	42.3%	9.3%	4.0%	3.7%
Male	32.0%	51.0%	11.5%	3.5%	2.0%
chi2=8.38, p<0.0786					
Mobility Group					
Daily	32.9%	48.9%	11.8%	4.4%	2.0%
Weekly	40.2%	47.1%	8.0%	0.6%	4.0%
Infrequent	55.2%	17.2%	10.3%	10.3%	6.9%
chi2=25.028, p<0.0015					

Source: Boschmann

As most participants drive independently, there was widespread agreement to the statement "driving has become more challenging in the Denver area" and was the most frequent topic of open ended responses (Table 10). Eighty-three percent (83%) "strongly agree"/"agree" with this statement, with lower levels of agreement (72.4%) among the Infrequent mobility group. There were similar levels in the Age Group, and increased rates of agreement by age (91.9%, High Longevity). Much of the concern relates to increased traffic and congestion due to recent population growth, as well as many incidents of aggressive or impatient drivers, careless and distracted driving, and too many people disobeying basic traffic laws (stop signs, lights, or conventions of traffic merging). Many feel this is leading to an environment that is unwelcoming to older drivers.

In terms of transportation resources for older adults, 38.7 percent do not "feel knowledgeable about what is available in Denver," and 42.4 percent "don't know" "if there are adequate transportation options for older adults in Denver." Many noted that as active independent drivers, they are not looking for these resources, though many hear that a lot of options do exist. Many noted that while different local organizations do provide services to older adults, there is need for better awareness and promotion of what organizations and services are available. As individuals slowly or abruptly transition from independence in driving, information of mobility options is not always easy to find. On-line based information (new media) should be supplemented by paper-based information (traditional media) to best broadcast the breadth of resources information to the older adult population.

Conclusions

This article presented the findings from primary data collected through focus groups and a survey questionnaire regarding the mobility of older adults in the Denver, Colorado (USA) metropolitan area. It makes two core contributions to the existing literature.

First, this research provides evidence of the experiences and perceptions of daily mobility for older adults that is specific to the context of Denver. The findings are largely consistent with

research on car-dependent cities where older adults continue to use the automobile as primary mode of transportation (Coughlin 2001; Rosenbloom 2009; Coughlin and D'Ambrosia 2012). Participants in this study articulated that driving is an essential and that "not having a car in Denver is difficult." This is particularly relevant given how participants articulated that "getting out" can be central to quality of life. Even though resources for alternative forms of transportation do exist, most are not yet aware of them. Many survey respondents noted that "things are fine now, until I stop driving—which could happen anytime." As such, one policy implication is to better educate the aging population on options for non-car transportation. This should include making ride-hailing apps more accessible and age-friendly.

Second, this study explored *perceptions* of individual mobility as it relates to traditional measures of mobility. In general, despite changes and declines in actual daily out-of-home mobility, the perceptions and satisfaction with mobility remains quite high. This reality is substantiated in the literature (Rosenbloom 2012), but is an area in need of more research to understand nuances of independence, well-being and mobility that are subjective to location, individual, and phase in lifecourse (Schwanen and Ziegler 2011). Social networks are a possible source for transportation assistance for older adults. But this is not a desirable option, as there is a strong dislike in feeling dependent upon others (Coughlin 2001) or placing burden upon others. This study found that most participants age in place, but when making a change, residential choice is driven by many factors (particularly affordability, and low-maintenance options); improving convenience in getting to places is generally not a deciding factor. Older adults are not attracted to new residential transit oriented development sites near light rail stations. For developers and city planning offices, this suggests an opportunity to construct older adult residential facilities with older adult transportation perceptions and needs in mind.

There are numerous suggestions of how to make cities more age-friendly (Quinn 2008; Steels 2015) that often focus on urban design that is higher-density with multiple transportation options (including walkability) and mixed land use developments. But as this paper highlights, the trend among many older adults is a preference to age in place. For older adults accustomed to living in a low-density car-dependent urban environment there is a profound preference for the automobile as the primary mode of transportation (Coughlin 2001), and it is a false assumption that older adults will transition to public transportation options when they no longer drive (Rosenbloom 2009, 2012). In the coming decades, mobility as a service (MaaS) and automated vehicles may provide a new wealth of transportation options for older adults to remain independent long after driving cessation. In the interim, if the goal is to facilitate independence and aging in place, given the current limitations of many car-dependent cities, a dominant solution is how best to keep older adults driving longer (Rosenbloom 2009), or to supplement with convenient options for getting rides through existing ride hailing services or local volunteer driver programs.

There are two noted limitations to this particular study. First is the low response rate in the survey. Survey research in general has seen falling response rates due to a variety of reasons, including gradual technological and societal changes across society, survey fatigue, and growing concerns about privacy and confidentiality. Despite this decline, surveys do remain viable and low responses can still provide a high level of reliability (Krosnick et al. 2015). Second, given the potential sampling bias in the collected data, this sample is not necessarily representative of all the older adult population throughout the Denver area. However, the conclusions drawn here are specific to this sample, and can still provide useful evidence and insights for other scholars and practitioners.

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