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Research Article

Depressive Symptoms Among Older Adults Who Do Not Drive: Association With Mobility Resources and Perceived Transportation Barriers

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Abstract

Purpose of the Study: To examine alternative means of mobility that nondriving older adults rely on and their impact on well-being.

Design and Methods: Data from the 2011 (T1, *N* = 6,680) and 2012 (T2, *N* = 5,413) interview waves of the National Health and Aging Trends Study were used to examine sample characteristics by driving status, use of alternative mobility resources, and perceived transportation-related barriers among ex-drivers and nondrivers, and their association with depressive symptoms.

Results: A majority of nondrivers relied on their informal support system and/or paid assistance to drive them to places. About half reported walking/using a wheelchair or scooter. A significant proportion of never drivers also used public transportation and van/shuttle services, whereas a smaller proportion of ex-drivers used them. Nondrivers who walked for transport had lower depressive symptoms than those who did not walk at either T1 or T2, and perception of transportation barriers to visiting friends/family was associated with higher depressive symptoms at T1 only.

Implications: Older adults' mobility needs should be met through increasing walkability, public and paratransit transportation, supplemental senior transportation, and increasing informal caregivers-transportation providers' ability to aid older adults.

Keywords: Mobility, Alternative transportation, Transportation barriers, Depression

The reasons older adults stop driving (age-related declines in cognitive, functional, and/or visual capacities or a health crisis such as a stroke or fractures from a fall) and the negative effects of driving cessation on older adults' physical, mental, cognitive, and social functioning have been extensively studied (Ackerman, Edwards, Ross, Ball, & Lunsman, 2008; Anstey, Windsor, Luszcz, & Andrews, 2006; Choi, Lohman, & Mezuk, 2014; Croston, Meuser, Berg-Weger, Grant, & Carr, 2009; Curl, Stowe, Cooney, & Proulx, 2014; Edwards, Lunsman, Perkins, Rebok, & Roth, 2009; Ragland, Satariano, & MacLeod, 2005). The inability to drive and resulting poor mobility can significantly restrict older adults' instrumental activities of daily living (e.g., grocery shopping) and social integration and can lead to further physical, functional, and mental decline and reduced friendship networks (Mezuk & Rebok, 2008). Curl and colleagues (2014) found that mobility restrictions affect older adults' social relationships and participation more than engagement in paid employment or other formal activities. Former drivers and those who have never driven also have higher risks of long-term care entry after adjusting for demographic and health variables than drivers, and both former and never drivers are at increased risk for death (Edwards, Perkins, Ross, & Reynolds, 2009; Freeman, Gange, Muñoz, & West, 2006).

To facilitate mobility as a means of improving well-being in late life, policy prescriptions and research agendas have focused on prolonging safe driving and making available alternative means of transportation (Dickerson et al., 2007; Marottoli & Coughlin, 2011; Staplin & Freund, 2013). In contrast to the many studies on the negative impact of driving cessation, little research has been done on alternative means of mobility that nondriving older adults rely on and their impact on well-being. Mezuk and Rebok (2008) did find that older adults' ability to use public transportation did not mitigate the effect of driving cessation on their social integration and that cessation had no impact on support from friends or relatives. With rapidly increasing numbers of older adults and the importance of mobility for health and aging-in-place (Keysor et al., 2010; Robison, Shugrue, Porter, Fortinsky, & Curry, 2012), more research is needed to examine the relationships among older adults' use of alternative means of mobility (e.g., walking, public transportation), perceptions of transportation barriers, and well-being. Based on two interview waves of data from a nationally representative sample of adults aged 65 years and older, this study examined relationships between affective and cognitive depressive symptoms and (a) the use of alternative means of mobility, and (b) perceived transportation-related barriers among older adults who quit driving (ex-drivers) and who never drove (never drivers).

Conceptual Framework and Hypotheses

Webber, Porter, and Menec's (2010) mobility framework and the ecological model of adaptation in aging (Lawton & Nahemow, 1973) form this study's conceptual basis. Webber and colleagues define mobility as "the ability to move oneself (either independently or using assistive device or transportation) within environments that expand from one's home to the neighborhood and regions beyond" (p. 444). Ability to move about the community is essential for carrying out basic life-maintenance activities and maintaining other connections and engagement. The mobility framework is rooted in the ecological model of adaptation in aging that focuses on person-in-environment fit, including one's ability to successfully negotiate physical and social environments in order to maintain well-being in late life. Mobility constraints diminish older adults' ability to negotiate their environments and contribute to the loss of independence and meaningful experiences through social integration. Since mobility is central to determining whether older adults can independently meet their basic life-maintenance and social needs (Webber et al., 2010), availability and use of alternative mobility resources is likely to be associated with lower depressive symptoms among nondriving older adults.

In the United States, mobility is nearly synonymous with driving a personal automobile. In 2009, 75 million individuals or 92% of those in the 45–64 age group, and 33 million individuals or 82% of those in the 65+ age group, had a driver's license (United States Census Bureau, 2012). Driving cessation is inevitable for most older adults as they experience declines in their capacity to safely operate a vehicle. Approximately 1 million older adults stop driving each year due to poor health (Dickerson et al., 2007). Alternative mobility resources for nondriving older adults include their informal social support systems, public mass transportation systems, paratransit services for the disabled and elderly (e.g., van, shuttle or taxi services operated by public transit services), grassroots and community-based senior transportation services, known as supplemental transportation programs (STPs) for seniors, and commercial taxi and other private/specialized transportation services (Beverly Foundation, 2002; Dickerson et al., 2007). One study found that older adults were more likely to stop driving if they had received at least some transportation support from friends/neighbors, organizations, or hired assistants (ty (Choi, Adams, & Kahana, 2012). Walking as a means of transport is also an important resource for older adults living in walkable neighborhoods and can increase health-enhancing levels of physical activity (Cerin et al., 2013; Shimura, Sugiyama, Winkler, & Owen, 2012; Turrell, Haynes, Wilson, & Giles-Corti, 2013).

Many older adults, however, have limited access to alternative mobility resources. Some lack family members who live in close proximity. Public transportation, paratransit services, and STPs are more likely to be available in urban than rural areas. Many low-income older adults cannot afford commercial taxis and other private-pay transportation services. Walking for transport tends to be an option only where the built environment and neighborhood amenities allow it (Clarke & Gallagher, 2013; Koohsari, Sugiyama, Lamb, Villanueva, & Owen, 2014; Rosso, Grubesic, Auchincloss, Tabb, & Michael, 2013). Physical and functional health problems may also pose barriers to using public transportation and walking.

Gender, race/ethnicity, and culture also influence mobility patterns and accessibility to mobility resources (Webber et al., 2010). Women and racial/ethnic minorities are more likely than men and non-Hispanic Whites to stop driving (Choi, Mezuk, Lohman, Edwards, & Rebok, 2012). A population-based study of older Latinos also found that females comprised the majority of those who never drove, consistent with data reported among older adults in general, and those who never drove were less acculturated than both current and former drivers (Foley, Heimovitz, Guralnik, & Brock, 2002; Segal-Gidan, Varma, Salazar, & Mack, 2010). Segal-Gidan and colleagues speculate that many never drivers may have lived in communities where support systems were nearby and, thus, had less exposure to the larger cultural environment. Although their study did not examine immigration status, never drivers' lower levels of acculturation may also be attributable to a larger proportion of foreign-born elders in this group. United States Department of Transportation, Bureau of Transportation Statistics, and Federal Highway Administration (2003) statistics show

that persons who do not own a car take far fewer trips than those who own a car. Among low-income, racial/ethnic minority older adults, lack of financial resources to purchase and operate a personal vehicle (i.e., costs of fuel, maintenance, and insurance) may also contribute to never-driving or driving cessation (Segal-Gidan et al., 2010). US DOT data show that households with total incomes of less than $25,000 were almost 10 times more likely not to have a vehicle compared with those with incomes greater than $25,000.

Driving and other mobility patterns also reflect personal history, which may have been influenced by the availability and accessibility of mobility resources. For example, New York state trails all other states in rates of both vehicles per person (0.54 in 2011) and drivers per population (0.58 in 2011; Federal Highway Administration—Office of Highway Policy Information, 2013), likely due to the extensive public transportation system in New York City's densely populated boroughs. Older adults who have spent most of their lives in urban areas with well-developed public transit services and/or with amenities that are easily accessible by public transit or walking may have had less need for a personal vehicle and may be less likely to perceive transportation-related barriers to meeting their needs. Older adults who have never driven but are able to walk and use public transportation may also experience less depression than their peers who relied on driving personal automobiles as their primary means of mobility but can no longer drive. Perceived transportation barriers, especially to maintaining social relationships and social support, are thus likely to contribute to depressive symptoms.

Based on the mobility framework, ecological model of aging, and previous research, the study hypotheses were: Among nondrivers, controlling for sociodemographics and physical health status, (H1) walking for transport and use of public transportation will be associated with lower depressive symptoms at time 1 (T1); (H2) perceived transportation barriers to visiting family/friends will be associated with higher depressive symptoms at T1; (H3) ex-drivers will have higher depressive symptoms than never drivers at T1; and (H4) these relationships at time 2 (T2) will hold, controlling for T1 depressive symptoms.

Design and Methods

Data and Sample

Data are from the 2011 (T1) and 2012 (T2) interview waves of the National Health and Aging Trends Study (NHATS). NHATS' aims are to promote scientific study of late-life disability trends and dynamics and advance understanding of the social and economic impacts of late-life functional changes for older people, their families, and society (Kasper & Freedman, 2014). The NHATS sample is representative of U.S. Medicare beneficiaries aged 65 years or older who resided in the community in their own or another's home or in residential care settings (Montaquila, Freedman, Edwards, & Kasper, 2012). Those in older age groups and Blacks were oversampled. The present study included the 6,680 T1 sample persons who resided in their own or another's home and excluded those residing in nursing homes (n = 468) or other such settings (n = 412) and those represented by proxy respondents (e.g., their spouse or child [n = 517]) due to dementia, illness, hearing impairment, and/or speech impairment. These exclusions were based on both systematic and respondent-level missing data on many variables included in this study. Individual interviews were not conducted with sample persons in nursing homes and some residential care facilities, and some questions were skipped when proxies were interviewed. Of the T1 study sample, 4,996 reported being current drivers, 1,193 former (ex-) drivers, and 491never drivers.

At T2, 5,413 of the 6,680 T1 respondents were interviewed again, including 83.0% of T1 current drivers, 74.3% of T1 ex-drivers, and 75.7% of T1 never drivers [$\chi^2(2) = 46.82$, $p < .001$]. Attritions due to death and illnesses were higher among ex-drivers [9.7% of ex-drivers vs. 1.6% of current drivers and 4.2% of never drivers, $\chi^2(2) = 189.21$, $p < .001$ for death, and 2.0% of ex-drivers vs. 0.6% of current drivers and 1.1% of never drivers, $\chi^2(2) = 18.58$, $p < .001$ for illnesses], but refusal to participate was higher among current drivers [13.5% of current drivers vs. 10.4% of ex-drivers and 10.7% of never drivers, $\chi^2(2) = 7.90$, $p < .018$]. We used both waves of data to examine driving transitions between T1 and T2, to control for the effect of T1 depressive symptoms on T2 depressive symptoms, and to examine potential differences between T2 new ex-drivers and T1–T2 continued ex-drivers.

Measures

Depressive symptoms (outcome variable) at T1 and T2 were measured with the two-item Patient Health Questionnaire-2 (PHQ-2; Kroenke, Spitzer, & Williams, 2003), which captures the cognitive or affective symptoms of anhedonia and depressed mood by asking "Over the last month, how often have you (a) had little interest or pleasure in doing things; and (b) felt down, depressed, or hopeless?" Responses were based on a 4-point scale (1 = not at all; 2 = several days; 3 = more than half the days; 4 = nearly every day). The combined score represented symptom severity. Kroenke and colleagues reported PHQ-2 scores ≥3 as having a sensitivity of 83% and a specificity of 92% for major depression in primary and specialty care patients. The PHQ-2's criterion validity for major depression in older adults is also reported to be good (sensitivity = 100%, specificity = 77%, AUC [area under the curve] = 0.88; Li, Friedman, Conwell, & Fiscella, 2007).

Driving status (predictor): Driving status was measured with a series of questions including driving frequency during the last month and time last drove. At T1, the categories were current driver (i.e., drove during the preceding

month), ex-driver (no longer drove during the preceding month), or never driver. At T2, they were continued current driver (drove at both T1 and T2), resumed driver (ex-driver at T1 but current driver at T2), new ex-driver (quit driving between T1 and T2), continued ex-driver (quit driving by T1 and continued to be a nondriver at T2), and never driver.

Alternative mobility resources (predictor): At each wave, sample persons were asked how (other than driving) they got to places outside their home during the preceding month. They could choose more than one of the following means (yes = 1 or no = 0): (a) getting a ride from a family member, friend, or someone paid to help; (b) walking or using a wheelchair or scooter; (c) taking public transportation; (d) using a van or shuttle service provided by the place where the sample persons lived; (e) using a van or shuttle service for seniors or disabled persons; (f) taking a taxi; and (g) using other means (specifications are not available in public use data files). Because of low frequencies, both types of van or shuttle services were combined into one (using a van or shuttle service).

Perceived transportation-related barriers (predictor): These were measured with the following questions to nondrivers only: "In the last month, did a transportation problem ever keep you (yes = 1, no = 0) from (a) visiting in person with friends or family not living with; (b) attending religious services; (c) participating in clubs, classes, or other organized activities; and (d) going out for enjoyment (including dinner, a movie, gambling, or hearing music or seeing a play).

Controls in multivariate analysis: (a) Sociodemographic characteristics were age in years, gender, race/ethnicity, birth place (US-born vs. foreign born), marital status (married vs. not married at T1 and T2), education (college degree or higher vs. all others), and family income (in $5,000 units at T1); (b) the number (0–9) of diagnosed chronic illnesses (high blood pressure, heart attack or heart disease, arthritis, osteoporosis, diabetes, lung disease, stroke, cancer, and dementia) at T1 and T2; and (c) self-rated health at T1 and T2 (1 = *excellent* to 5 = *poor*).

Descriptive sample characteristics at T1 also included employment status (in the preceding month; yes = 1, no = 0); volunteering status (in the preceding month; yes = 1, no = 0); ADL/IADL (activities and instrumental activities of daily living) impairments (0–14); word recall score (0–10); self-rated memory (1 = *excellent* to 5 = *poor*); and vision problems (i.e., with vision aids, seeing well enough to recognize someone across the street, yes = 1, no = 0). In addition, we described both T1 and T2 social participation in the preceding month—visiting friends/family not co-residing, attending religious services, participating in clubs, classes, or other organized activities, and going out for enjoyment.

Analysis

All analyses were performed using Stata13/MP's *svy* function to account for NHATS' multistage cluster sampling design and to adjust analysis results based on the NHATS-specified stratification and personal analysis weights at T1 and T2 (which accounted for attrition since T1). Stata's subpop command was used for all analyses of subsamples to ensure that variance estimates incorporated the full sampling design. All estimates presented are weighted except for sample sizes. First, sample demographic, health, mental health, and social participation characteristics were examined by T1 and T2 driving status using χ^2 tests and analysis of variance (ANOVA) with Bonferroni corrections. Second, use of alternative mobility resources (for both drivers and nondrivers) and perceived transportation-related barriers (for nondrivers only) are presented. Third, focusing on nondrivers at T1 and/or T2 only, linear regression analyses were used to test study hypotheses.

Results

Sample Characteristics by Driving Status

Table 1 shows T1 sample characteristics (N = 6,680) by driving status: 81.3% were current drivers, 13.5% ex-drivers, and 5.2% never drivers. Ex-drivers included those who gave up driving decades ago as well as those who recently ceased driving; the average time since last driving for all ex-drivers was 7.04 (SE = 0.37) years, and about two-thirds had stopped driving within the 6 years prior to the interview. As expected, compared with current drivers, ex-drivers, and never drivers were more likely to be older, women, racial/ethnic minorities, foreign-born, not married, less educated, of lower income, and in poorer health. Compared to ex-drivers, never drivers were more likely to be female [$\chi^2(1) = 69.20$, $p < .001$], racial/ethnic minorities, especially Hispanic [$\chi^2(3) = 104.31$, $p < .001$], foreign-born [$\chi^2(1) = 69.95$, $p < .001$], unmarried [$\chi^2(1) = 32.56$, $p < .001$], living with others [$\chi^2(3) = 21.66$, $p = .001$], to have lower education [62% < high school; $\chi^2(3) = 138.55$, $p < .001$], and to have never worked outside the home [$\chi^2(1) = 69.95$, $p < .001$], although the two groups did not differ in the proportions of those who worked for pay [$\chi^2(1) = 1.14$, $p = .501$] or volunteered [$\chi^2(1) = 2.10$, $p = .159$] in the preceding month. Ex-drivers and never drivers did not differ in age, any health status variable including vision, depressive symptoms, and social participation except religious service attendance.

Table 2 shows that at T2, 78.1% were continued drivers; 1.4% were resumed drivers after an average of 2.5 (SE = 0.53) years of nondriving (e.g., those who may have recovered from a health crisis that had led to a suspension of driving); 4.5% were new ex-drivers; 11.1% were T1–T2 continued ex-drivers; and 5.0% were never drivers. Continued drivers and resumed drivers were younger and had better health, lower depressive symptoms, and higher social participation than nondrivers. Further analysis of the three nondriving groups found that T1–T2 ex-drivers were older [$F(2, 55) = 8.18$, $p < .016$] than new ex-drivers and never drivers, but new ex-drivers had significantly more new diagnoses [$F(2, 55) = 8.59$, $p < .001$] and greater increase in depressive symptoms [$F(2, 55) = 3.79$, $p < .029$] since T1 than the other two groups. However, the three groups

Table 1. Sample Characteristics by Driving Status at Time 1 ($N = 6,680$)

	Current driver	Ex-driver	Never driver	*p* Value
N (%)	4,996 (81.28)	1,193 (13.51)	491 (5.21)	
Demographics				
Age (years)[a]	73.60 (0.10)	78.71 (0.34)	77.39 (0.43)	<.001
Male (%)	48.69	30.14	10.64	<.001
Race/ethnicity (%)				<.001
Non-Hispanic White	85.14	71.47	45.41	
Black	6.58	12.45	20.44	
Hispanic	4.94	10.67	24.45	
Other	3.34	5.44	9.71	
Born in the United States (%)	90.60	84.57	57.30	<.001
Marital status (%)				<.001
Married	64.59	41.04	30.75	
Divorced/separated	11.48	16.31	14.82	
Widowed	21.30	38.61	44.67	
Never married	2.63	4.05	9.76	
Living arrangement (%)				<.001
Alone	26.29	31.50	34.43	
With spouse	63.71	40.10	28.46	
With other	10.0	28.40	37.11	
Education (%)				<.001
<High school	16.84	33.08	62.66	
High school diploma	26.70	30.43	23.53	
Some college	28.37	22.11	10.87	
Bachelor's degree	28.08	14.08	2.94	
Income (in $5,000 unit)[b]	13.15 (0.78)	7.32 (1.58)	3.31 (0.18)	<.001
Have ever worked outside home (%)	94.01	89.25	72.88	<.001
Worked for pay last month (%)	21.44	3.88	5.74	<.001
Volunteered last month (%)	30.18	8.96	11.28	<.001
Health and mental health status				
No. of chronic illnesses[a]	2.22 (0.02)	2.96 (0.06)	2.75 (0.07)	<.001
No. of ADL/IADL impairments[a]	0.56 (0.05)	2.66 (0.10)	2.48 (0.24)	<.001
Self-rated health[a]	2.51 (0.02)	3.32 (0.04)	3.37 (0.07)	<.001
Word recall score[c]	3.85 (0.04)	2.62 (0.07)	2.63 (0.12)	<.001
Self-rated memory[a]	2.48 (0.02)	2.93 (0.03)	2.99 (0.06)	<.001
Vision problems (%)	2.60	12.31	10.42	<.001
Depressive symptoms[a]	2.76 (0.02)	3.36 (0.05)	3.51 (0.12)	<.001
Social participation in the preceding month				
Visited family/friends not coresiding (%)	90.96	77.67	73.19	<.001
Attended religious services (%)	59.89	45.05	56.03	<.001
Attended club/class/organized activities (%)	42.69	18.74	17.02	<.001
Went out for enjoyment (%)	85.47	60.17	55.34	<.001

Notes: ADL/IADL = activities and instrumental activities of daily living.
[a]Bonferronni-corrected analysis of variance (ANOVA): current driver < ex-driver = never driver.
[b]Bonferronni-corrected ANOVA: current driver > ex-driver > never driver.
[c]Bonferronni-corrected ANOVA: current driver > ex-driver = never driver.

did not differ in T2 total number of medical conditions, self-ratings of health, and depressive symptoms. The three groups did not differ in any type of social participation.

Alternative Mobility Resources and Perception of Transportation-Related Barriers

Table 3 shows that at T1, compared to 34.5% of drivers, 86.3% of ex-drivers, and 80.5% of never drivers had received a ride from family, friends, or hired help. More than half of drivers and never drivers and 47.2% of ex-drivers also walked or used a wheelchair/scooter for transport (i.e., to get to places) (4.4% and 1.8% of all walkers used a wheelchair and a scooter, respectively). Higher proportions of never drivers used public transportation, taxi, and van/shuttle services (28.4%, 13.4%, and 16.2%, respectively) than current drivers and ex-drivers (6.2%, 3.4%, and 1.3%, respectively, for current drivers, and 15.7%,

Table 2. Sample Characteristics by Driving Status at Time 2 ($N = 5,413$)

	T1 and T2 driver	T1 ex-driver–T2 driver	T1 driver–T2 ex-driver	T1 and T2 ex-driver	Never driver	*p* Value
N (%)	3,857 (78.06)	78 (1.39)	279 (4.45)	827 (11.07)	372 (5.03)	
Demographics						
Age[a] (years; M, *SE*)	74.39 (0.11)	75.83 (0.79)	78.22 (0.51)	80.27 (0.34)	78.50 (0.50)	<.001
Male (%)	48.79	34.80	35.03	30.88	13.49	<.001
Race/ethnicity (%)						<.001
Non-Hispanic White	86.09	75.06	76.94	69.48	48.64	
Black	6.45	9.63	9.35	14.36	20.79	
Hispanic	4.31	13.68	12.71	11.10	20.33	
Other	3.15	1.63	1.0	5.07	10.24	
Born in the United States (%)	91.28	87.69	84.87	84.44	59.76	<.001
Married (%)	63.01	58.04	49.38	37.48	28.26	<.001
College graduate (%)	29.64	13.36	18.55	13.83	2.91	<.001
Health and mental health status						
No. of newly diagnosed chronic illnesses since T1[b] (M, *SE*)	0.24 (0.01)	0.17 (0.04)	0.66 (0.07)	0.38 (0.04)	0.34 (0.05)	<.001
Total no. of chronic Illnesses[c] (M, *SE*)	2.41 (0.03)	3.17 (0.17)	3.43 (0.13)	3.32 (0.07)	3.20 (0.12)	<.001
Self-rated health[c] (M, *SE*)	2.46 (0.02)	3.06 (0.04)	3.43 (0.07)	3.25 (0.05)	3.34 (0.06)	<.001
Depressive symptoms[c] (M, *SE*)	2.68 (0.03)	3.10 (0.19)	3.63 (0.11)	3.37 (0.06)	3.47 (0.10)	<.001
T2–T1 depressive symptom changes[d] (M, *SE*)	−0.05 (0.02)	−0.32 (0.28)	0.28 (0.10)	0.002 (0.06)	−0.02 (0.12)	.026
Social participation in the preceding month						
Visited family/friends not coresiding (%)	93.67	81.42	78.48	77.0	78.0	<.001
Attended religious services (%)	60.66	61.64	45.48	45.49	53.45	<.001
Attended club/class/organized activities (%)	45.84	31.38	20.59	21.89	19.09	<.001
Went out for enjoyment (%)	88.20	79.02	60.39	60.37	57.62	<.001

[a]Bonferronni-corrected analysis of variance (ANOVA): continued driver = resumed driver < all others.
[b]Bonferronni-corrected ANOVA: continued driver < resumed driver < all others
[c]Bonferronni-corrected ANOVA: continued driver < all others.
[d]Bonferronni-corrected ANOVA: continued driver = resumed driver < T1 driver-T2 ex-driver.

Table 3. Alternative Mobility Resources and Transportation-Caused Barriers Among Drivers and Nondrivers

	T1 (N = 6,680)				T2 (N = 5,413)					
	Current	Ex-driver	Never driver	p Value	T1 and T2 driver	T1 ex-driver–T2 driver	T1 driver–T2 ex-driver	T1 and T2 ex-driver	Never driver	p Value
N (%)	4,996 (81.28)	1,193 (13.51)	491 (5.21)		3,857 (78.06)	78 (1.39)	279 (4.45)	827 (11.07)	372 (5.03)	
Mobility resources (%)										
Ride from family/friends or paid help	34.46	86.34	80.47	.001	36.25	67.96	87.66	87.53	74.0	<.001
Walking or using a wheelchair/scooter	52.51	47.21	58.75	<.001	54.15	36.11	40.56	45.62	57.51	<.001
Public transportation	6.19	15.65	28.39	<.001	6.28	4.37	7.49	15.38	26.18	<.001
Taxi	3.39	9.27	13.43	<.001	3.32	4.82	4.55	8.77	16.18	<.001
Van/shuttle services	1.30	10.75	16.16	<.001	1.20	7.22	15.65	14.37	16.64	<.001
Other	8.10	2.15	1.41	<.001	9.40	2.82	3.70	2.82	3.29	<.001
Ride from family and walking	17.23	39.01	44.97	<.001	18.99	19.45	34.43	37.03	40.82	<.001
Ride from family and public transportation	2.74	9.06	18.91	<.001	6.28	4.37	7.49	15.38	26.18	<.001
Ride from family and taxi	1.44	6.01	8.50	<.001	1.18	3.63	3.68	5.50	10.51	<.001
Ride from family and van/shuttle services	0.94	9.17	10.67	<.001	0.79	5.52	13.42	11.19	11.52	<.001
Walking and public transportation	5.10	13.59	24.37	<.001	5.31	4.37	7.49	13.53	24.72	<.001
Walking and taxi	2.62	7.46	11.26	<.001	2.62	4.82	3.61	6.57	13.25	<.001
Walking and van/shuttle services	0.69	6.67	9.52	<.001	0.67	4.73	9.58	8.49	11.25	<.001
Public transportation and taxi	2.06	5.67	7.30	<.001	2.16	2.81	2.01	5.70	9.46	<.001
Ride from family and walking and public transportation	2.22	7.72	15.27	<.001	2.29	2.90	5.65	7.89	11.10	<.001
Transportation-caused barriers (%) to[a]										
Visiting family/friends not coresiding	n/a	15.60	11.56	.094	n/a	n/a	16.47	15.28	12.45	.390
Attending religious services	n/a	15.13	12.87	.255	n/a	n/a	13.85	14.68	13.55	.870
Attending clubs/classes/organized activities	n/a	12.49	9.05	.088	n/a	n/a	13.33	11.88	8.38	.274
Going out for enjoyment	n/a	12.88	9.60	.070	n/a	n/a	12.58	12.08	8.18	.166

Notes: n/a = not applicable.

[a]Time frame was during the preceding month.

9.3%, and 10.8%, respectively, for ex-drivers). Further analysis found that 32% of never drivers, compared to 15% of ex-drivers, resided in the Middle Atlantic Census division, which includes New York State and other urban areas where walking and public transportation and taxi use tend to be common. Data also show that nondrivers rely on more than one resource; for example, at T1, 39.0% of ex-drivers and 45.0% of never drivers got a ride from family/friend/hired help *and* walked, and 9.1% of ex-drivers and 18.9% of never drivers got a ride from family/friend/hired help *and* used public transportation.

At T2, compared to 36.3% of continued drivers and 68.0% of resumed drivers, 87.7% of continued ex-driver, 87.5% new ex-drivers, and 74.0% of never drivers received a ride from family/friends or hired help. More current drivers (54.2%) and never drivers (57.5%) walked than resumed drivers (36.1%), new ex-drivers (40.6%), and continued ex-drivers (45.6%). Never drivers were most likely to have used public transportation (26.2%) and van/shuttle services (16.2%), followed by continued ex-drivers (15.4% for public transportation and 14.37% for van or shuttle services) and new ex-drivers (7.5% for public transportation and 15.7% for van or shuttle services).

Ex-drivers and never drivers did not significantly differ at either T1 and T2 in their perception of transportation-related barriers. Overall, 8%–16% of nondrivers reported that transportation was a barrier to engaging in specific social participation activities. Further analysis showed that both ex-drivers and never drivers rated the importance of visiting friends/family higher than other activities at both T1 and T2. For example, at T1, visiting friends/family was rated as 2.37 (*SE* = 0.02) on a 3-point scale (1 = not so important, 3 = very important), attending religious services as 2.31 (*SE* = 0.03), going out for enjoyment as 2.01 (*SE* = 0.02), and participating in clubs, classes, or other organized activities as 1.60 (*SE* = 0.02). Ratings were similar at T2.

Association Between Depressive Symptoms and Alternative Mobility Means and Perceived Transportation-Related Barriers Among Nondrivers

Table 4 shows that at T1, controlling for demographic and health status, walking or using a wheelchair or scooter for transport was associated with lower depressive symptoms among nondrivers, whereas perception of transportation barriers to visiting friends/family was associated with higher depressive symptoms. Nondriver type (ex-driver vs. never driver) was not a significant correlate of depressive symptoms. At T2, controlling for demographics, health status, and T1 depressive symptoms, walking or using a wheelchair or scooter for transport was again associated with lower depressive symptoms, but perceived transportation barriers and nondriver type (continued ex-driver and new ex-driver vs. never driver) were not associated with depressive symptoms. These findings partially support H1 (association of walking and public transportation use with lower depressive symptoms) at both T1 and T2, fully support H2 (association between perceived transportation barriers to visiting family/friends and higher depressive symptoms) at T1 only, and do not support H3 (higher depressive symptoms among ex-drivers) at T1 and T2. H4 (significant effect on T2 depressive symptoms controlling for T1 depressive symptoms) was partially supported (for walking and lower depressive symptoms).

Discussion

This study helps to fill the knowledge gap regarding nondriving older adults' use of alternative mobility resources, their perception of transportation-related barriers, and their depressive symptoms. The findings show that nondrivers were more likely than drivers to be women, racial/ethnic minorities, have sociodemographic disadvantages (lower education and income), and had more health problems than drivers. The study corroborates previous research findings of health deterioration as the primary trigger for driving cessation among older adults. Of nondrivers, never drivers appear to have more sociodemographic disadvantages than ex-drivers, but the two groups did not differ in physical, cognitive, or mental health status and social participation. Nearly one-third of never drivers lived in the Middle Atlantic states.

The results also indicate that nondrivers' transportation needs are largely met by their informal support system, indicating that providing transportation is an important part of informal caregiving. Ex-drivers were somewhat more likely than never drivers to have gotten a ride from family/friends or paid help and less likely to have used all other types of transportation. About half of never drivers as well as current drivers reported walking/using a wheelchair or scooter for transport. A little more than a quarter of never drivers also used public transportation and less than one-fifth used van or shuttle services, while even fewer ex-drivers used these means. Given the lack of differences in the health status and extent of social participation between ex-drivers and never drivers, significant differences in types of transportation use may be due to differences in personal habits and/or availability and accessibility of mobility resources.

The study's key finding is that at both T1 and T2, nondrivers who walked (or used a wheelchair or scooter) for transport had lower depressive symptoms than those who did not walk. It seems reasonable that nondrivers who could walk for transport may feel less negative impacts of nondriving compared to those who could not walk either because of health reasons or the distance to the places where they need to travel to meet their needs. Walking may have also benefited physical health in addition to mental health (Turrell et al., 2013). Though walking was the only alternative mobility means associated with depressive symptoms, most older adults used more than one resource (e.g., rides from family/friends *and* use of van or shuttle services). Since it was difficult to parse out the effect of

Table 4. Correlates of Depressive Symptoms Among Nondrivers

	Time 1 (N = 1,666), B (SE)	Time 2 (N = 1,446), B (SE)
Age	−0.01 (0.00)*	−0.01 (0.01)
Male	0.03 (0.10)	0.12 (0.11)
(Female)		
Black	0.02 (0.11)	−0.11 (0.10)
Hispanic	0.02 (0.22)	0.28 (0.21)
Other Race	−0.26 (0.21)	−0.07 (0.21)
(Non-Hispanic White)		
Born in the United States	−0.23 (0.14)	0.19 (0.15)
(Foreign-born)		
Married	0.17 (0.11)	−0.03 (0.10)
(Not married)		
College degree	−0.16 (0.13)	−0.13 (0.09)
(No college degree)		
Income (in $5,000)	0.01 (0.01)	0.01 (0.01)
No. of chronic illnesses	0.19 (0.03)***	0.10 (0.03)***
Self-rated health	0.40 (0.05)***	0.32 (0.03)***
Ex-driver	−0.17 (0.12)	
(Never driver)		
T1 and T2 ex-driver		−0.10 (0.09)
T1 driver–T2 ex-driver		0.05 (0.14)
(Never driver)		
T1 depressive symptom score		0.34 (0.03)***
Mobility means		
Walk/wheelchair/scooter	−0.19 (0.06)**	−0.28 (0.10)**
Use ride from family/friend/paid help	−0.15 (0.13)	−0.19 (0.13)
Use public transportation	−0.20 (0.14)	0.18 (0.14)
Use taxi	0.07 (0.09)	−0.12 (0.12)
Use van services	0.02 (0.11)	−0.06 (0.11)
Use other means	0.42 (0.40)	0.32 (0.32)
Transportation-caused barriers to		
Visiting family/friends	0.38 (0.13)**	0.15 (0.15)
Attending religious services	0.04 (0.14)	−0.19 (0.19)
Attending meetings/activities	0.19 (0.18)	0.09 (0.20)
Going out for enjoyment	0.06 (0.17)	0.09 (0.14)
	$F(22, 35) = 11.41$, $df = 56$, $p < .001$, $R^2 = 20.48$	$F(24, 33) = 24.42$, $df = 56$, $p < .001$, $R^2 = 29.32$

Notes: (): Reference category.
*$p < .05$. **$p < .01$.***$p < .001$.

each transportation resource in the current study, future research should attempt to determine the effects of various type of transportation use on depressive symptoms and health status.

Perception of transportation as a barrier to visiting friends/family also contributed significantly to depressive symptoms at T1. As discussed, the mobility framework (Webber et al., 2010) emphasizes older adults' ability to move about the community as essential for maintaining independence and well-being. This study supports the mobility framework as mobility constraints, especially those interfering with social support and connection, diminish older adults' emotional well-being. Because older adults placed greater importance on visiting friends/family than other social participation activities, those who are prevented or constrained from engaging in these visits due to lack of transportation would understandably be more depressed. The reasons why these perceptions are not significant at T2 are not clear, although with passing time, it appears that health concerns per se became more significant and direct contributors to depressive symptoms. Older adults may also have come to accept their mobility limitations.

The study had a few limitations. First, despite using two waves of data in the multivariate analysis, only correlational, not causal, relationships can be assumed given the nature of survey data. Second, the NHATS did not distinguish between sick-quitter nondrivers and those who stopped driving for other reasons such as the cost of owning a personal automobile, the hassles or stress of driving, or other reasons for turning to alternative transportation use. The latter group may have stopped driving at earlier

ages than sick quitters and have different characteristics than sick quitters. Third, although the PHQ-2 is a valid depression measure for older adults, the full length (nine-item) PHQ-9 would have allowed examination of variations in symptom severity in greater depth. Fourth, the data set did not include information on neighborhood walkability, amenities, and availability and accessibility of public transportation or senior transportation services, making it difficult to discern if not using these alternative mobility means was due to a lack of availability/accessibility, personal preferences/familiarity, or capacity (e.g., health and affordability). For example, older adults who have never used public transportation may be fearful of doing so, and neighborhood safety may also influence use, especially at night. Future research on older adults' mobility needs should examine neighborhood- or community-level factors and older adults' reasons for use and nonuse of different means of transportation.

Despite these limitations, the findings have significant policy implications for meeting older adults' mobility needs through increasing walkability, public transportation, paratransit services, and STPs, and increasing informal caregivers-transportation providers' ability to aid older adults. Reducing transportation barriers by targeting alternatives to driving a personal automobile is an essential feature of aging-friendly communities where the fit between older adults' needs and environmental conditions is a paramount concern (Lehning, 2014; Menec, Means, Keating, Parkhurst, & Eales, 2011). For those who have the capacity, walking is an especially desirable transport option because of its added health and mental health benefits, which in turn can help them continue to walk and remain mobile. Shimura and colleagues (2012) found that 50–65 year olds living in high-walkable neighborhoods had significantly smaller reductions in the time they spent walking for transport over 4 years than did their peers living in low-walkable neighborhoods. Winters and colleagues (2014) also found that older adults who live in walkable communities that provide commercial and social opportunities walk more. Walkability requires investment in safety (e.g., crime free neighborhoods, crossroads with safety signals), structures and infrastructure (e.g., barrier-free sidewalks; proximity of grocery stores, restaurants, and other businesses, recreational and other amenities; and easy to use and frequent public transportation), inclusiveness, and attractiveness (Cerin et al., 2013; Clarke & Gallagher, 2013; Giles-Corti et al., 2013). Barrier-free sidewalks and proximity of businesses may also help older adults who are unable to walk at all or for a significant distance due to health problems but can use assistive mobility devices (e.g., wheelchairs and scooters). Public investment in these infrastructures will benefit all age groups and promote population health (Müller-Riemenschneider et al., 2013).

Special emphasis should be placed on expanding public mass transportation, paratransit services, and STPs and making them more senior friendly to attract the increasing numbers of older adults who can use them. Suburban and rural areas in particular need greater development of paratransit services and STPs. Offering community residents free public transportation may not only encourage use but greater use leading to improvements in individual and community health and wellbeing. Availability, accessibility, acceptability, affordability, and adaptability are the five A's of senior friendly transportation (Beverly Foundation, 2002). Dickerson et al. (2007) recommend "arm through arm rather than curb to curb" STP services for people with dementia (p. 587). Individualized transportation services for frail older adults may be expensive, but not providing it may result in greater costs due to premature institutionalization. Innovative programs such as ITN America (http://itnamerica.org/) that contribute to sustainable transportation services for seniors through practice, research, policy analysis and advocacy, and education also need to be widely implemented.

As this study shows, a majority of nondrivers depended on their informal support systems for transportation needs. Meeting transportation needs is likely a labor of love for most informal caregivers; however, many spousal caregivers are likely to be older adults themselves who may also be experiencing functional, cognitive, and/or sensory problems that may interfere with safe driving. Adult–child caregivers may face time constraints that prevent them from providing transportation for their parents (or other older family members) as often as needed or desired. Caregiver support programs should include assessment and education about safe driving and information about locally available STPs and other transportation options that can provide respite from transportation in times of need.

References

Ackerman, M. L., Edwards, J. D., Ross, L. A., Ball, K. K., & Lunsman, M. (2008). Examination of cognitive and instrumental functional performance as indicators for driving cessation risk across 3 years. *The Gerontologist*, **48**, 802–810. doi:10.1093/geront/48.6.802

Anstey, K. J., Windsor, T. D., Luszcz, M. A., & Andrews, G. R. (2006). Predicting driving cessation over 5 years in older adults: psychological well-being and cognitive competence are stronger predictors than physical health. *Journal of the American Geriatrics Society*, **54**, 121–126. doi:10.1111/j.1532-5415.2005.00471.x

Beverly Foundation. (2002). *Supplemental Transportation Programs for seniors*. Pasadena, CA. Retrieved from https://www.aaafoundation.org/sites/default/files/stp.pdf

Cerin, E., Lee, K. Y., Barnett, A., Sit, C. H., Cheung, M. C., Chan, W. M., & Johnston, J. M. (2013). Walking for transportation in Hong Kong Chinese urban elders: A cross-sectional study on what destinations matter and when. *The International Journal of Behavioral Nutrition and Physical Activity*, **10**, 78. doi:10.1186/1479-5868-10-78

Choi, M., Adams, K. B., & Kahana, E. (2012). The impact of transportation support on driving cessation among community-dwelling older adults. *Journal of Gerontology: Psychological and Social Sciences*, **67**, 392–400. doi:10.1093/geronb/gbs035

Choi, M., Lohman, M. C., & Mezuk, B. (2014). Trajectories of cognitive decline by driving mobility: evidence from the Health and Retirement Study. *International Journal of Geriatric Psychiatry*, **29**, 447–453. doi:10.1002/gps.4024

Choi, M., Mezuk, B., Lohman, M. C., Edwards, J. D., & Rebok, G. W. (2012). Gender and racial disparities in driving cessation among older adults. *Journal of Aging and Health*, **24**, 1364–1379. doi:10.1177/0898264312460574

Clarke, P., & Gallagher, N. A. (2013). Optimizing mobility in later life: The role of the urban built environment for older adults aging in place. *Journal of Urban Health*, **90**, 997–1009. doi:10.1007/s11524-013-9800-4

Croston, J., Meuser, T. M., Berg-Weger, M., Grant, E. A., & Carr, D. B. (2009). Driving retirement in older adults with dementia. *Topics in Geriatric Rehabilitation*, **25**, 154–162. doi:10.1097/TGR.0b013e3181a103fd

Curl, A. L., Stowe, J. D., Cooney, T. M., & Proulx, C. M. (2014). Giving up the keys: how driving cessation affects engagement in later life. *The Gerontologist*, **54**, 423–433. doi:10.1093/geront/gnt037

Dickerson, A. E., Molnar, L. J., Eby, D. W., Adler, H., Be'dard, M., Berg-Weger, M., ..., Trujillo, L. (2007). Transportation and aging: A research agenda for advancing safe mobility. *The Gerontologist*, **47**, 578–590. doi:10.1093/geront/47.5.578

Edwards, J. D., Lunsman, M., Perkins, M., Rebok, G. W., & Roth, D. L. (2009). Driving cessation and health trajectories in older adults. *Journal of Gerontology: Medical Sciences*, **64**, M1290–M1295. doi:10.1093/gerona/glp114

Edwards J. D., Perkins M., Ross L. A., & Reynolds S. L. (2009). Driving status and three-year mortality among community-dwelling older adults. *Journal of Gerontology: Medical Sciences*, **64**, M300–M305. doi:10.1093/gerona/gln019

Federal Highway Administration—Office of Highway Policy Information. (2013). US Highway statistics: Vehicle per person: Comparison by state. (Interactive data analysis). Retrieved from http://www.google.com/publicdata/explore?ds=gb66jodhlsaab

Foley, D. J., Heimovitz, H. K., Guralnik, J. M., & Brock, D. B. (2002). Driving life expectancy of persons aged 70 years and older in the United States. *American Journal of Public Health*, **92**, 1284–1289. doi:10.2105/AJPH.92.8.1284

Freeman, E. E., Gange, S. J., Muñoz, B., & West, S. K. (2006). Driving status and risk of entry into long-term care in older adults. *American Journal of Public Health*, **96**, 1254–1259. doi:10.2105/AJPH.2005.069146

Giles-Corti, B., Bull, F., Knuiman, M., McCormack, G., Van Niel, K., Timperio, A., …, Boruff, B. (2013). The influence of urban design on neighbourhood walking following residential relocation: Longitudinal results from the RESIDE study. *Social Science & Medicine*, **77**, 20–30. doi:10.1016/j.socscimed.2012.10.016

Kasper, J. D., & Freedman, V. A. (2014). *National Health and Aging Trends Study user guide: Rounds 1 & 2: Final release*. Baltimore: Johns Hopkins University School of Public Health. Retrieved from http://www.nhats.org/scripts/documents/NHATS_User_Guide_R1R2_Final_Release_Feb2014.pdf

Keysor, J. J., Jette, A. M., LaValley, M. P., Lewis, C. E., Torner, J. C., Nevitt, M. C., ..., Multicenter Osteoarthritis (MOST) group. (2010). Community environmental factors are associated with disability in older adults with functional limitations: The MOST study. *Journal of Gerontology: Biological and Medical Sciences*, **65**, 393–399. doi:10.1093/gerona/glp182

Koohsari, M. J., Sugiyama, T., Lamb, K. E., Villanueva, K., & Owen, N. (2014). Street connectivity and walking for transport: Role of neighborhood destinations. *Preventive Medicine*, **66**, 118–122. doi:10.1016/j.ypmed.2014.06.019

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2003). The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Medical Care*, **41**, 1284–1292. doi:10.1097/01.MLR.0000093487.78664.3C

Lawton, M. P., & Nahemow, L. (1973). Ecology and the aging process. In C. Eisdorfer, & M. P. Lawton (Eds.), *The psychology of adult development and aging* (pp. 619–674). Washington, DC: American Psychological Association.

Lehning, A. J. (2014). Local and regional governments and age-friendly communities: A case study of the San Francisco Bay Area. *Journal of Aging & Social Policy*, **26**, 102–116. doi:10.1080/08959420.2014.854140

Li, C., Friedman, B., Conwell, Y., & Fiscella, K. (2007). Validity of the Patient Health Questionnaire 2 (PHQ-2) in identifying major depression in older people. *Journal of the American Geriatrics Society*, **55**, 596–602. doi:10.1111/j.1532-5415.2007.01103.x

Marottoli, R. A., & Coughlin, J. F. (2011). Walking the tightrope: Developing a systems approach to balance safety and mobility for an aging society. *Journal of Aging & Social Policy*, **23**, 372–383. doi:10.1080/08959420.2011.605655

Menec, V. H., Means, R., Keating, N., Parkhurst, G., & Eales, J. (2011). Conceptualizing age-friendly communities. *Canadian Journal of Aging*, **30**, 479–493. doi:10.1017/S0714980811000237

Mezuk B., & Rebok G. W. (2008). Social integration and social support among older adults following driving cessation. *Journal of Gerontology: Social Sciences*, **63**, S298–S303. doi:10.1093/geronb/63.5.S298

Montaquila, J., Freedman, V. A., Edwards, B., & Kasper, J. D. (2012). *National Health and Aging Trends Study Round 1 sample design and selection*. NHATS Technical Paper #1. Baltimore: Johns Hopkins University School of Public Health. Retrieved from http://www.nhats.org/scripts/sampling/NHATS%20Round%201%20Sample%20Design%2005_10_12.pdf

Müller-Riemenschneider, F., Pereira, G., Villanueva, K, Christian, H., Knuiman, M., Giles-Corti, B., & Bull, F. C. (2013). Neighborhood walkability and cardiometabolic risk factors in Australian adults: An observational study. *BMC Public Health*, **15**, 13:755. doi:10.1186/1471-2458-13-755.

Ragland, D. R., Satariano, W. A., & MacLeod, K. E. (2005). Driving cessation and increased depressive symptoms. *The Journals of Gerontology Series A, Biological Sciences and Medical Sciences*, **60**, 399–403. doi:10.1093/gerona/60.3.399

Robison, J., Shugrue, N., Porter, M., Fortinsky, R. H., & Curry, L. A. (2012). Transition from home care to nursing home: Unmet needs in a home- and community-based program for older adults. *Journal of Aging & Social Policy*, **24**, 251–270. doi:10.1080/08959420.2012.676315

Rosso, A. L., Grubesic, T. H., Auchincloss, A. H., Tabb, L. P., & Michael, Y. L. (2013). Neighborhood amenities and mobility in older adults. *American Journal of Epidemiology*, **178**, 761–769. doi:10.1093/aje/kwt032

Segal-Gidan, F., Varma, R., Salazar, X., & Mack, W. J. (2010). Factors influencing driving status in an older Latino population. *Journal of Aging and Health*, **22**, 332–347. doi:10.1177/0898264309358763

Shimura, H., Sugiyama, T., Winkler, E., & Owen, N. (2012). High neighborhood walkability mitigates declines in middle-to-older aged adults' walking for transport. *Journal of Physical Activity & Health*, **9**, 1004–1008.

Staplin, L., & Freund, K. (2013). Policy prescriptions to preserve mobility for seniors—A dose of realism. *Accident Analysis and Prevention*, **61**, 212–221. doi:10.1016/j.aap.2013.01.014

Turrell, G., Haynes, M., Wilson, L. A., & Giles-Corti, B. (2013). Can the built environment reduce health inequalities? A study of neighbourhood socioeconomic disadvantage and walking for transport. *Health & Place*, **19**, 89–98. doi:10.1016/j.healthplace.2012.10.008

United States Census Bureau. (2012). *Table 1114. Licensed drivers and number in accident by age: 2009*. Retrieved from http://www.census.gov/compendia/statab/2012/tables/12s1114.pdf

United States Department of Transportation, Bureau of Transportation Statistics, & Federal Highway Administration (2003, January). *2001 National Household Travel Survey*, Preliminary Data Release Version 1 (day trip data only). Retrieved from http://nhts.ornl.gov

Webber, S. C., Porter, M. M., & Menec, V. H. (2010). Mobility in older adults: A comprehensive framework. *The Gerontologist*, **50**, 443–450. doi:10.1093/geront/gnq013

Winters, M., Voss, C., Ashe, M. C., Gutteridge, K., McKay, H., & Sims-Gould, J. (2014). Where do they go and how do they get there? Older adults' travel behaviour in a highly walkable environment. *Social Science and Medicine*. **Advance online publication.** doi: 10.1016/j.socscimed.2014.07.006