Too Old To Drive? The Role of Walkable Places and New Technologies in Addressing Age-Related Driving Cessation

Abstract (250 Words)

By 2035, the number of older Americans number will grow to 78.0M, and 94.7M by 2060, more than doubling the current number. This demographic shift will have far-reaching implications for the country, few as critical as those related to transportation and the ability for our older populations to access friends, family, goods, services, and healthcare. This research aims to add to our understanding of issues around aging in place by considering how people may be planning (or hoping) to address the fact that eventually most of us will reach a point at which we are no longer able to drive. This research is divided into two parts. The first aims to understand how individuals plan to address driving cessation – the point at which individuals are no longer able to drive – and if an individual's demographic characteristics, current travel behaviors, future travel behavior preferences, and current built environment influence such plans. The second area of inquiry will examine expectations of autonomous vehicle technology as a solution to age-related driving cessation. A statistical analysis of a survey of 349 Americans we find that age, gender, current travel behavior, and the built environment each significantly impact willingness to move to a more walkable place, and support for walkable-community policies, only demographics and travel behavior significantly impact willingness to use autonomous vehicles upon cessation of driving. This work has implications for policy and planning to foster more age-friendly communities, as well as the role new technologies may play in the lives of aging Americans.

INTRODUCTION

At last count, there were 49.2M adults aged 65 or older living in the United States (Census, 2010). This represents 15.2% of the population. By 2035, that number will grow to 78.0M older Americans and 94.7M by 2060. This is nearly double the current number. Moreover, they will represent 23.5% of the population, with the largest growth estimated to be in the 85 and older group. Although mobility barriers might make walking difficult for some, researchers project that better health care, nutrition, education, and income will mean that most of these older Americans "will be in good health and not seriously disabled" (Rosenbloom, 2003). They will also be more racially and ethnically diverse than ever before.

This demographic shift will have far-reaching implications for the country, few as critical as those related to transportation and the ability for our older populations to access friends, family, goods, services, and healthcare. More so than any generation before, aging Americans desire to "age in place" (Farber et al., 2011; Wiles et al., 2012). Indeed, quality of life and clinical outcomes for all aging individuals are better the longer they can remain in the community and age in place (Wang et al., 2012), but doing so presents unique transportation challenges. One of the inevitable consequences of getting older is that the ability to drive a car is diminished and can eventually disappear. According to the National Association of Area Agencies on Aging, the most frequent reason older adults call the national told-free Eldercare Locator hotline is to ask about transportation options. Without suitable transportation, it becomes increasingly difficult for these populations to participate in their community. Despite increasing desire among aging Americans to live in more walkable places, such places either do not exist or are unaffordable for most people (Talen, 2013). For the foreseeable future, the ever-increasing number of Americans choosing to age in place will be doing so in communities that require a car for most (or all) daily activities.

These difficulties, however, will not be borne by all older Americans. One study found that only 21% of elderly Americans live in walkable places (Rosenbloom, 2003). Walkable places can impact a range of health indicators for aging populations, including independence, emotional and physical function, cognitive function, and body mass that in turn affect the development of chronic conditions, mortality, and quality of life (Kerr et al., 2012). The existing literature also suggests that older adults living in urban areas are more active, had higher reported quality of life (Baernholdt et al. 2012), tend to walk more (Marquet and Miralles-Guasch, 2015) with associated, documented positive health impacts (Kerr et al., 2012).

Based on a survey of 349 Americans, we will first delve into built environment factors such as walkability and land uses and consider whether these respondents will have the ability to age in place. We will next consider how respondents plan to deal with the transportation challenges that come with aging and losing the ability to drive, as well as their support for building communities that allow people to drive less. This will include a look into respondent's self-evaluated expectations of how they expect to get around after driving cessation, including shifting mode choices and residential location decisions. These results will be disaggregated by residential location so that we can see how living in a more walkable place – or not and currently being dependent upon an automobile – might play a role in their views.

We will also consider technology as a panacea for the transportation challenges facing aging Americans. While transportation for our aging populations is clearly an issue, it is also one that many believe will be solved by technology. For example, conventional wisdom suggests that autonomous vehicles (AVs) will become a viable possibility, but they can only become a viable solution if people are willing to use them. How keen are older Americans on the idea of autonomous vehicles? Will transportation issues for our aging population actually be solved by AVs? Or will we need to begin investing more in built environments that facilitate aging in place without the use of an automobile? This paper will examine these issues in the context of the viewpoints, travel behaviors, and residential locations of 349 Americans.

DATA & METHODS

This research is divided into two general areas of inquiry. The first aims to understand how individuals plan to address driving cessation – the point at which individuals are no longer able to drive – and if an individual's demographic characteristics, current travel behaviors, future travel behavior preferences, and current built environment influence such plans. The second area of inquiry will examine expectations of autonomous vehicle technology as a solution to age-related driving cessation.

To address these issues, we first present descriptive statistics, including demographic measures, current and expected travel behavior, and built environment characteristics. We then use linear and logistic regression models to identify correlates of individual's plans to address driving cessation as well as their support for building communities that allow people to drive less. Finally, we present additional descriptive statistics and a logistic regression model regarding perceptions of autonomous vehicle technologies and the extent to which individual's hope to use AVs to address age-related driving cessation.

Data

The data for this research is drawn from two sources: (i) a household survey and (ii) open-source built environment measures. The two data sources were combined in a GIS at the Census Block Group level for statistical analysis. The survey data is drawn from a mail-out, mail-back survey designed by the researchers and administered in Fall, 2018. The survey included an additional mailer, as well as two reminder post-cards, and no incentive was offered for completing the survey. 1,250 addresses were purchased across three counties (Douglas, Sarpy, and Lancaster) in Nebraska. These counties include the cities of Lincoln and Omaha, as well as surrounding rural areas. The sampling area was selected in an effort to maximize built environment differences across the sample population (e.g., from revitalized and walkable urban districts in each cities' downtown center to suburban developments and rural areas). 349 surveys were completed, with a response rate of 27.9%. The survey included questions on current and future (expected) travel behavior, perspectives and plans regarding age-related driving cessation and aging in place, and demographics. The survey instrument and research design received Institutional Review Board (IRB) approval in Summer, 2018.

A primary aim of this research is to assess the impact of the built environment on an individual's considerations of how they will address age-related driving cessation. To do this we used measures of density, land uses, and urban form at the Census Block Group level of geography from the Center for Neighborhood Technology's H+T (housing + transportation) Index. The H+T index is an open-source dataset available for the United States at the census block group level (https://htaindex.cnt.org/). As such, our analysis of built environment characteristics is also at the block group level.

Statistical Analysis Part 1: Addressing driving cessation through walkability

By first examining built environment descriptives, we assess the extent to which respondents will be able to age in place when no longer able to drive. We then examine how individuals plan to address age-related driving cessation, as well as their support for associated built environment policies. Specifically, we identify correlates of planning to change residential location in response to age-related driving cessation using a binary logistic regression. Then, using a linear regression model, we identify correlates associated with support of "policies for building communities that allow people to drive less."

The dependent variable in the model is responses to the question "Do you hope to move somewhere where you do not rely on a car when they are too old to drive" with responses "yes" or "no." The independent variables in the model include demographic factors, current and preferred future travel behavior, and build environment characteristics (Table 1).

Independent variables for demographics and travel behavior were included based on availability and reviewed for multicollinearity. Built environment variables were selected based on applicability to the research questions (i.e., do these variables represent elements of density, land use, and accessibility?), and reviewed for multicollinearity. The H+T index includes a general "compact neighborhood index," an "employment mix index" and a "residential density" score, all measured from zero to 100. The compact neighborhood score was not included in the analysis because employment and residential density measures offer more specificity in findings, and because it is highly-correlated with residential density (pearson's 0.66) and moderately correlated (pearson's 0.47 to 0.53) with all other built environment measures.

The employment mix index and residential density measures are specific to the H+T index. The employment mix index provides a measure of employment diversity and total number of jobs (for details in how the variable is calculated see: CNT, 2015). The residential density measure is an estimate (also specific to the H+T index) where blocks are designated as "residential" if there is at least one house per acre, and the residential density is then calculated as the average density of blocks within a given block group. This measure is also considered robust (PIUR, 2012) but the estimation procedure is instructive when considering the minimum score on this variable in our dataset is zero.

The dependent variable in the linear regression model is responses to the question "how supportive are you of policies for building communities that allow people to drive less?" with responses on a 5-point Likert-scale ranging from "very supportive" to "not at all supportive." There is some debate in the literature regarding whether a linear or ordinal regression model is most appropriate for a likert-scaled dependent variable. Consensus is that such an approach is generally easier to interpret, offers similar findings, and is appropriate if the variable has at least 5 response categories (Sullivan and Artino, 2013). The linear regression model uses the same independent variables as the logistic model (see above, Table 1). Descriptive statistics are presented in Table 1, and results from both binary and linear regression models are reported in Table 2.

Statistical Analysis Part 2: Autonomous vehicles and driving cessation

The second question we examine in this research is: what role might the idea of autonomous vehicles play in addressing age-related driving cessation? We answer this question by first reviewing descriptive statistics of variables measuring attitudes regarding autonomous vehicles (Table 3), we then use a binary logistic regression to identify correlates of willingness to rely on autonomous vehicles post age-related driving cessation.

The binary logistic regression model uses yes/no responses to the question "when you are no longer able to drive, do you hope to rely on autonomous vehicle technology (e.g., self-driving cars)?" The model takes the same form as the logistic regression model describes in part 1 of the methods and includes the same demographic, travel behavior, and built environment variables included in the earlier regression models (Table 1).

RESULTS

Descriptive statistics and regression results for parts 1 and 2 of the research effort are presented below.

Results Part 1: Addressing driving cessation through walkability

Part 1 results first illustrate demographic, travel behavior, built environment characteristics, and dependent variables from each regression model. We then present results testing correlations between such factors and (i) consideration of moving residential location to a more walkable place in response to age-related driving cessation (binary logistic regression, then (ii) support for policies to build less auto-dependent communities

Table 1: Descriptive Statistics

Dependent Variables							
	n	**Yes**	**No**				
Desire to move to a walkable community when no longer able to drive	320	197 (61.6%)	123 (38.4%)				
Desire to rely on AVs when no longer able to drive	320	110 (34.4%)	210 (65.6%)				
		Very supportive	**Supportive**	**Somewhat supportive**	**A little supportive**	**Not at all supportive**	
Support for walkable community policies	338	92 (27.2%)	122 (36.1%)	62 (18.3%)	35 (10.4%)	27 (8.0%)	
Independent Variables							
	n	**Min**	**Max**	**Mean**	**SD**		
Age	341	21	107	57.8	16.8		
		Female	**Male**				
Gender	347	196 (56.5%)	151 (43.5%)				
		white	**non-white**				
Race	349	307 (88.0%)	42 (12.0)				
		No diploma	**High school/GED**	**Some college, but no degree**	**Technical /Junior college**	**Bachelor's degree**	**Graduate degree**
Education	335	6 (1.8%)	30 (9.0%)	56 (16.7%)	44 (13.1%)	116 (34.6%)	83 (24.8%)
		Under $24,999	**$25,000-$34,999**	**$35,000-$49,999**	**$50,000-$74,999**	**$75,000-$99,999**	**$100,000+**
HH Income	314	34 (10.8%)	30 (9.6%)	42 (13.4%)	58 (18.5%)	48 (15.3%)	102 (32.5%)
		5 or more days/week	**2-4 days/week**	**About 1 day/week**	**2 days or fewer/week**	**Never**	
"In the past 12 months, how often did you drive yourself to work"	187	149 (79.7%)	25 (13.4%)	3 (1.6%)	2 (1.1%)	8 (4.3%)	
		Everyday	**A few times/week**	**A few times/month**	**A few times/year**	**Never**	
"In the past 12 months, how often did you drive for shopping or errands"	322	84 (26.1%)	186 (57.8%)	39 (12.1%)	4 (1.2%)	5 (2.8%)	
		Strongly agree	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**	
"I wish I drove less than I currently do"	324	21 (6.5%)	40 (12.3%)	70 (21.6%)	110 (34.0%)	83 (25.6%)	
"I want to continue driving for my entire life	326	127 (39.0%)	111 (34.0%)	57 (17.5%)	19 (5.4%)	12 3.4%)	
		Min	**Max**	**Mean**	**SD**		
Residential density	349	0	26	4.52	3.584		
Employment mix index	349	77	92	87.88	2.443		
Block size (acres)	349	3	273	20.70	36.309		
Intersection density	349	4	613	163.99	96.455		

Descriptives

Descriptive statistics for demographic, travel behavior, and built environment characteristics are presented in Table 1. With regard to demographic characteristics, the average age of survey respondents is 57.8 years, and the sample population is 56.5% female, primarily identifies as white (88.0%), is generally well-educated (59.4% has a Bachelor's or Graduate degree), and 66.3% of the population lives in a household with a combined income at or above $50,000 annually. Taken together, descriptives indicate a population that is older, more highly-educated, wealthier, and less diverse than the general population.

Travel behavior variables indicate a population that primarily drives, and expresses limited interest in reducing their driving. The majority of the population primarily drives for most transportation purposes (79.9% report driving to work 5 or more days per week, and 83.9% of the population report driving for shopping/errands 2-4 times per week or more). Similarly, most of the population is not interested in driving less, with 34.0% disagreeing and 25.6% strongly disagreeing with the statement "I wish I drove less than I currently do." Majority of respondents also agree (34.0%) or strongly agree (39.0%) with the statement "I want to continue driving for my entire life."

Built environment statistics also support the notion that, on average, the sample population lives in an environment conducive to driving, but also that the built environment varies dramatically across our sample. Average intersection density ($miles^2$) is 163.9 (standard deviation of 96.4), and the average block size is 20.7 acres (standard deviation of 20.7). The employment mix index shows an average score of 87.8 , with considerably little variation around the mean (standard deviation of 2.4). Residential density indicates a wide-range across the sample, with a minimum of zero (i.e., an average of zero homes per block in a block group), a maximum of 26, and an average of 4.5 homes per block in a given block group. For comparison, Salt Lake City, Utah's average intersection density is 58, average block size is 14, employment mix index of 91, and residential density of of 3.95. Boston, Massachusetts has an average intersection density of 391, average block size of 4, employment mix index of 91, and residential density of 17.8.

Part 1: Logistic regression model

Binary logistic regression results test for significant correlations between demographic, travel behavior, and built environment characteristics and whether or not individuals "…hope to move somewhere where you do not rely on a car when they are too old to drive." Results are presented in Table 2, including coefficients in predicted log-odds units (B), exponentiated coefficients – also called odds-ratios (Exp(B)), and significance scores (*p*, where $p<0.1$ is considered borderline significant and $p<0.05$ is considered significant).

Significant variables are described below in terms of odd-ratios because of their ease of interpretation. In this model, odds-ratio values greater than one indicate a positive relationship to the dependent variables where an increase in the value of a given predictor variable is associated with an increase in the likelihood that an individual does hope to move somewhere where they do not rely on a care when they are no longer able to drive (when controlling for all other variables in the model). In terms of demographic variables, age, gender, and race are each significantly-negatively associated with the desire to move to a walkable place after driving cessation; that is, with a one-unit increase in age, there is a corresponding 4% reduction ((0.966-1)*100) in the odds of reporting a desire to move to a walkable place. Being male is associated with a 56% reduction in the odds of reporting a desire to move to a walkable place after driving cessation. Finally, reporting oneself as white is associated with 92% reduction in the likelihood one expresses a desire to move to a more walkable place when they are too old to drive. In contrast, a one-unit increase in household income is associated with a 48.8% increase in the odds of reporting a desire to move to a walkable place after driving cessation.

Two travel behavior measures and one built environment variable are significant in the model. Currently driving to work is borderline-negatively-significant in the model (p=0.053), while increasing desire to drive less is associated with a 51% increase in the likelihood one desires to move to a more walkable place. Furthermore, average block size is significant (p=0.030), where a unit increase in average block size in one's immediate area is associated with a 2.5% reduction in the likelihood one desires to move to a more walkable place when they can no longer drive.

Table 2: Logistic and Linear Regression Models

	Logistic Regression – Moving to a walkable place			Linear Regression – Support for building walkable places		
	B	Exp(B)	*p*	Unst B	Stand B	*p*
Demographics						
Age	-0.035	0.966	0.018	-0.015	-0.178	0.021
Gender	-0.815	0.442	0.048	-0.360	-0.144	0.057
Race	-2.470	0.085	0.042	0.242	0.051	0.519
Education	-0.042	0.818	0.959	0.135	0.132	0.106
Income	0.398	1.488	0.014	0.022	-0.026	0.771
Travel Behavior Measures						
Drive to work	-0.846	0.429	0.053	-0.243	-0.153	0.065
Drive for shopping/errands	-0.169	0.844	0.592	-0.054	-0.029	0.719
Desire to drive less	0.415	1.514	0.019	0.114	0.117	0.146
Desire to continue driving	-0.286	0.751	0.223	-0.189	-0.146	0.064
Built Environment Measures						
Residential density	-0.011	0.989	0.850	-0.066	-0.191	0.028
Employment mix index	-0.043	0.958	0.725	0.017	0.032	0.762
Block size (acres)	-0.025	0.975	0.030	-0.008	-0.206	0.049
Intersection density	-0.004	0.996	0.140	0.000	0.013	0.894
Constant	13.484	717495.739	0.212	4.425	na	0.359
	Chi-square: 45.477, df 13, sig 0.000			R square: 0.252		
	Cox and Snell: 0.240					
	Nagelkerke: 0.333					

Part 1: Linear regression model

Linear regression results test for significant correlations between demographic, travel behavior, and built environment characteristics and the extent to which individuals support policies for building communities that allow people to drive less. Results are also presented in Table 2, including unstandardized and standardized regression coefficients and significance scores (where significance is determined using the same p-value criteria as the binary logistic regression). Unstandardized regression coefficients represent the slope of the line between independent and dependent variable, and are interpreted as a one-unit increase in the independent variable is associated with a corresponding increase of the unstandardized beta in the dependent variable, while controlling for all other variables in the model. Standardized regression coefficient values range from 0 to 1 (or 0 to -1) and are used to assess the relative strength of the relationship between each independent variable and the dependent variable. Because the dependent variable in this case is measured on a 5-point scale we do not directly interpret the significant unstandardized coefficients, instead focusing on their significance and relative impact on the dependent variable.

One demographic and two built environment measures are significant in this model, while one additional demographic measure and two travel behavior measures are borderline significant. Regarding demographics, age is negatively associated with support for walkable-community policies. Gender, while only borderline significant (p=0.057) suggests that male respondents are less supportive of such policies as well. Travel behavior measures, while not reaching our threshold for significance, suggest that increases in driving to work (p=0.065) are associated with reductions in support for walkable-community policies, and increasing desire to continue driving is associated with a reduction in support for policies for building communities that allow people to drive less. Finally, built environment variables indicate that increasing residential density and increasing block size are each individually associated with reduced support for walkable-community policies. All variables described above have standardized coefficients of between 0.144 and 0.206, indicating that no single factor is primarily responsible for explaining support for walkable-community policies and that multiple factors have some impact on the dependent variable.

Part 2: Autonomous vehicles and driving cessation

Part 2 of the research aims at addressing AVs as a panacea for transportation challenges associated with age-related driving cessation. Results first offer insights into general responses to autonomous vehicles and then demonstrate significant correlations between demographic, travel behavior, and built environment characteristics and willingness to use autonomous vehicles in response to age-related driving cessation.

Descriptive statistics include a block of seven, 5-point Likert-scale questions measuring levels of agreement with statements regarding AVs and AV technology (Table 3). Results indicate that nearly half of the sample population disagrees or strongly disagrees (49.5%) with the statement "I would like to use AVs instead of driving. Similarly, over half of the sample report disagreement with the statements "I would like to have my own AV" (53.5%) and "I would like to use a shared, on-demand, AV vehicle" (59.4%). The majority of the sample also reports a desire to continue to drive, at least occasionally (69.4%). Regarding level of automation, a majority of the sample population is uncomfortable with an entirely autonomous vehicle (63.7%), and nearly half of those surveyed expressed a desire to retain some control of the vehicle if needed/wanted (48.6%). Finally, 43.8% of the sample does not think AVs will be safer than human drivers, and 23.4% do think they will be safer than human drivers. Taken together, the sample population evinces somewhat negative perceptions of AV technology, limited willingness to use AVs (either personal or shared), a desire to retain some control over an AV, and limited faith in the technology being safer than human drivers.

Table 3: Descriptive Statistics – Autonomous Vehicle Perceptions

	n	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
"I would like to use autonomous vehicles instead of driving"	337	24 (7.1%)	49 (14.5%)	97 (28.8%)	85 (25.2%)	82 (24.3%)
"I would like to have my own personal autonomous vehicle"	335	29 (8.7%)	52 (15.5%)	75 (22.4%)	80 (23.9%)	99 (29.6%)
"I would like to use a shared, on-demand, autonomous vehicle (instead of owning my own)"	337	11 (3.3%)	54 (16.0%)	72 (21.4%)	96 (28.5%)	104 (30.9%)
"Even if I had an autonomous vehicle, I would still like to drive sometimes"	336	99 (29.5%)	134 (39.9%)	46 (13.7%)	22 (6.5%)	35 (10.4%)
"I am comfortable with a vehicle that is completely autonomous"	336	19 (5.7%)	36 (10.7%)	67 (19.9%)	93 (27.7%)	121 (36.0%)
"I would like an autonomous vehicle that mostly drives itself as long as I could take control of it if I needed or wanted"	338	36 (10.7%)	128 (37.9%)	73 (21.6%)	43 (12.7%)	58 (17.2%)
"I think autonomous vehicles will be safer than human drivers"	338	26 (7.7%)	53 (15.7%)	111 (32.8%)	69 (20.4%)	79 (23.4%)

Part 2: Binary regression model

The binary regression model includes identical independent variables as those included in the models reported above, aimed at testing for significant correlations between these variables and reported willingness to rely on autonomous vehicles post age-related driving cessation. Model results are reported in Table 4 and are interpreted in the same way as the logistic regression model described in part one (above).

Two demographic variables and two travel behavior variables are significant in the model, while none of the built environment measures are significant. Age and gender are each significant, with increases in age associated with a 4.4% reduction in likelihood of reporting willingness to rely on AVs. Alternately, being male is associated with being over 3 times more likely (Exp(B)=3.108) to report a willingness to rely on AVs when they are no longer able to drive. Turning to travel behavior measures, current amount of driving to work and desire to continue driving are each associated with reductions in likelihood (45% and 42% reduced likelihood, respectively) to wish to rely on AVs as they become unable to drive.

Table 4: Logistic Regression – Autonomous Vehicles

	B	Exp(B)	*p*
Demographics			
Age	-0.045	0.956	0.001
Gender	1.134	3.108	0.003
Race	0.039	1.039	0.958
Education	0.159	1.173	0.365
Income	0.139	1.149	0.387
Travel Behavior Measures			
Drive to work	-0.601	0.548	0.045
Drive for shopping/errands	0.512	1.669	0.099
Desire to drive less	-0.125	0.882	0.427
Desire to continue driving	-0.549	0.578	0.008
Built Environment Measures			
Residential density	0.080	1.084	0.192
Employment mix index	0.030	1.030	0.794
Block size (acres)	-0.005	0.995	0.636
Intersection density	-0.001	0.999	0.777
Constant	0.332	0.973	0.973
	Chi-square: 34.335, df 13, sig 0.001		
	Cox and Snell: 0.187		
	Nagelkerke: 0.253		

DISCUSSION & CONCLUSIONS

This research aims to add to our understanding of issues around aging in place by considering how people may be planning (or hoping) to address the fact that eventually most of us will reach a point at which we are no longer able to drive. Nationally, most Americans prefer to age in place, by remaining in their community as they age, most Americans also live in auto dependent places. A primary argument for building walkable communities is that they will be much better suited to aging in place; alternately, the potential introduction of autonomous vehicles could allow aging individuals to retain their ability to travel (and therefore their independence and access to the community) without changing the built environment to better support walking, bicycling, and transit. We examine the relationship between individual characteristics, current and preferred future travel behavior, and the built environment on three outcomes: (i) willingness to move somewhere where they do not rely on a car once they are no longer able to drive, (ii) support for policies to build communities that allow people to drive less, and (iii) willingness to rely on an AV when they are no longer able to drive.

Descriptive statistics indicate that our sample population, for the most part, lives in low-density (and thus auto-reliant) areas, primarily drives for most transportation needs, and is unwilling to reduce driving or stop driving entirely. Indeed, current and desired future driving behavior was significant or nearly-significant (i.e., $p<.01$) in all of the regression models, where those who drove more and wanted to continue to do so tended not to support walkability, nor want to move to a walkable place, and were more likely to consider an AV if incapable of driving. Additionally, our sample population expresses a healthy skepticism toward autonomous vehicles, particularly fully-autonomous vehicles (i.e., those that do not allow a human driver to take control of the vehicle). This coupled with a desire to continue driving suggests Americans may be more amenable to driver-assist-type technologies than fully autonomous vehicles. But more research is needed to understand how people perceive the differences between increasingly-capable driver assistance technologies and a car that truly does not require a human driver. The extent to which exposure to, and increasing reliance on, driver-assist technologies may shape willingness to use AVs is also unknown.

Across the regression models, we also find that increasing age tends to be associated with reductions in willingness to address age-related driving cessation by moving to a more walkable place, supporting policies for walkable places or using an AV to address driving cessation. Furthermore, being male is also associated with a reduced desire to move or to support policies to enhance walkability, but an increased desire to use AVs when they are no longer able to drive. Findings, particularly around age, are troubling considering the number of aging baby-boomers for whom driving cessation could pose serious consequences (e.g., social isolation, limited access to healthcare) but suggest that younger Americans, given the option, may be more inclined toward walkable built environments. While this is not definitive based on our analysis, it comports with surveys indicating increasing support for walkable places (NAR, 2017).

The built environment appears to have modest impacts on the desire to move to a more walkable place once one is no longer able to drive and support for walkable-community policies. Findings appear contradictory, where in reductions in block size correlate with reductions in support for walkability (or a desire to move to a more walkable place). But we also increasing density associated with reduced support for walkability. Findings may be reflective of the fact that many people are simply not interested in changing residential location. They may also reflect the fact that the limited areas of relatively-increased density are frequently high-poverty areas or tourist/student-oriented (in the case of Lincoln) entertainment districts. Future research is needed to either validate or refute these assertions, but regardless, this line of reasoning further elucidates the fact that there is a dearth of high-quality, walkable places in the majority of American cities.

Our sample population is not generalizable, and findings should be considered cautiously; however, this is the first work of its kind examining how people (not only older Americans) are considering age-related transportation issues, and if they hope to age in place, move to a more walkable place, and/or rely on new transportation technologies when no longer able to drive. This research also raises the question of what an ideal "aging in place" community might be in terms of quantifiable built environment metrics. The World Health Organization has identified "essential features" of age-friendly cities (WHO 2007), focusing on general, qualitative accounts of key components of age-friendly places (much of which corresponds with core New Urbanist principles), face structural barriers to implementation (Scharlach 2012), and lack clear evaluation criteria (Greenfield et al.

2015). Meanwhile, planners struggle to clearly articulate and design communities that meet the needs of aging individuals. Data limitations preclude us from addressing this issue, but more research is needed so that we may adequately plan and design to meet the needs of aging individuals.

The decision to age in place is centered on a desire to remain in a community whose social ties have decades to develop. Addressing this issue for those rapidly-approaching a point at which they cannot safely drive is important, but our research raises concerns that some older individuals lack the desire to change their lifestyles despite the start limitations that aging in auto-oriented communities will pose for one's health and wellness. But our research also points to a willingness among younger individuals to circumvent this problem by building more walkable communities in general. Certainly, the long-term solution is to build walkable and accessible communities where people can eventually age in place, and this work is further evidence for a growing need and desire to do so.

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