

Original Research Article

Coming Out of “Retirement” – Predictors of Driving Resumption Among Older Drivers

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Abstract

Background and Objectives: Predictors and consequences of driving cessation in older adults have been studied extensively. This study sought to establish the extent to which former drivers resume driving and identify associated factors.

Research Design and Methods: Descriptive analysis of the 2011–2015 National Health and Aging Trends Study data (Round 1: $n = 6,680$; Round 5: $n = 3,409$) characterized the extent of driving resumption through 2015 by baseline driving status (driver, former driver, never driver). Weighted multivariate logistic regression and multilevel longitudinal models examined predictors of driving resumption.

Results: Among drivers who stopped driving during the study, 17%–28% resumed driving. Age, vehicle ownership, stroke, hospitalization, memory, and perceived transportation barriers were associated with resumption in regression analysis. In multilevel analysis stratified by baseline driving status, poor word recall (OR = 0.62; 95% CI = 0.40, 0.95) and use of public transportation (OR = 9.74; 95% CI = 1.54, 61.77) were significantly associated with driving resumption for baseline drivers, while use of taxi (OR < 0.001; 95% CI = <0.001, 0.02) was negatively associated with resumption for baseline former drivers.

Discussion and Implications: This study highlights several factors associated with driving resumption. Uncertainty about the underlying causes for resumption remains, so results should be interpreted with caution. However, predictive factors may help to identify individuals in need of additional mobility transition counseling. Ongoing transportation assessment may be warranted among former drivers.

Translational Significance: Results suggest that up to 28% of older drivers may stop and re-start driving and that the process of transitioning to nondriving may not be linear. Those most likely to resume were younger than age 85, had better than average memory performance, and had been hospitalized in the past year. Older adult driving status may need to be assessed regularly. Additional research is needed to determine reasons for driving resumption.

Keywords: Driving cessation and resumption, Longitudinal cohort, Predictors, Transportation.

Mobility enables individuals to meet their needs through community resources, and the feasibility, safety, and degree of personal control an individual has on the mode of transportation impacts his or her social and emotional well-being.¹ Reliance on driving is nearly synonymous with transportation mobility in the United States,² and driving is associated with independence and autonomy.³⁻⁵ Even in areas with public transportation, older residents prefer to drive, in part due to difficulties utilizing public transportation, including route locations and schedules, physical difficulties getting on/off, fear of falling or injury, and fear of crime.¹ However, many older adults stop driving due to age-related visual, cognitive, and/or functional decline or medication side-effects.⁴ U.S. men aged 70–74 are expected to outlive their ability to drive by approximately 7 years, and women by 11 years.⁶ With increasing life expectancy, the number of adults aged 65 and older in the United States is estimated to reach 88 million by 2050,⁷ making transportation a major concern.

Literature about age-related changes in driving has primarily focused on identifying factors associated with driving reduction and cessation, such as older age, female, lower education, and living alone,⁸⁻¹¹ or with health consequences (eg, increased risk of dependence, depression, entry into long-term care, mortality) which have been studied extensively.¹²

Conceptual Framework and Hypothesis

The multifaceted decision to stop driving has been described as a progressive continuum through a series of self-imposed restrictions culminating in cessation.¹³ Alternatively, it has been portrayed as self-regulatory feedback loops leading to cessation.¹⁴ In both models, the decision to stop driving is viewed as a permanent condition. Studies typically classify driving status as current driver, former or ex-driver, and never driver while ignoring the possibility of a return to driving.

An early study estimated that 0.5%–10.9% of older adults who lost self-reliance in driving (ie, no longer usually drove themselves) would regain driving self-reliance.¹⁵ A small sample of rural older women who voluntarily stopped driving found that the 48% who were unable to maintain cessation resumed driving within 6–9 months.¹⁶ State driver licensing laws may prohibit driving for a specified period of time due to medical restrictions such as syncope, but a nested case-control study made no mention of this potentially time-limited cessation.¹⁷ Choi and DiNitto¹⁸ appeared to be the first to introduce an expanded, time-dependent method of classifying driving status to include driving resumption. Based on the driving cessation literature, we hypothesized that driving resumption as currently defined may include those temporarily suspending driving (eg, due to a medical condition) and those who intended to stop driving but resumed from necessity (eg, lack of acceptable alternative transportation).

The stages of change/trans-theoretical model (TM) has been used to understand driving reduction and cessation.^{19,20}

The TM model may not apply to all driving cessation situations, however, because driving is not inherently problematic behavior. It only becomes so when performed by those with impaired ability, and not all changes in driving status are related to driving skill or ability.²⁰

TM describes a process of moving from precontemplation (lack of awareness of a problematic behavior) through stages of contemplation (aware but uncommitted), preparation (deciding to act), and action (behavior modification lasting up to 6 months) until a new behavior consistently replaces the problematic behavior in the maintenance stage.²¹ Although a return to prior behavior may repeatedly loop through earlier stages until the new behavior becomes set, thus terminating the change process,²¹ to our knowledge this aspect has not been incorporated into previous driving cessation literature.

In behavioral psychology, return to unwanted or problematic behavior following a period of improvement or abstinence is common,²² particularly during the first year.²³ Cognitive behavioral strategies to identify high-risk contextual factors (e.g., people, places, events) that may trigger a return to prior behavior help individuals make informed decisions by evaluating expectations, building coping skills, increasing self-efficacy, and developing a plan or roleplaying responses to potential triggers.²²

When TM has been applied to driving cessation, it has not explicitly addressed the need for contingency planning during maintenance to sustain nondriving behavior. Lack of planning for driving cessation, in general, is a noted problem. In a survey of older adults, only 6% had thought a lot about what they would do if they had to stop driving, and no former drivers had made plans for cessation.²⁴ Thus, a certain amount of driving resumption is to be expected in the general population of older adults as those facing transportation challenges may fall back into long-established travel behaviors, regardless of their reason for initially ceasing to drive. Although some individuals may recover from a temporary condition that prevented driving and resume without additional difficulty, this remains unstudied.

Our goal for this exploratory study was to expand the research focus of older adult driving patterns by drawing attention to driving resumption and establishing the extent to which this occurs among Medicare beneficiaries across 5 years of data. We hypothesized that resumed drivers differed from continued former drivers (ie, those who maintained driving cessation) based on sociodemographic, health/mental health, and transportation factors. In line with our proposed view of different classifications of driving resumption, we anticipated that younger age, major surgery, and stroke might be associated with a temporary suspension of driving. Among those with potential functional limitations, we anticipated that those living in rural areas (which have fewer alternative transportation options²⁵), lacking social resources (living alone, small social network), and reporting transportation barriers would be likely to resume.

Research Design and Methods

Data and Sample

The National Health and Aging Trends Study (NHATS) is sponsored by the National Institute on Aging (grant number NIA U01AG032947) through a cooperative agreement with the Johns Hopkins Bloomberg School of Public Health. Data are from public use files of Rounds 1–5 (2011–2015).²⁶ NHATS has been described elsewhere.^{27,28} The data set provides a nationally representative sample of Medicare beneficiaries aged 65 years and older living in the contiguous United States at recruitment, with oversampling of non-Hispanic Blacks and those aged 85 and older. The current study was limited to community-dwelling self-respondents ($n = 6,680$) at baseline, which excluded participants residing in various types of residential care facilities ($n = 1,048$) and those who were represented by a proxy respondent (eg, family member) due to dementia, illness, and/or speech or hearing impairment ($n = 517$).¹⁸

Measures

Driving status

Time-dependent driving status was set at baseline and updated based on the previous round classification (Supplementary Figures 1a and 1b). Status was based on a series of questions from the Driving and Transportation subsection of the survey including driving frequency in the past month and whether the individual drove since last interview. Baseline driving status was assigned as current driver (drove in past month), former driver (not a current driver but did not identify as never driving, whether or not the respondent could report the date/age/year last drove), or never driver.¹⁸ In subsequent rounds, never drivers were flagged and not asked to respond to driving frequency questions and were therefore excluded from further analysis.²⁹ For Rounds 2–5, four categories of driving status were used to capture change in driving status from the previous round. For example, Round 2 driving categories were defined as continued driver (current driver in both baseline and current round), resumed driver (baseline former driver but drove at any time during the past year), new former driver (baseline driver but not a current driver), and continued former driver (baseline former driver and did not drive in the past year). Driving categories in subsequent rounds were determined in a similar fashion. Resumed driving was treated as a dichotomous outcome using “no” as a reference.

Sociodemographic

Potential predictors were selected based on the driving reduction and cessation literature and available in the NHATS data: gender, baseline age (5-year categories), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic), birthplace (U.S.-born, foreign-born), living arrangement (with spouse/partner, with someone other than spouse/partner, alone), education (less than high

school, high school or above), Medicaid insurance at baseline, vehicle ownership, social network size (0–5), and residence in a metropolitan area.

Health and mental health

Self-rated health was dichotomized as good-to-excellent versus poor-to-fair. Chronic health conditions (heart attack/heart disease, high blood pressure, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia/Alzheimer’s disease, and cancer) were examined separately and as total number of conditions (0–9). Overnight hospitalization in the past year, surgery (knee, hip, back, or heart) in the past year, vision impairment (based on a series of self-report questions about the ability to see across the street, across the room, and close-up) were dichotomous. Depressive symptom severity (2–8, with a higher number indicating increased severity) was based on the Patient Health Questionnaire-2. Memory was measured as immediate word recall score (0–10, with higher numbers indicating better recall) and self-rated memory (good-to-excellent vs poor-to-fair).

Transportation

NHATS participants were asked at each round how, other than driving, they got to places outside the home/building in the past month: (a) walk (including wheelchair or scooter); (b) ride from family, friend, or paid help; (c) van/shuttle provided by place of residence; (d) van/shuttle for seniors or those with disabilities; (e) public transportation; (f) taxi; and (g) other. Because the analysis was limited to community-dwelling respondents, use of shuttle provided by place of residence had low frequency and was excluded. Perceived transportation barriers was based on a series of questions asked of noncurrent drivers about whether a transportation problem kept them from (a) visiting in person with those not living with respondent; (b) attending religious services; (c) participating in organized social activities; and (d) going out for enjoyment (eg, dinner, movie, gambling). Because a reliability study suggested that these be used as a summary measure they were summed as number (0–4) of perceived transportation barriers.³⁰

Statistical Analysis

All analyses were conducted using SAS software, Version 9.4 (SAS Institute, 2012). Statistical significance for analyses was determined using two-tailed testing with $p < .05$ except during initial univariate analyses for model building, which used $p < .25$ to retain a wider range of potential variables. Casewise exclusion was used for modeling when subjects were missing data for the variable(s) of interest. Both weighted and unweighted descriptive analyses were performed to evaluate sample characteristics and determine the extent of driving resumption. In weighted logistic regression analysis, variance estimates were calculated using the balanced repeated replication (BRR) method to account for sampling weights.³¹

First, we carried out weighted descriptive and logistic regression analyses for baseline sample characteristics. In descriptive analysis, sample characteristics were compared by driving status with three categories (current driver, former driver, and never driver) using the chi-square test for categorical characteristics as well as simple linear regression for continuous characteristics. In weighted logistic regression analysis, we identify potential predictors for driving resumption. Because there is no literature on predictors for driving resumption, we considered the structured purposeful selection procedure to determine a subset of variables to include in the model.³² From the final model, we reported the adjusted odds ratio (aOR) and 95% confidence intervals (CI) of predictors as measures of association.

Second, using the baseline driving status as a stratification variable, we conducted multilevel longitudinal analysis on subsequent rounds of data to assess the impact of the selected predictors on driving resumption. For each time-dependent variable in the model, we further examined the feasibility of treating it as a random or subject-specific effect by using the deviance test for the goodness-of-fit of the model as well as the Wald test for the significance of the variance of the model. A time-dependent variable would be treated as random if the following two conditions were both satisfied: (1) the resulting model was significantly better than the model treating it as fixed, and (2) the within-person variance of the random effect was significantly different from zero. This process was repeated until all random effects included in the model satisfied the above two conditions. Modeling was repeated treating all variables as fixed effects for comparative purposes.

This study was exempt from Institutional Review Board oversight.

Results

Baseline characteristics of the sample by driving status, weighted to create national percentages (Supplementary

Appendix A) include 74.8% of the sample were identified as current drivers, representing 81.3% of the U.S. population of Medicare beneficiaries aged 65 and above. Nationally, an estimated 13.5% of this population were former drivers, and 5.2% never drivers. All baseline characteristics differed significantly by driving status.

Table 1 presents the unweighted number of sample participants by driving status across Rounds 1–5, as well as the number of participants excluded from the analysis due to death or loss to follow-up. Among baseline former drivers, driving resumption eligibility occurred as early as Round 2, while for baseline drivers it did not occur until Round 3 (driver in Round 1, former driver in Round 2, and potential for resumption in Round 3). The proportion of drivers at baseline who stopped and restarted driving during the study period declined over time, from 27.9% in Round 3 to 17.1% in Round 5 (Supplementary Appendix B). Among those who had ever driven but were not driving at baseline (ie, former drivers at baseline), the proportion of resumed drivers ranged from 1.4% to 2.1% following a high proportion of 11.2% in Round 2. This resulted in an overall proportion of resumed drivers ranging from 8.3% in Round 5 to 11.2% in Round 2. Across the study period, 174 (57%) observations of resumed driving were classified as new former drivers in the preceding round, indicating only 1 year of nondriving. Only 15 former drivers had multiple classifications of resumed driving across the study period, indicating a limited amount of cycling through periods of driving and nondriving.

Table 2 presents the final weighted logistic regression model predicting driving resumption in Round 2 among baseline former drivers. Living arrangement, depressive symptoms, use of public transportation, and use of taxi were not statistically significant when adjusting for other covariates although they were retained based on the purposeful selection criteria. Just more than 22% of those in the youngest age category resumed driving, compared with 6% in the oldest age category. Those aged 65–69 were 8.2

Table 1. Count of Sample Participants by Driving Status, NHATS 2011–2015

Driving Status	Round 1 (N = 6,680)	Round 2 (N = 5,434)	Round 3 (N = 4,472)	Round 4 (N = 3,763)	Round 5 (N = 3,409)
Driver (Round 1) or Continued driver (Rounds 2–5)	4,996	3,858	3,101	2,566	2,293
Resumed driver ^a		103	71	70	61
New former driver		286	249	185	176
Former driver (Round 1) or Continued former driver (Rounds 2–5)	1,193	813	766	710	674
Never driver	491	374	285	232	205
Excluded from further analysis					
Died		225	280	234	199
Censored (lost to follow-up)		1,021	682	475	155

Note: N = for driving status includes the total of current/continued drivers, resumed drivers, former/continued former drivers, new former drivers, and never drivers.

^aResumed driver: former driver who drove since last interview.

Table 2. Weighted Logistic Regression Model of Round 2 Driving Resumption Among Round 1 Former Drivers

Variable	OR	95% CI	p Value
Sociodemographic			
Age			.004
65–69 vs 85+***	8.24	2.81, 24.15	<.001
70–74 vs 85+**	4.42	1.64, 11.9	.003
75–79 vs 85+**	3.46	1.53, 7.79	.003
80–84 vs 85+	1.74	0.72, 4.24	.22
Living arrangement			.46
Spouse/partner vs alone	1.21	0.57, 2.57	.62
Other vs alone	0.69	0.32, 1.47	.33
Vehicle owner (yes vs no)**	2.51	1.24, 5.07	.01
Health/mental health			
Stroke (yes vs no)**	0.33	0.14, 0.77	.01
Hospitalization (yes vs no)***	4.07	2.29, 7.21	<.001
Surgery (yes vs no)	1.94	0.78, 4.84	.15
Diabetes (yes vs no)	0.61	0.33, 1.15	.13
Depressive symptoms (2–8), higher is more severe	1.01	0.79, 1.29	.95
Immediate word recall score (0–10), higher is better**	1.34	1.10, 1.63	.003
Self-rated memory (good vs poor)*	2.55	1.09, 5.94	.03
Transportation			
Public transportation (yes vs no)	0.58	0.20, 1.71	.33
Taxi (yes vs no)	0.76	0.19, 3.00	.70
Number of perceived transportation barriers (0–4)**	1.40	1.08, 1.82	.01

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

times more likely to resume driving compared with those aged 85 and above when controlling for other variables (aOR = 8.24; 95% CI = 2.81, 24.15). Approximately 86% of the population owned vehicles, including 42% of former drivers. Among baseline former drivers, 7.3% of those without a personal vehicle resumed driving. Those who owned a vehicle were more than twice as likely to resume driving as those without (aOR = 2.51; 95% CI = 1.24, 5.07). Among the 79.8% of former drivers without a history of stroke, 15.7% resumed driving. Those with history of stroke were 67% less likely to resume driving (aOR = 0.33; 95% CI = 0.14, 0.77). Of the 65.2% of former drivers without a history of hospitalization, 9.1% resumed driving. Those with an overnight hospitalization were four times more likely to resume driving (aOR = 4.07; 95% CI = 2.29, 7.21) compared with those without an overnight hospitalization. The weighted mean word recall score for former drivers was 3.99. For each additional word recalled the odds of driving resumption increased by 34% (aOR = 1.34; 95% CI = 1.10, 1.63). The weighted mean number of perceived transportation barriers was 0.56. For each additional perceived transportation barrier, the odds of driving resumption increased by 40% (aOR = 1.40; 95% CI = 1.08, 1.82).

Table 3 presents the results of the fixed effects multilevel longitudinal analysis, stratified by baseline driving status as follows:

- *Baseline drivers.* Among the 3,479 baseline drivers remaining in the study at Round 3 (who therefore

had the possibility of resumed driving), there were 174 observations of resumed driving. For fixed effects, only use of public transportation (aOR = 3.94; 95% CI = 1.42, 10.94) was significant. In the random-effects model (results not shown), only depressive symptoms ($p = .002$) and immediate word recall score ($p < .001$) were statistically significant random effects, meaning that there was significant within-person variation in the effect of each predictor on the outcome over time.

- *Baseline former drivers.* Among the 916 baseline former drivers who remained in the study at Round 2 and therefore had the potential classification as resumed driver, there were 131 observations of resumed driving. Round of data collection was negatively associated with driving resumption (aOR = 0.35; 95% CI = 0.26, 0.45). Age was also associated with driving resumption, following a trend of decreasing association as age category increased. Those who lived with someone other than a spouse or partner were less likely to resume driving compared with those who lived alone (aOR = 0.52; 95% CI = 0.30, 0.89) although those who lived with a spouse or partner were not statistically different compared with those who lived alone. Those who owned a personal vehicle were 2.85 times more likely to resume driving than those who did not (aOR = 2.85; 95% CI = 1.76, 4.61). Self-rated memory (aOR = 1.63; 95% CI = 1.02, 2.60) and immediate word recall score (aOR = 1.16; 95% CI = 1.02, 1.32) were both associated with driving resumption when controlling for other factors.

Table 3. Fixed Effects Longitudinal Regression Analysis of Driving Resumption, Stratified by Baseline Driving Status

Variables	Drivers (<i>n</i> = 8,809)			Former drivers (<i>n</i> = 2,198)		
	aOR	95% CI	<i>p</i> Value	aOR	95% CI	<i>p</i> Value
Time						
Round (centered, unit change from mean)				0.35	0.26, 0.45	<.001
Sociodemographic						
Gender (male vs female)	0.47	0.20, 1.12	.09			
Age						
65–69 vs 85+				6.76	3.30, 13.84	<.001
70–74 vs 85+				4.79	2.38, 9.61	<.001
75–79 vs 85+				3.43	1.75, 6.72	<.001
80–84 vs 85+				1.71	0.82, 3.56	.15
Living arrangement						
Spouse/partner vs alone	1.73	0.70, 4.30	.24	0.68	0.40, 1.16	.16
Other vs alone	2.08	0.77, 5.65	.15	0.52	0.30, 0.89	.02
High school degree or equivalent (no vs yes)	1.76	0.69, 4.50	.24			
Vehicle owner				2.85	1.76, 4.61	<.001
Health/mental health						
Self-rated memory (good vs poor)	0.95	0.47, 1.94	.89	1.63	1.02, 2.60	.04
Immediate word recall score (per unit change from mean)	0.87	0.72, 1.06	.16	1.16	1.02, 1.32	.02
Depressive symptoms (per unit change from mean)	0.96	0.76, 1.21	.71			
Hospitalization				1.68	1.12, 2.52	.01
Transportation						
Public transportation (yes vs no)	3.94	1.42, 10.94	.009			
Taxi (yes vs no)	0.48	0.11, 2.18	.34	0.29	0.10, 0.82	.02
Transportation barriers (yes vs no)				0.28	0.10, 0.80	.02

Note: Covariate selection for stratified models was developed separately, resulting in slightly different final models. Results significant at $p \leq .05$ are bolded. aOR = adjusted odds ratio; CI = confidence interval.

Those with a history of overnight hospitalization in the past year were 1.68 times more likely to resume driving than those without hospitalization (aOR = 1.68; 95% CI = 1.12, 2.52). Use of taxi (aOR = 0.29; 95% CI = 0.10, 0.82) and any perceived barriers to transportation (aOR = 0.28; 95% CI = 0.10, 0.80) were negatively associated with driving resumption. In the random-effects model (results not shown), there was a statistically significant within-person variation for a round of data collection ($p = .008$) and immediate word recall score ($p = .03$).

Discussion and Implications

Driving resumption varies over time, and appears most likely to occur soon after driving cessation, as indicated by the 57% of resumed drivers who had stopped driving in the previous round. In contrast, less than 5% of those classified as continued former drivers resumed driving during Rounds 3–5. This supports Johnson's research which found 48% of participants resumed driving within 6–9 months of voluntary cessation.¹⁶ Despite acknowledged physical and functional declines leading to the decision to stop driving, reasons cited for resumed driving included inadequate alternative transportation options to meet needs (eg, shopping, medical appointments) for self or friends.¹⁶

Existing cross-sectional analyses may overestimate driving due to selection bias.⁸ However, reporting resumption as a percentage of ever drivers or all study participants, such as the estimated 1.4% of participants reported by Choi and DiNitto,¹⁸ may underestimate the occurrence because doing so includes continued and never drivers. Driving resumption in this study was defined more broadly, using the additional flagged response of having driven since the last interview rather than limiting resumption to current driving status. We believe our results captured greater nuance in driving habits and showed higher driving resumption.

To our knowledge, this study is the first to explicitly explore extent and predictors of driving resumption among older adults. Although the phenomenon was identified more than 25 years ago,¹⁵ it has gone largely unstudied until now. This study demonstrates that a portion of older drivers experiences episodes of driving cessation and resumption, and that a small minority of resumed drivers cycle through periods of driving and cessation. Additionally, this study identified several sociodemographic, health/mental health, and transportation factors associated with driving resumption, including age, living with others, vehicle ownership, stroke, overnight hospitalization, memory, public transportation, taxi, and perceived transportation barriers, each of which will be discussed briefly below.

The decreasing percentage of resumed drivers across the study may be a reflection of participant aging. The decreasing odds trajectory for age is consistent with studies of driving cessation, in which older individuals were found to be less likely to drive than younger individuals.^{8,9,33–35}

Living arrangement was only significant in longitudinal analysis of baseline former drivers. Those who lived with others were less likely to resume driving compared with those who lived alone, with no statistically significant difference between those who lived with a spouse versus those who lived alone. Johnson¹⁶ found all the rural women who resumed driving lived alone, which would seem to indicate that this is an area for further study. One possible explanation is that those living with others were more easily able to obtain rides.

Although individuals who did not own vehicles still reported active driving, owning a car significantly increased the odds of resumption. This finding likely reflects the sentiment expressed in a qualitative study of driving self-regulation about having a car available for use when absolutely necessary.³

In logistic regression, a history of stroke decreased the odds of driving resumption by 67%. However, stroke was not included in the final longitudinal models due to the lack of significance in the model building process. The negative association for stroke is consistent with a study that found stroke history was independently associated with driving cessation.³⁵ A study of stroke patients found that only 31%³⁶ of preincident drivers had resumed driving by 6 months poststroke.³⁷ As a brain injury, stroke can result in lack of muscle control as well as cognitive impairment, both of which are important capabilities for driving safely. Even acute mild stroke may initially impair an individual's ability to handle complex driving tasks.³⁸

History of overnight hospitalization in the past year was highly statistically significant. In longitudinal modeling among former drivers, hospitalization increased odds of resumption by 68%. One possible explanation for this finding is survivor bias; only those who survived to the next round of data were included in the analysis. The data may also reflect the operationalization of the driving variable. Recovery from an acute condition (eg, major surgery) may have prohibited driving for at least a month but would not necessarily imply an intention to permanently stop driving. Potential confounding due to undefined variables is also possible.

Both measures of memory (self-rated and immediate word recall score) were statistically significant in the logistic model. Those with good (vs poor) self-rated memory were 2.55 times more likely to resume driving, while for each additional word recalled, the odds of driving resumption increased by 34%. Both memory variables remained statistically significant in the longitudinal fixed effects model among former drivers but were not significant among baseline drivers. Cognitive decline (including memory) has been associated with driving cessation,⁸ and conversely, driving cessation has been associated with increased cognitive decline.³⁹ Thus, perceived and objective memory may

indicate preservation of cognitive functioning and thus the interest in and ability to resume driving.

Baseline drivers were 3.94 times more likely to resume driving if they used public transportation (vs no) in fixed effect modeling. While additional study into the effects of various alternative means of transportation is recommended, these findings suggest that for those accustomed to driving, the use of public transportation may not be an adequate substitute.¹ Perhaps individuals who used public transportation were healthier than those who did not and were, therefore, able to resume driving. Another possible explanation is that individuals who used public transportation found that it did not adequately meet their needs and therefore resumed driving from perceived necessity. For individuals with cognitive or functional impairment, driving may have seemed easier than using public transportation, even if the driver was unsafe in doing so. This explanation would appear to be consistent with literature regarding preferences of older adults to utilize personal vehicles rather than public transportation and potential difficulties in utilizing such services even in areas in which they are available.¹

In fixed effect modeling, baseline former drivers who used a taxi (vs no) were 71% less likely to resume driving. Taxi service is very similar to using a personal vehicle in terms of flexibility of travel time and route, so those who used taxi service may have had their transportation needs adequately met and had the financial resources to use such services. Similarly, newer on-demand ride share services such as Uber and Lyft as well as community-based volunteer driver programs may also be a means of meeting transportation needs, although those in very rural areas may have limited access to such services. The survey wording may not adequately capture these alternative ride-share options. In initial univariate analysis, getting a ride from family, friend, or paid help was not statistically significant and was not included in further model-building analysis.

The number of perceived transportation barriers was statistically significant in the logistic model, with a 40% increased odds of resumption for each additional barrier. In fixed effects longitudinal analysis of former drivers, the variable was dichotomized (yes vs no) due to model complexity, and those with any (vs no) perceived transportation barriers were 72% less likely to resume driving. These apparent opposite effects may be an artifact of variable categorization, as well as the relatively low number of individuals with perceived transportation barriers because only those who were not currently driving were asked to answer the perceived barrier questions. Further study into the association between driving status and perceived transportation barriers is recommended.

Strengths of this study include the explicit recognition of driving resumption as a time-dependent behavior within the context of driving reduction and cessation. This study examined a variety of factors that may influence driving resumption as a research artifact (temporary suspension

without intention to give up driving) or as a return to prior behavior and followed a structured method of variable selection and statistical model building. Initial selection of potential variables was based on the literature relating to driving reduction and cessation. Longitudinal fixed effect modeling utilized 5 years of annual data collection.

Study limitations primarily relate to secondary data analysis and the availability of variables in the public-use NHATS data files. A limitation common to surveys based on self-report is the potential for misclassification. NHATS used both self-response as well as proxy respondents. Inclusion at baseline was limited to self-respondents but this criterion did not extend to subsequent rounds of data collection, and proxy status was not assessed in this analysis. Additionally, respondents may not accurately remember the time since they last drove. Another potential limitation was the relatively small number of resumed drivers, which resulted in some variables being omitted from analysis due to small cell counts (such as specific types of surgery) and other variables being dichotomized to increase cell counts. The dichotomous urban/rural variable was excluded from model building due to lack of statistical significance, but geographic context should be considered in future studies of driving status.

It was not possible to examine the specific transportation options available to participants. While NHATS collected data on a wide range of topics and included objective measures of physical performance, it was not designed to examine changes in driving patterns and as such, it did not include objective measures of key functional ability associated with driving, such as a visual-cognitive processing speed as measured by the useful field of view test, which has been associated with driving reduction and is predictive of crashes.⁴⁰⁻⁴² Likewise, NHATS did not collect information about driving ability (such as road or simulator tests), self-identification of driving status, driving history (eg, current licensure, history of crashes, or citations), driving rehabilitation services, use of mobility transition counseling/planning, or reasons for changes in driving status.

This study raises important methodological considerations. Driving cessation literature does not use a standardized definition of current versus former driver. Rather than using driving history (or frequency) in the past month or past year, perhaps the use of 3- or 6-month intervals would be a more accurate representation of actual driving habits, as suggested by Johnson's finding of resumption after 6-9 months.¹⁶ A comparison between researcher-defined driving status (eg, based on driving frequency) and older adult self-identification of driving status may also provide additional insight. More research is needed to ascertain the circumstances surrounding driving resumption such as an extension of qualitative research exploring driving reduction and cessation.^{3,5,43} We hypothesized that resumption is not a uniform experience and proposed two basic scenarios—temporary suspension of driving without intention to stop (eg, for acute medical condition or temporary license suspension) and intention to stop but resumption

out of perceived necessity. Testing the hypothesis about classifying driving resumption was beyond the scope of this initial study but is an area for future research. Older adult perspectives into driving from necessity and acceptable alternative transportation are needed to further inform interventions targeted to meeting the unmet needs of these older adults.

Driving resumption differed by form of alternative transportation that was used, so promotion of alternative transportation options that more closely resemble the use of private vehicles (such as taxi, Uber and Lyft, and volunteer driver programs) that are financially affordable to older drivers may be an important policy consideration. It should be noted, however, that many older adults may have technological barriers to utilizing app-based services. Only 42% of older adults own smartphones, and those who do tend to be younger, have greater financial resources, and have higher educational attainment.⁴⁴ Thus, those with the fewest resources may be least able to utilize mobile ridesharing options. Provision of nonemergency medical transportation is available in some rural areas, but these services typically do not include rides for meeting basic necessities, such as grocery shopping or socialization activities. Therefore, transportation and health policy should consider the needs of older adults who may not be able to drive safely but see no viable alternatives to meeting their basic needs.

This study also sheds light on an important aspect of driving among older adults. Driving reduction and cessation is a recognized experience for many older adults as they face declining physical and/or cognitive functioning. Results suggest that some older drivers may stop and restart driving, and that the process of transitioning to non-driving may not be a linear progression. Those working with older adults may need to consider regular follow-up about driving status to ascertain unmet transportation needs, particularly in relation to life changes (eg, partner/spouse health event or death, relocation, etc.). By identifying driving resumption as part of the driving behavior change process associated with aging, this study highlights the importance of considering the needs of those who resume driving, possibly due to a health-related hiatus from driving (such as recovery from an acute health condition) or due to perceived necessity in response to unmet transportation needs. Promotion of driver rehabilitation services, such as for those recovering from strokes or other medical conditions, may help older adults resume driving safely. Health practitioners and mobility counselors should also consider asking patients who may have stopped driving about their driving and transportation use while considering the possibility of resumption.

Supplementary Material

Supplementary data are available at *Innovation in Aging* online.

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Conflict of Interest

None reported.

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