

The Potential Impact of Driving Cessation for Rural and Urban Older Adults: AAA LongROAD Study

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The influence of driving on the well-being of older adults has been documented in multiple studies demonstrating the declines in social engagement, cognitive and physical function and survival following driving cessation (Choi, et al., 2013; Curl et al., 2014; Doebler, 2016; O’Connor et al., 2013; Tyrovolas et al., 2017). The motivation to continue driving may be especially pronounced for older adults in rural areas because of limited options for public and other alternative sources of transportation as well as the longer distances between regular destinations such as grocery stores, pharmacies, health care providers and locations for social activities (Byles & Gallienne, 2012; Donorfio et al., 2009; Johnson, 2002, Payyandadan et al., 2018). Thus, investigators speculate that older rural drivers may be more likely than urban drivers to continue driving despite various physical and cognitive limitations (e.g. Byles & Gallienne, 2012). This study examines whether there are urban-rural differences in how older adults rate the potential impact that driving cessation would have on their lives. Results confirm that older drivers from a rural area rate the prospect of driving cessation as more impactful on their lives and that these perceptions may influence their decision to continue driving despite health decline.

METHODS:

AAA LongROAD is a prospective, multisite cohort study of personal, vehicular and environmental factors that predict the driving behaviors, patterns and outcomes (e.g. crashes, convictions) of older adults. A total of 2,990 women and men 65-79 years of age were recruited from health systems at five study sites (Ann Arbor, MI; Baltimore, MD; Cooperstown, NY; Denver, CO; and San Diego, CA). Details regarding the study design and methods are described in Li et al., (2017).

The data for these analyses were collected at the baseline visit for all participants. The potential impact of driving cessation was based on responses to the following questions:

Measuring Potential Impact of Driving Cessation
If you could not drive, how much would it affect what you <i>want</i> to do?
If you could not drive, how much would it affect what you <i>need</i> to do?

The response options for these questions ranged from 1 to 7, with 1 labeled as “not at all” and 7 labeled as “completely.” For each of these questions, “completely”

was the modal response. In the analyses, high potential impact of driving cessation was classified as “yes” (response option 7) or “no” (response options 1-6).

The designation of urban or rural residence was based on the Rural Urban Commuting Area (RUCA) values for ZIP codes of study participants (Hall et al., 2006). Over two-thirds of LongROAD study participants lived in the core region of metropolitan statistical areas. Two smaller categories of participants were defined by residence within the non-core region of a metropolitan statistical area and by residence in non-metropolitan areas. Following similar logic and nomenclature used in a Pew Research Center report (Parker et al., 2018), these three RUCA categories are referred to as urban, suburban and rural, respectively.

Sociodemographic characteristics recorded at the baseline visit and included in the analyses were age, gender, marital status, race and ethnicity, educational attainment, household income and whether the participant was employed. In addition to the questions about potential impact of driving cessation, participants were asked how many days they drove in a typical week; how many miles they drove on most trips out and back from home; the other forms of transportation recently used (in addition

to driving oneself); whether a friend or family member was available to give them rides; and whether there was someone who depended on them for driving. These sociodemographic and driving-related characteristics were included in the analyses as variables that might vary across RUCA categories and help explain differences in the ratings of potential impact of driving cessation.

A chi-square test statistic was computed for the bivariate analyses of the RUCA categories with the two measures of potential impact from driving cessation. To further assess whether high ratings for potential impact of driving cessation varied by RUCA categories, logistic regression models were computed separately for each outcome measure. Odds ratios and 95% confidence intervals are reported for the RUCA categories with the urban category serving as the referent. The models also adjusted for the sociodemographic and driving-related variables.

RESULTS:

Sociodemographic and driving characteristics of the AAA LongROAD study population by RUCA categories are summarized in Table 1. Residents of urban areas were more likely to be college graduates and have higher levels of income. The race and ethnicity of the study population was predominantly white and non-Hispanic, especially beyond the urban areas. The percentage of participants who reported normally driving each day of the week was approximately similar across the three RUCA categories. Residents of the suburban and rural areas had a higher percentage of most trips from home being longer than 15 miles. Recent use of alternative forms of ground transportation was more common in urban areas. Virtually all participants, regardless of area of residence, indicated that a friend or family member was available to give them a ride.

Responses to the survey questions on potential impact of driving cessation are shown in Table 2. For both questions the potential impact of driving cessation increased across categories of urbanicity, with older adults living in rural areas being especially much more likely to perceive a major impact on their lives.

Logistic regression models were designed to specifically contrast suburban and rural residents with those who live in urban areas, while adjusting for sociodemographic and driving-related characteristics that may also potentially predict impact of driving cessation (see Table 3). Among

the sociodemographic characteristics, the potential impact of driving cessation was stronger for women than men, but less impactful for married than non-married participants. The impact of driving cessation was also inversely related to years of education. Older adults still working for pay reported that driving cessation would specifically impact what they needed to do.

Driving frequency and miles driven on most trips from home were both directly related to the potential impact of driving cessation, while impact tended to be lower among recent users of the alternate forms of transportation. Driving cessation had less impact if a friend or relative was available to provide rides, but had more impact on the needs of participants who served as the driver for someone else. Finally, the greater potential impact of driving cessation that was observed for rural residents in Table 2 persisted after adjustment for the additional influence of sociodemographic and driving-related characteristics.

DISCUSSION:

Data from the AAA LongROAD study cohort indicated that older drivers from a rural area were more likely to rate the prospect of driving cessation as very impactful on their lives. Adjustment for the sociodemographic and driving-related variables had little effect on the association between rural-urban status and the potential impact of driving cessation. As others have noted, these perceptions may influence older rural adults to continue driving despite the challenges posed by age-related decline in cognitive, sensory and motor abilities (Owsley, 2004).

In a study exploring health care providers' mobility counseling provision to older drivers, subjective judgments about driving ability were included in a mail survey of adults 65 years of age or older in randomly selected households of five Midwestern and Western states (Huseth, 2014). The sample was stratified by rurality using Rural-Urban Continuum Codes (Hall et al., 2006) in order to examine urban-rural differences in attitudes about driving. Among the 775 respondents (412 rural, 363 urban) who stated that they were still driving, urban respondents were more likely than rural respondents to rate their driving ability as "excellent" (49% vs. 40%) and confidence in their driving ability as "very confident" (48% vs. 38%). These differences may have reflected underlying differences in the aforementioned physical and cognitive function of older rural and urban drivers. This comparison will be examined

in future analyses of objective measures of functional status being collected in the AAA LongROAD Study.

The greater potential impact of driving cessation for older rural adults may require strategies to enhance both the ability to drive safely and the accessibility of alternative sources of transportation. Accessibility of alternate sources of transportation include national transportation network services and rideshare programs that serve as convenient and cost-effective methods of mobility. Programs have been developed to improve driving ability through education about coping with high-risk conditions and situations; on-road training sessions; physical conditioning for better flexibility and range of motion; and use of driving simulators for visual processing speed training (Boot et al., 2014). Technological advances in driving support systems may also be particularly helpful for safety concerns of older rural adults, e.g. poorly lit roads, narrow roads without shoulders, limited visibility of roadside objects and animals (Payyanadan et al., 2018). Improvements in rural public transportation will be critical for reducing the impact of driving cessation. While the economic and logistical challenges for rural public transportation have been recognized, so have important strategic principles (e.g. flexible services, interagency coordination and tailored outreach to potential riders) for addressing these challenges and meeting the transportation needs of the older rural adult population (Bond et al., 2017; Kostyniuk et al., 2012; Wood et al., 2016).

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ABOUT THE AAA FOUNDATION FOR TRAFFIC SAFETY

The AAA Foundation for Traffic Safety is a 501(c)(3) nonprofit, publicly supported charitable research and education organization. It was founded in 1947 by the American Automobile Association to conduct research to address growing highway safety issues. The organization's mission is to identify traffic safety problems, foster research that seeks solutions and disseminate information and educational materials. AAA Foundation funding comes from voluntary, tax-deductible contributions from motor clubs associated with the American Automobile Association and the Canadian Automobile Association, individual AAA club members, insurance companies and other individuals or groups.

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Table 1: Sociodemographic and Driving-related Characteristics of Older Adult Drivers from Metropolitan and Non-Metropolitan Areas: the AAA LongROAD Study Cohort

	URBAN (N = 2,181)	SUBURBAN (N = 415)	RURAL (N=394)
<i>Sociodemographic Characteristics</i>			
Years of Age - mean (SD)	71.0 (4.1)	71.4 (3.9)	71.5 (4.0)
% Female	53.0	51.8	54.8
% Married or Living with Partner	65.0	73.9	68.0
% White, Non-Hispanic	81.4	95.2	99.0
% ≥ 16 Years of Education	68.9	48.7	55.9
% Income ≥ \$100,000	37.7	22.3	20.1
% Working for Pay	31.3	26.7	28.4
% Working as Volunteer	46.0	44.2	48.0
<i>Driving-related Characteristics</i>			
% Drive 7 days/week	44.9	38.6	43.4
% Most trips from home > 15 miles	24.8	48.4	45.9
<i>Used Forms of Transportation</i>			
% Public Bus in last 3 months	13.7	6.3	7.1
% Train/Subway in last 3 months	20.0	9.9	10.7
% Taxi in last 3 months	18.9	8.4	9.6
% Someone available to give me rides	94.7	96.4	95.4
% Someone depends on me for rides	26.8	23.4	20.9

Table 2: Potential Impact of Driving Cessation for Older Adult Drivers from Metropolitan and Non-Metropolitan Areas: the AAA LongROAD Study Cohort

	URBAN (N = 2,181)	SUBURBAN (N = 415)	RURAL (N=394)	P value
Impact of Cessation on What You Want to Do (% High)	43.8	49.2	60.2	< 0.001
Impact of Cessation on What You Need to Do (% High)	36.3	40.2	53.8	< 0.001

Table 3: Logistic Regression Models for the Association of Sociodemographic Characteristics, Driving-Related Characteristics and Rural/Urban Residence with the Potential Impact of Driving Cessation in Older Adult Drivers: the AAA LongROAD Study Cohort

VARIABLE (contrast)	Impact of Driving Cessation on What you Want to Do OR (95% CI)	Impact of Driving Cessation on What you Need to Do OR (95% CI)
<i>Sociodemographic Variables</i>		
Age (year)	0.98 (0.96, 1.00)	0.98 (0.96, 1.00)
Gender (Female/Male)	1.64 (1.39, 1.93)	1.74 (1.47, 2.07)
Race-Ethnicity (White, Non-Hispanic/other)	1.03 (0.82, 1.29)	0.86 (0.68, 1.08)
Marital Status (Married, with Partner/other)	0.79 (0.66, 0.94)	0.73, (0.61, 0.88)
Education (≥ 16 years/< 16 years)	0.77 (0.65, 0.92)	0.73 (0.61, 0.87)
Income (≥ \$100,000/ < \$100,000)	1.10 (0.91, 1.32)	0.96 (0.79, 1.16)
Working as Volunteer (yes/no)	0.95 (0.81, 1.11)	0.90 (0.77, 1.06)
Working for Pay (yes/no)	1.10 (0.94, 1.32)	1.33 (1.11, 1.59)
<i>Driving-related Variables</i>		
Drive 7 days/week (yes/no)	1.48 (1.26, 1.73)	1.51 (1.28, 1.78)
Most trips from home > 15 miles (yes/no)	1.22 (1.03, 1.45)	1.31 (1.10, 1.56)
Used bus in last 3 months (yes/no)	0.78 (0.60, 1.01)	0.71 (0.54, 0.94)
Used train/subway in last 3 months (yes/no)	0.80 (0.64, 1.01)	0.79 (0.62, 1.01)
Used taxi in last 3 months (yes/no)	0.77 (0.61, 0.97)	1.04 (0.82, 1.32)
Someone available to give rides (yes/no)	0.52 (0.37, 0.73)	0.57 (0.41, 0.81)
Someone depends on me for rides (yes/no)	1.10 (0.92, 1.31)	1.41 (1.18, 1.70)
<i>Geographic Variables</i>		
RUCA Category (suburban/urban)	1.15 (0.91, 1.45)	1.13 (0.89, 1.44)
RUCA Category (rural/urban)	1.82 (1.44, 2.31)	2.03 (1.60, 2.58)

Bold values denote statistical significance at the p<0.05 level