

Patterns of Self-Reported Driving While Intoxicated Among Older Adults: AAA LongROAD Study

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Drinking and driving continues to be a major public health problem. The relationship between driving while intoxicated (DWI) and crashes is well-established, with DWI responsible for 28% of today's crash deaths (NHTSA, 2017). Older adults form a significant proportion of the population of drivers who drink and drive. Indeed, the Substance Abuse and Mental Health Services Administration's (SAMHSA) National Survey on Drug Use and Health (NSDUH) found that 4% of adults age 65 years and older reported driving under the influence of alcohol in the past year (Lipari, Hughes, & Bose, 2016). The risks of alcohol use in older drivers are exacerbated by delayed alcohol metabolism, increased use of medications, and declining physical and cognitive functioning. Using baseline data from a large national study of drivers ages 65 and older, we document the prevalence of self-reported alcohol use and alcohol use while driving as well as sociodemographic, health and behavioral factors associated with alcohol use while driving.

METHODS

This study uses baseline data from the longitudinal, multisite AAA LongROAD study, described in detail elsewhere (Li et al., 2017). The study aims to explore the role of medical, behavioral, social, technological and environmental factors in safe driving among older adults. It enrolled 2,990 older drivers at five study sites (Ann Arbor, Michigan; Baltimore, Maryland; Cooperstown, New York; Denver, Colorado; and San Diego, California). LongROAD collects self-reported and objectively measured information on health, functional performance and driving behaviors; objective driving data (from a device that collects location data, accelerometer measurements, etc.); medical record information; medication history; and state motor vehicle driving records.

At participant enrollment, participants completed a questionnaire asking about their alcohol use in the last three months and how often they drive when they may be over the legal blood-alcohol limit (i.e. DWI). In addition, they were asked about their average weekly alcohol intake. For the purpose of this study, we defined high-risk drinking as more than seven drinks per week regardless of

gender, according to current NIAAA guidelines for older adults (NIAAA, accessed 2018), and we compared subjects who reported "never" or "hardly ever" driving under the influence with those reporting DWI "occasionally" or more often.

After a bivariate analysis of the relationship between sociodemographic, health, and driving-related variables and DWI behavior was conducted, a logistic regression model was constructed to identify the factors most strongly associated with DWI among the study population. In addition to high-risk drinking behavior, driving frequency and demographic information, including study site, gender, age, race, marital status, education level and income were used to construct the model. Additional variables were included in the derivation of the final model if they achieved an alpha level of less than 0.25 on bivariate analysis.

RESULTS

Slightly more than half (53.1%) of the LongROAD participants were female with the majority younger than 75 years old. Most participants were white, married or living with a partner, and had an associate's degree or higher. About a third (33.2%) reported an annual income of \$100,000 or greater. The distribution of alcohol use is also reported in Table 1. The majority of participants (72.7%) reported drinking ("any drinking") in the last three months. Fifteen percent of respondents reported high-risk drinking, and 3.3% of respondents reported having driven while over the legal limit at least occasionally.

Based on the results of bivariate analyses of the factors associated with self-reported DWI (Table 2), anger and emotional support met the threshold for inclusion for construction of the final logistic regression model ($p < 0.25$), as did reported avoidance of hazardous driving conditions and distracted driving, self-rated physical readiness for driving, level of comfort during driving and risky driving behaviors. Demographic information, number of days

and miles driven in a normal week, and high-risk drinking practices were adjusted for in the final model.

Table 3 describes the final logistic regression model with adjusted odds ratios. High-risk drinking was found to be significantly associated with driving over the limit at least occasionally (adjusted OR=12.01, 95% CI: 7.19, 20.07). Reporting risky driving behaviors was also significantly associated with driving while intoxicated at least occasionally (adjusted OR=13.34, 95% CI: 6.02, 29.56), while reporting avoidance of hazardous driving conditions was less likely to be associated with doing so (adjusted OR=0.71, 95% CI: 0.60, 0.85) as was higher level of comfort during challenging driving scenarios (adjusted OR=0.65, 95% CI: 0.44, 0.95). Finally, participants in the Denver study site were less likely to have driven while intoxicated at least occasionally (adjusted OR=0.40, 95% CI: 0.16, 0.98), while female gender was also less likely to be associated with driving while intoxicated at least occasionally (adjusted OR=0.47, 95% CI: 0.26, 0.83).

DISCUSSION

Reported recent alcohol use by the older drivers in the LongROAD study significantly exceeds previously estimated alcohol use among older adults. Fifteen percent of the participants reported high-risk drinking in the previous three months, and 72.7% reported drinking in the previous three months. By comparison, the National Institute on Alcohol Abuse and Alcoholism's (NIAAA) National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) reported that 55.2% of adults 65 years of age or older reported alcohol use in a 12-month period from 2012 to 2013, while the 2015 NSDUH reported that 42.7% of adults 65 years of age or older reported alcohol use in the past month (Grant, et al., 2017; NSDUH, accessed 2018). According to NESARC-III, 3.8% of adults 65 years of age or older reported high-risk drinking from 2012 to 2013, where high-risk drinking was defined as exceeding daily drinking limits at least weekly in a 12-month period. It is possible that NESARC-III more closely reflects actual population prevalence because it was based on a nationwide representative sample; on the other hand,

estimates based on the current study may better reflect actual prevalence because information was obtained in person from local staff who had good rapport with the subjects (i.e., participants may have been more honest about reporting inappropriate behavior such as DUI than in the larger national survey.) Additionally, under NESARC-III, men were considered to exceed daily limits if they reported drinking 5 or more drinks at least once during the past 12 months, and women were considered to exceed daily limits if they reported drinking 4 or more drinks. Finally, 3.3% of respondents in this study reported perceived DWI at least occasionally. This approximates the findings of the NSDUH, in which 4% of older adults reported any driving under the influence in the past year.

Engaging in risky driving behaviors was associated with self-reported DWI at least occasionally, while avoidance of hazardous driving conditions and higher level of comfort during challenging driving scenarios were less associated with self-reported DWI. This finding aligns with the positive

association between risky driving and drunk driving found among younger cohorts (Li, Simons-Morton, and Hingson, 2013). In other words, drunk drivers are more likely to engage in other risk-taking driving behaviors. Previous studies have also shown that individuals cited for DWI are more depressed, aggressive and paranoid (Donavan, Marlatt, and Salzberg, 1983), which may lead to increased risky behaviors. Finally, high-risk drinking was found to be strongly associated with DWI. Given that previous research has shown an association between problem drinking and overall crash risk (Donavan, Marlatt, and Salzberg, 1983), a notable proportion of which is attributable to DWI, interventions designed to reduce high-risk drinking should be expected to reduce the incidence of DWI. Indeed, a community level intervention against high-risk drinking in California and South Carolina showed evidence of lower self-reported DWI activity and decreased crashes in which the driver had been drinking (Holder, Gruenewald, and Ponicki, 2000). Lastly, the final model identified female gender as being significantly less associated with driving over the limit at least occasionally. This coincides with existing research showing that women overall have traditionally reported far less drunk driving compared with their male counterparts (Schwartz, 2008).

Our findings suggest that the rates of alcohol use among older adults, particularly high-risk drinking, may be significantly higher than previously thought. In addition, we found that among older drivers, being black, less educated, unmarried, and lower-income are factors associated with a lower risk of excessive drinking, while females appear to be at lower risk for both excessive drinking as well as driving while intoxicated. Finally, reporting risky driving behaviors was found to be strongly associated with DWI among the participants surveyed. DWI is a high-risk behavior at any age, but the danger of alcohol-influenced driving is exacerbated with advanced age. And although it appears that DWI is not particularly widespread among the older driving population, the notable levels of high-risk drinking detected in this study may indicate a predisposition to various risk-taking behaviors more generally. With the marked increase in the number of individuals over the age of 65 as the baby-boom generation ages, the importance of coordinating public health, education and law enforcement efforts aimed at reducing high-risk drinking and DWI cannot be overemphasized.

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ABOUT AAA FOUNDATION FOR TRAFFIC SAFETY

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Table 1: Characteristics of AAA LongROAD Participants Reporting any Drinking or High-Risk Drinking in the Last Three Months

Characteristic	Any drinking			High-risk drinking		
	Yes (n=2174)	No/Never Used (n=815)	Total (n=2989)	Yes (n=449)	No (n=2541)	Total (n=2990)
	n (%)	n (%)	n	n (%)	n (%)	n
Study site						
Cooperstown	416 (69.2)	185 (30.8)	601	80 (13.3)	521 (86.7)	601
Ann Arbor	460 (76.5)	141 (23.5)	601	89 (14.8)	512 (85.2)	601
Baltimore	430 (73.1)	158 (26.9)	588	87 (14.8)	501 (85.2)	588
Denver	425 (70.8)	175 (19.2)	600	90 (15.0)	510 (85.0)	600
San Diego	443 (74.0)	156 (26.0)	599	103 (17.2)	497 (82.8)	600
Sex						
Male	1035 (73.8)	368 (26.2)	1403	282 (20.1)	1122 (79.9)	1404
Female	1139 (71.8)	447 (26.2)	1586	167 (10.5)	1419 (89.5)	1586
Age						
65–69	901 (72.5)	341 (27.5)	1242	189 (15.2)	1054 (84.8)	1243
70–74	760 (73.3)	277 (26.7)	1037	155 (15.0)	882 (85.1)	1037
75–79	513 (72.3)	197 (27.8)	710	105 (14.8)	605 (85.2)	710
Race						
White	1929 (75.4)	629 (24.6)	2558	414 (16.2)	2145 (83.8)	2559
Black	113 (53.1)	100 (47.0)	213	13 (6.1)	200 (93.9)	213
Hispanic	55 (66.3)	28 (33.7)	83	9 (10.8)	74 (89.2)	83
Other	71 (57.3)	53 (42.7)	124	10 (8.1)	114 (91.9)	124
Education						
Graduate degree	990 (81.2)	230 (18.9)	1220	219 (17.9)	1002 (82.1)	1221
Associate or bachelor's degree	655 (73.1)	241 (26.9)	896	131 (14.6)	765 (85.4)	896
Some college or other postsec- ondary training	334 (63.3)	194 (36.7)	528	65 (12.3)	463 (87.7)	528
High school graduate	168 (61.3)	106 (38.7)	274	29 (10.6)	245 (89.4)	274
Less than high school	20 (32.3)	42 (67.7)	62	4 (6.5)	58 (93.6)	62
Marital status						
Married or living with a partner	1476 (74.8)	497 (25.2)	1973	345 (17.5)	1629 (82.5)	1974
Divorced or separated	329 (69.1)	147 (30.9)	476	54 (11.3)	422 (88.7)	476
Widowed	252 (66.7)	126 (33.3)	378	39 (10.3)	339 (89.7)	378
Never married	95 (72.0)	37 (28.0)	132	7 (5.3)	125 (94.7)	132
Total household income						
\$100,000 or more	789 (82.4)	169 (17.6)	958	213 (22.2)	746 (77.8)	959
\$80,000 to \$99,999	345 (80.1)	86 (20.0)	431	73 (16.9)	358 (83.1)	431
\$50,000 to \$79,999	504 (70.1)	215 (29.9)	719	93 (12.9)	626 (87.1)	719
\$20,000 to \$49,999	400 (62.4)	241 (37.6)	641	55 (8.6)	586 (91.4)	641
Less than \$20,000	65 (48.5)	69 (51.5)	134	10 (7.5)	124 (92.5)	134

Table 2: Factors Associated with Current Self-Reported Driving with Blood Alcohol Level Over the Legal Limit Among the AAA LongROAD Study Participants*

Characteristic ^a	“Occasionally” or more (n=98)	“Never” or “Hardly ever” (n=2883)	Total (n=2981)	Crude Odds Ratio ^b	95% Confidence Interval ^b	<i>p</i> -value ^c
	n (%)	n (%)	n			
High-risk drinking						<0.0001
No	34 (1.3)	2498 (98.7)	2532	1.00	ref	
Yes	64 (14.3)	385 (85.8)	449	12.21	(7.94, 18.77)	
Study site						0.03
Cooperstown	16 (2.7)	585 (97.3)	601	1.00	ref	
Ann Arbor	17 (2.8)	584 (97.2)	601	1.06	(0.53, 2.13)	
Baltimore	19 (3.3)	564 (96.7)	583	1.23	(0.63, 2.42)	
Denver	14 (2.3)	585 (97.7)	599	0.88	(0.42, 1.81)	
San Diego	32 (5.4)	565 (94.6)	597	2.07	(1.12, 3.82)	
Sex						<0.0001
Male	71 (5.1)	1330 (94.9)	1401	1.00	ref	
Female	27 (1.7)	1553 (98.3)	1580	0.33	(0.21, 0.51)	
Education						0.07
Graduate degree	52 (4.3)	1167 (95.7)	1219	1.00	ref	
Associate or bachelor’s degree	28 (3.1)	866 (96.9)	894	0.73	(0.46, 1.16)	
Some college or other postsec- ondary training	14 (2.7)	512 (97.3)	526	0.61	(0.34, 1.12)	
High school graduate	4 (1.5)	268 (98.5)	272	0.34	(0.12, 0.93)	
Less than high school	0 (0.0)	61 (100.0)	61	^d	^d	
Total household income						0.0002
\$100,000 or more	47 (4.9)	910 (95.1)	957	1.00	ref	
\$80,000 to \$99,999	22 (5.1)	409 (94.9)	431	1.04	(0.62, 1.75)	
\$50,000 to \$79,999	14 (2.0)	702 (98.0)	716	0.39	(0.21, 0.71)	
\$20,000 to \$49,999	11 (1.7)	628 (98.3)	639	0.34	(0.18, 0.66)	
Less than \$20,000	2 (1.5)	131 (98.5)	133	0.30	(0.07, 1.23)	
Mental health						
Anger (composite score)	44.32 (7.49)	42.72 (7.40)	42.77 (7.41)	1.03	(1.00, 1.06)	0.03
Social health						
Emotional support (composite score)	53.33 (6.52)	54.90 (7.45)	54.83 (7.44)	0.97	(0.949, 0.999)	0.04

* Only factors with $p < 0.25$ reported.^a Continuous variables are reported as means with standard deviations. Categorical variables are reported as number of subjects in the group with percentage of total respondents answering “Yes” or “No” in parentheses.^b Logistic regression was used to calculate crude odds ratios and 95% confidence intervals.^c Two-sample t-test was used for continuous variables. Chi-square test and Fisher’s exact test were used for categorical variables.^d Statistics unavailable due to lack of variation of participant responses.

Table 2 *cont*: Factors Associated with Current Self-Reported Driving with Blood Alcohol Level Over the Legal Limit Among the AAA LongROAD Study Participants*

Characteristic ^a	“Occasionally” or more (n=98)	“Never” or “Hardly ever” (n=2883)	Total (n=2981)	Crude Odds Ratio ^b	95% Confidence Interval ^b	<i>p</i> -value ^c
	n (%)	n (%)	n			
Driving Behaviors						
Number of days in the week during which driving occurs	5.94 (1.31)	5.54 (1.65)	5.55 (1.64)	1.18	(1.03, 1.36)	0.02
Number of miles driven in a normal week	148.90 (135.30)	119.40 (104.20)	120.35 (105.41)	1.00	(1.001, 1.004)	0.04
Self-rated physical readiness for driving	5.81 (0.80)	5.91 (0.68)	5.91 (0.68)	0.81	(0.61, 1.08)	0.22
Avoidance of hazardous driving conditions (composite score)	2.01 (1.62)	2.91 (2.17)	2.88 (2.16)	0.80	(0.72, 0.90)	<0.0001
Avoidance of distracted driving (composite score)	3.10 (1.34)	3.57 (1.26)	3.55 (1.26)	0.75	(0.64, 0.89)	0.0007
Level of comfort during challenging driving scenarios (composite score)	5.96 (0.84)	5.79 (0.96)	5.79 (0.96)	1.23	(0.98, 1.55)	0.08
Performance of risky driving behaviors (composite score)	1.88 (0.31)	1.60 (0.30)	1.61 (0.31)	14.30	(7.59, 26.94)	<0.0001

* Only factors with $p < 0.25$ reported.

^a Continuous variables are reported as means with standard deviations. Categorical variables are reported as number of subjects in the group with percentage of total respondents answering “Yes” or “No” in parentheses.

^b Logistic regression was used to calculate crude odds ratios and 95% confidence intervals.

^c Two-sample t-test was used for continuous variables. Chi-square test and Fisher’s exact test were used for categorical variables.

^d Statistics unavailable due to lack of variation of participant responses.

Table 3: Final Logistic Regression Model for Effects of Risk Factors on Self-Reported Driving with Blood Alcohol Level Over the Legal Limit

Characteristic	Adjusted Odds Ratio ^a	95% Confidence Interval	<i>p</i> -value
High-risk drinking			
No	1.00	ref	
Yes	12.01	(7.19, 20.07)	<0.0001
Study site			
Cooperstown	1.00	ref	
Ann Arbor	0.69	(0.32, 1.48)	0.33
Baltimore	0.69	(0.31, 1.53)	0.36
Denver	0.40	(0.16, 0.98)	0.04
San Diego	1.18	(0.57, 2.45)	0.66

^a Statistics unavailable due to lack of variation of participant responses.

Table 3 *cont*: Final Logistic Regression Model for Effects of Risk Factors on Self-Reported Driving with Blood Alcohol Level Over the Legal Limit

Characteristic	Adjusted Odds Ratio ^a	95% Confidence Interval	p-value
Gender			
Male	1.00	ref	
Female	0.47	(0.26, 0.83)	0.01
Age			
65-69	1.00	ref	
70-74	1.27	(0.74, 2.18)	0.38
75-79	0.88	(0.46, 1.72)	0.71
Race			
White	1.00	ref	
Black	1.27	(0.35, 4.62)	0.72
Hispanic	0.83	(0.19, 3.63)	0.81
Other	0.85	(0.23, 3.10)	0.80
Education			
Graduate degree	1.00	ref	
Associate or bachelor's degree	1.05	(0.60, 1.86)	0.86
Some college or other postsecondary training	1.21	(0.59, 2.46)	0.60
High school graduate	0.77	(0.25, 2.39)	0.65
Less than high school	^a	^a	^a
Marital Status			
Married or living with a partner	1.00	ref	
Divorced or separated	0.91	(0.38, 2.16)	0.82
Widowed	1.69	(0.73, 3.93)	0.22
Never married	1.41	(0.40, 5.06)	0.60
Total household income			
\$100,000 or more	1.00	ref	
\$80,000 to \$99,999	1.47	(0.78, 2.76)	0.23
\$50,000 to \$79,999	0.67	(0.32, 1.38)	0.27
\$20,000 to \$49,999	0.99	(0.43, 2.28)	0.99
Less than \$20,000	1.34	(0.26, 6.98)	0.73
Driving Behaviors			
Number of days in the week during which driving occurs	1.09	(0.91, 1.30)	0.37
Number of miles driven in a normal week	1.00	(0.997, 1.001)	0.32
Level of comfort during challenging driving scenarios (composite score)	0.65	(0.44, 0.95)	0.03
Avoidance of hazardous driving conditions (composite score)	0.71	(0.60, 0.85)	0.0001
Performance of risky driving behaviors (composite score)	13.34	(6.02, 29.56)	<0.0001

^a Statistics unavailable due to lack of variation of participant responses.