Emerging Adults Riding With Marijuana-, Alcohol-, or Illicit Drug–Impaired Peer and Older Drivers

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ABSTRACT. Objective: The purpose of this study was to examine the prevalence and covariates among emerging adults of riding with an impaired peer or older adult driver (RWI) because of marijuana (MJ), alcohol (ALC), or illicit drugs (ID). **Method:** Data were from Waves 4 (W4, $N = 2,085$) and 5 (W5, $N = 2,116$) of the NEXT Generation Health Study, collected in 2013–2014, 1 and 2 years after high school. W5 RWI was specified for substance-specific impaired peer and older adult (peer/older adult) drivers. Multinomial logistic regressions estimated W5 association of substance-specific RWI with W4 RWI, and W5 heavy episodic drinking, MJ use, and school/residence/work status. **Results:** At W5, 33% of the participants reported RWI in the past year, including riding with ALC- (21%), MJ- (17%), and ID- (5%) impaired peer drivers and ALC- (2%), MJ- (4%), and ID- (0.7%) impaired older adult drivers. W4 RWI was associated with W5 RWI with impaired peer/older adult

drivers for ALC- (adjusted odds ratio [AOR] = 4.28, 2.69) and MJ-RWI (AOR = 2.34, 3.56). W5 heavy episodic drinking was positively associated with W5 peer ALC-related RWI (AOR = 2.16) and peer/older adult MJ-related RWI (AOR = 2.38, 5.45). W5 MJ use was positively associated with W5 peer ALC-related RWI (AOR = 2.23), peer/older adult MJ-related (AOR = 10.89, 2.98), and peer/older adult ID-related (AOR = 9.34, 4.26) RWI. ID-related RWI was higher among those not attending 4-year college (AOR = 3.38), attending technology school (AOR = 16.23), living on their own (AOR = 6.85), or living on campus (AOR = 11.50). **Conclusions:** The high prevalence of RWI among emerging adults occurred mostly with ALC- or MJ-impaired peer drivers. The findings support the need for precisely tailored programs to prevent impaired driving according to substance use and age. (*J. Stud. Alcohol Drugs*, 79, 277–285, 2018)

MOTOR VEHICLE CRASHES are the leading cause of death and serious injury among adolescents and emerging adults (Centers for Disease Control and Prevention [CDC], 2014). Both driving while impaired (DWI) and riding with an impaired driver (RWI) contribute to this problem (O'Malley & Johnston, 2013; Peck et al., 2008). High rates of marijuana (MJ), alcohol (ALC), and illicit drug (ID) use, combined with dangerous and unsafe driving, contribute to high crash rates among teen drivers (Eaton et al., 2010; Insurance Institute for Highway Safety, 2016; National Highway Traffic Safety Administration, 2017; O'Malley & Johnston, 2013; Simons-Morton et al., 2016; Terry-McElrath et al., 2014). Impairment because of alcohol or other drugs is particularly dangerous for teenage drivers, with ALC-impaired youth being five times more likely than ALC-impaired adults to experience a motor vehicle crash (Peck et al., 2008). Risk factors associated with teen DWI in addition to substance use include male gender, previous

driving offenses, risky driving, poor family relationships, lack of parental monitoring, and a history of RWI (Copeland et al., 1996; Li et al., 2014b; Sabel et al., 2004). However, less is known about the predictors of RWI, and clarity of the characteristics of adolescent RWI is needed to guide the development of preventive interventions.

Research examining transitional periods between high school and 1 year after high school has identified risk factors for RWI and DWI. Studies show that previous RWI increases the likelihood of future teen DWI (Evans-Whipp et al., 2013; Li et al., 2014b), whereas social factors such as peer and parental influence have been associated with RWI (Kim & Kim, 2012; Vaca et al., 2016). According to social learning theory (Bandura, 1977) and the theory of planned behavior (Ajzen, 2012), behaviors (e.g., DWI) are influenced by descriptive norms (i.e., perceptions of how other people are behaving), injunctive norms (i.e., being approved by other people), and social norms (i.e., acceptable behavior in a group in terms of a typical behavior such as DWI). The association between teens' exposure to DWI and their own DWI has been observed in previous studies (Kim & Kim, 2012; Li et al., 2014b). Also, peer substance use is predictive of substance use among emerging adults (Andrews et al., 2002).

RWI is highly prevalent among adolescents. Leadbeater and colleagues (2008) found that 23%–40% of Canadian and American youth in Grades 7–12 reported riding with an MJ-

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or ALC-impaired driver, with rates increasing across grade levels. Because driving is a socially regulated behavior, peer and parental driving behaviors such as DWI could serve to model and normalize dangerous driving practices (Li et al., 2014a). Li et al. (2014a) found that teenagers who had previously ridden with an impaired driver were more likely to drive while impaired than teenagers with no past RWI. Other research reported associations between previous RWI, alcohol use, substance use, and heavy episodic drinking and subsequent RWI in high school and the first year after high school (Vaca et al., 2016). According to Leadbeater et al. (2008) and Harris et al. (2017), adolescents are more likely to ride with ALC-impaired adults than with ALC-impaired peers but are more likely to ride with an MJ-impaired peer than with an MJ-impaired adult (Leadbeater et al., 2008).

Vaca and colleagues (2016) found that teens 1 year after high school living on a college campus had an increased risk of RWI compared with same-aged youth living at home. Li et al. (2016) found that heavy episodic drinking and MJ, ALC, and ID use were prospectively associated with substance-specific DWI 1 year after high school. The findings above were based on RWI without consideration of the type of substances or driver age. Therefore, research examining covariates of substance-specific (MJ, ALC, ID) RWI among emerging adults has been needed. Another gap in the literature has been the relative contribution of impaired peer and adult drivers to the prevalence of substance-specific RWI. The purpose of this study was to examine the prevalence and covariates of emerging adults riding with peer or older adult drivers impaired by MJ, ALC, or ID. We hypothesized the following prospective associations with RWI: (a) previous RWI; (b) an impaired peer driver; and (c) independent environmental circumstances (e.g., living on campus, living alone, attending college).

Method

Sampling

Data for this study were from Wave 4 (W4; $M_{\text{age}} = 19.16$ years, $SE = 0.02$) and Wave 5 (W5; $M_{\text{age}} = 20.27$ years, $SE = 0.02$), collected 1 year and 2 years after high school as part of the NEXT Generation Health Study. NEXT is a nationally representative longitudinal study of a probability cohort that started in 2009–2010. U.S. school districts were the primary sampling units, stratified by the nine U.S. census divisions. Within each census division, the sample of primary sampling units was first selected with probability proportional to the total enrollment. Within this sampling framework, 145 schools were invited and 81 (55.9%) agreed to participate. Of the 3,796 students recruited in 10th grade, 2,785 (response rate = 73%) participated in the NEXT study across all waves. Of 2,785 participants, 78% ($n = 2,177$) and 79% ($n = 2,202$) completed the survey in W4 and W5. Parental

consent and participant assent were obtained. African American participants were oversampled to provide better population estimates. The study protocol was approved by the Institutional Review Board of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

Measures

Riding with alcohol-/drug-impaired drivers ([RWI], W4 and W5). The variable of interest is W5 RWI, which was measured by asking study participants the following: “During the last 12 months, how many times did you ride in a vehicle driven by someone who had been drinking alcohol?” The same question was repeated for “smoking marijuana” and “using illicit drugs (including Ecstasy [3,4-methylenedioxymethamphetamine; MDMA], amphetamines, opiates, cocaine/crack cocaine, glue or solvents, LSD [lysergic acid diethylamide], anabolic steroids) other than alcohol or marijuana.” For each substance, participants were asked who was driving, with five options: “A friend or relative about the same age as me, unknown/not well-known person about the same age as me, an older relative, an older known adult, and an unknown older adult.” Separate categorical outcome variables were generated for MJ-, ALC-, and ID-impaired RWI, each with either an impaired peer or older adult driver.

W4 RWI, a covariate, was measured using one question derived from the Youth Risk Behavior Survey questionnaire (CDC, 2011). RWI was measured by asking participants how many times in the last 12 months they rode in a vehicle driven by someone who had been drinking ALC or using ID (including marijuana and other illicit drugs), with five options (*never*, *1*, *2 or 3*, *4 or 5*, and *6 or more times*). The RWI score was dichotomized as one or more times versus never. W4 RWI did not differentiate between those drivers that used MJ, ALC, or ID and did not identify the driver as a peer or an older adult.

Heavy episodic drinking (W5). Teens were asked, “Over the last 30 days, how many times (if any) have you had four (for females)/five (for males) or more drinks [of alcoholic beverage] in a row within two hours?” Response options were *none*, *1*, *2*, *3–5*, *6–9*, and *10 or more times*. Because of a severe floor effect and nonnormal distribution of the data (the same reason for the dichotomous variables below), the scores were dichotomized as at least once versus none. This question was adapted from the Monitoring the Future national survey (Johnston et al., 2010).

Marijuana use (W5). Derived from the Monitoring the Future national survey (Johnston et al., 2010), marijuana use was measured by asking participants, “On how many occasions (if any) have you smoked or used marijuana in the last 30 days?” Response options included *never*, *once or twice*, *3–5*, *6–9*, *10–19*, *20–39*, and *40 or more times*. A dichotomous variable was then generated to indicate marijuana use at least once (vs. none) in the last month.

TABLE 1. Prevalence of past-year riding with an impaired driver in the 1st and 2nd year after high school

Variable	Overall			Male			Female		
	<i>n</i>	Wtd. %	[95% CI]	<i>n</i>	Wtd. %	[95%CI]	<i>n</i>	Wtd. %	[95% CI]
Wave 5 (<i>n</i> = 2,202)									
RWI, overall									
No	1,448	67.00	[62.45, 71.55]	589	66.85	[61.08, 72.62]	859	67.10	[62.17, 72.03]
Yes	694	33.00	[28.45, 37.55]	282	33.15	[27.38, 38.92]	412	32.90	[27.97, 37.83]
RWI with an alcohol-impaired driver									
Never	1,689	79.16	[74.94, 83.39]	698	80.01	[74.98, 85.03]	991	78.62	[74.05, 83.19]
With a peer	347	16.99	[13.58, 20.40]	131	16.00	[12.43, 19.56]	216	17.63	[13.57, 21.70]
With an adult	104	3.84	[2.05, 5.64]	40	4.00	[1.42, 6.58]	64	3.75	[1.70, 5.79]
RWI with a marijuana-impaired driver									
Never	1,667	76.48	[72.57, 80.40]	669	74.67	[68.78, 80.56]	998	77.66	[73.41, 81.90]
With a peer	413	21.15	[17.39, 24.91]	176	23.66	[18.02, 29.30]	237	19.53	[15.20, 23.86]
With an adult	56	2.37	[1.31, 3.42]	22	1.67	[0.65, 2.69]	34	2.82	[1.39, 4.24]
RWI with an illicit drug-impaired driver									
Never	2,015	93.86	[91.39, 96.32]	814	91.91	[87.77, 96.04]	1,201	95.12	[93.03, 97.21]
With a peer	98	5.41	[2.86, 7.96]	41	7.08	[2.91, 11.25]	57	4.32	[2.18, 6.47]
With an adult	25	0.74	[0.31, 1.16]	12	1.01	[0.17, 1.85]	13	0.56	[0.20, 0.91]
Wave 4 (<i>n</i> = 2,177)									
RWI, overall									
No	1,500	76.10	[71.64, 80.60]	598	78.06	[71.97, 84.15]	902	74.86	[69.50, 80.23]
Yes	479	23.90	[19.40, 28.40]	191	21.94	[15.85, 28.03]	288	25.14	[19.77, 30.50]

Notes: Wtd. = weighted; CI = confidence interval; RWI = riding with an impaired driver.

Environmental status variables (W5). Environmental variables included current residence, school status, and work status. Residence included three categories: parent/guardian's home, own place (e.g., rented room or apartment), and on campus (e.g., school dormitory or residence hall). School status consisted of three categories: not in school, attending a technical/community college, and attending a university or college. Work status included three categories: not working, working part time (<30 hours), and working full time (≥30 hours).

Demographic variables. Participants reported age, gender, race/ethnicity, family socioeconomic status, and urban/rural location. Family socioeconomic status was estimated using the Family Affluence Scale (Harris et al., 2009) that included the number of family cars owned, computers owned, having one's own bedroom, and the number of family vacations in the last 12 months. Students were then categorized as being of low, moderate, or high affluence (Spriggs et al., 2007). Parental education was based on the highest level attained by either parent.

Statistical analyses

The total sample included 2,177 participants in W4 and 2,202 in W5, but those still in high school at W4 (*n* = 67) and W5 (*n* = 27) and those who had missing data on RWI at W4 (*n* = 28) and W5 (*n* = 63) were excluded from the analy-

sis. Therefore, 2,085 (96%) participants at W4 and 2,116 (99%) participants at W5 were included in the analysis.

Statistical analyses were performed using SAS Version 9.4 (SAS Institute Inc., Cary, NC). Features of complex survey design including clustering and sampling weights were included in all analyses. A chi-squared test was used to compare demographics between those who dropped out of the study and those who remained in the study by W5. Unadjusted multinomial logistic regression models were first tested to examine the bivariate associations of W5 RWI with each covariate. The variables associated at *p* = .10 with any type of W5 RWI were included in the adjusted models as covariates. Then, the adjusted multinomial logistic regression models were conducted, adjusted for the selected covariates.

Results

Descriptive analysis

Table 1 shows the frequency of W4 RWI and substance-specific frequencies of W5 RWI by gender. The percentage of overall RWI in W4 was slightly higher in females (25.1%) than in males (21.9%) but similar in W5 (32.9% females vs. 33.2% males). In addition, the information about demographic and substance use variables in W4 and W5 is provided in Table 2. The weighted prevalence of each variable did not show a large difference between W4 and W5.

TABLE 2. Demographic information and substance use in Waves 4 and 5

Variable	Wave 4			Wave 5		
	<i>n</i>	Wtd. %	[95% CI]	<i>n</i>	Wtd. %	[95% CI]
Sex						
Male	913	41.11	[36.95, 45.27]	904	40.79	[36.95, 44.63]
Female	1,264	58.89	[54.73, 63.05]	1,297	59.21	[55.37, 63.05]
Race/ethnicity						
Hispanic	643	19.83	[10.90, 28.76]	656	20.22	[12.15, 28.30]
African American	557	13.45	[6.60, 20.30]	572	13.61	[6.63, 20.59]
White	862	61.83	[49.81, 73.85]	858	60.75	[49.63, 71.87]
Other	109	4.90	[2.93, 6.87]	108	5.42	[3.26, 7.58]
Family affluence						
Low	597	21.35	[15.85, 26.86]	614	22.11	[16.75, 27.47]
Moderate	915	49.05	[45.24, 52.86]	928	48.86	[45.83, 51.88]
High	444	29.59	[23.97, 35.22]	436	29.03	[23.45, 34.61]
Parental education						
High school	748	32.19	[26.52, 37.86]	763	32.27	[26.03, 38.51]
Some college	726	39.08	[35.33, 42.82]	749	38.61	[34.29, 42.92]
Bachelor	517	28.74	[22.75, 34.72]	498	29.12	[21.99, 36.25]
Urban/rural location						
Urban	1,372	62.47	[46.29, 78.66]	1,411	62.66	[46.55, 78.77]
Rural	593	37.53	[21.34, 53.71]	575	37.34	[21.23, 53.45]
Heavy episodic drinking in last 30 days						
No	1,565	68.15	[62.57, 73.73]	1,535	67.66	[62.92, 72.41]
Yes	583	31.85	[26.27, 37.43]	604	32.34	[27.59, 37.08]
Marijuana use in last 30 days						
No	1,674	78.02	[73.42, 82.62]	1,658	78.30	[73.54, 83.06]
Yes	474	21.97	[17.38, 26.58]	484	21.70	[16.94, 26.46]
Other illicit drug in the past year						
No	1,984	91.68	[88.85, 94.52]	2,052	92.39	[88.47, 96.32]
Yes	162	8.32	[5.48, 11.15]	149	7.61	[3.68, 11.53]

Notes: Wtd. = weighted; CI = confidence interval.

Among those who dropped out of the study by W5, 43% were White (vs. 31% Hispanic, 20% African American, and 6% other), $\chi^2(3) = 9.70$, $p < .05$; 42% were participants whose parents' highest level of education was high school (vs. 34% some college and 25% bachelor's degree or higher), $\chi^2(2) = 2.67$, $p = .26$; 60% were male (vs. 39% female), $\chi^2(1) = 71.55$, $p < .001$; and 19% had high family socioeconomic status (vs. 45% moderate and 35% low family socioeconomic status), $\chi^2(2) = 4.32$, $p = .12$.

Adjusted multinomial logistic regression models

Tables 3, 4, and 5 show the adjusted odds ratios, 95% confidence intervals, and p values for W5 ALC-, MJ-, and ID-RWI with a peer or an older adult driver.

W4 RWI increased the likelihood of RWI at W5 with an ALC-impaired peer driver by 4.28 times ($p < .001$) (Table 3), an ALC-impaired older adult driver by 2.69 times ($p = .04$) (Table 3), an MJ-impaired peer driver by 2.34 times ($p < .001$) (Table 4), and an MJ-impaired older adult driver by 3.56 times ($p = .01$) (Table 4). However, overall W4 RWI was not associated with ID-specific RWI at W5, regardless of a peer or an older adult driver.

Race/ethnicity was included in all adjusted models, but the only significant associations were found for MJ-specific RWI with a peer driver, which indicated that Hispanic participants were 0.54 times ($p = .02$) as likely to ride with an MJ-impaired peer driver (Table 4) and 4.62 times ($p = .04$) more likely to ride with an ID-impaired older driver (Table 5) compared with White participants.

Heavy episodic drinking at W5 was associated with 2.16 times ($p = .04$) as great a likelihood of W5 RWI with an ALC-impaired peer driver (Table 3), 2.38 times ($p < .001$) as great a likelihood of W5 RWI with an MJ-impaired peer driver (Table 4), and 5.45 times ($p = .01$) as great a likelihood of W5 RWI with an MJ-impaired older adult driver (Table 4).

Marijuana users at W5 were 2.23 times ($p = .01$) as likely to ride with an ALC-impaired peer driver (Table 3), 10.89 times ($p < .001$) as likely to ride with a MJ-impaired peer driver (Table 4), 2.98 times ($p < .001$) as likely to ride with a MJ-impaired older driver (Table 4), 9.34 times ($p < .001$) as likely to ride with an ID-impaired peer driver (Table 5), and 4.26 times ($p = .05$) as likely to ride with an ID-impaired older adult driver (Table 5).

For environmental status variables, work status was

TABLE 3. Association (multinomial logistic regression) of Wave 5 alcohol RWI with demographic and substance use variables (alcohol RWI w/ peer vs. no alcohol RWI)

Variable	Alcohol RWI w/peer vs. no alcohol RWI			Alcohol RWI w/adult vs. no alcohol RWI		
	OR	[95% CI]	<i>p</i>	OR	[95% CI]	<i>p</i>
Wave 4 RWI						
Yes	4.28	[2.76, 6.64]	<.001	2.69	[1.02, 7.08]	.04
No	ref.			ref.		
Race/ethnicity						
Hispanic	0.53	[0.23, 1.24]	.14	1.08	[0.41, 2.84]	.88
African American	1.36	[0.77, 2.41]	.28	2.15	[0.71, 6.54]	.18
Other ^a	1.52	[0.38, 6.07]	.55	1.05	[0.20, 5.56]	.96
White	ref.			ref.		
Family affluence						
Moderate	1.51	[0.82, 2.78]	.19	1.12	[0.39, 3.23]	.83
High	1.90	[0.70, 5.16]	.21	0.74	[0.41, 1.33]	.31
Low	ref.			ref.		
Parental education						
High school	0.88	[0.40, 1.96]	.76	0.38	[0.15, 1.00]	.05
Some college	1.30	[0.67, 2.54]	.43	0.83	[0.34, 2.03]	.68
Bachelor	ref.			ref.		
Wave 5 heavy episodic drinking						
Yes	2.16	[1.05, 4.48]	.04	1.68	[0.51, 5.52]	.39
No	ref.			ref.		
Wave 5 marijuana use						
Yes	2.23	[1.27, 3.91]	.01	1.96	[0.90, 4.24]	.09
No	ref.			ref.		
Residence status						
Own place	1.80	[0.82, 3.95]	.14	0.82	[0.26, 2.65]	.74
On campus	1.73	[0.71, 4.20]	.23	1.10	[0.24, 5.00]	.90
Other	0.87	[0.37, 2.06]	.75	1.12	[0.31, 4.03]	.86
At home	ref.			ref.		
School status						
Not attending university	1.01	[0.44, 2.29]	.99	1.10	[0.42, 2.92]	.84
Attending tech./comm. school	1.79	[0.92, 3.46]	.09	2.15	[0.86, 5.34]	.10
Attending university	ref.			ref.		

Notes: Alcohol RWI = riding with an alcohol-impaired driver; OR = odds ratio; CI = confidence interval; ref. = reference; tech./comm. = technical/community. ^aOther race/ethnicity was composed of Asian, Hawaiian/Pacific Islander, American Indian, and Alaskan native.

excluded from the adjusted models because it was not significantly associated with any type of W5 RWI at $p = .10$ level. Significant associations of residence and school status with W5 RWI were found only for ID-specific RWI with a peer driver. Participants were more likely to ride with an ID-impaired peer driver if they lived on their own (3.38, $p = .03$) or on campus (16.23, $p = .01$) relative to those who lived at the home of a parent/guardian. Relative to attending college, those not attending 4-year college 6.85 ($p = .05$) and those attending community college or technical schools were 11.50 ($p = .02$) times as likely to ride with an ID-impaired peer driver. Residence and school status variables were otherwise not significantly associated with either RWI.

Discussion

This study examined the prevalence and selected covariates of overall and substance-specific RWI in a nationally representative sample of emerging adults. Overall, 33% of emerging adults reported RWI at least once in the past year, with approximately 23% with a MJ-impaired driver, 20%

with an ALC-impaired driver, and 6% with an ID-impaired driver, consistent with previous reports (Leadbeater et al., 2008). This is one of the first studies to report RWI by substance and driver type. Study participants reported high rates of past-year RWI with impaired peers relative to impaired older adult drivers, including about 21% with peers and 2.4% with older adult drivers for MJ-related RWI, 17% with peers and 4% with older adult drivers for ALC-impaired RWI, and 5.4% with peers and less than 1% with older adult drivers for ID-RWI. However, the rate of RWI with an impaired adult driver was not inconsequential, particularly given the likelihood that emerging adults mostly ride with peers and not with older adults.

Only a few studies have reported teen MJ-related RWI. Whitehill et al. (2014) reported that 51.2% of male and 34.8% of female college students rode as a passenger with an MJ-using driver, but age was not specified. Leadbeater and colleagues (2008) reported that 29% of urban and 37% of rural Canadian high school students reported peer MJ-related RWI. Differences in the RWI prevalence estimates in these surveys could be attributable to variability in the

TABLE 4. Association (multinomial logistic regression) of Wave 5 Marijuana RWI with demographic and substance use variables

Variable	Marijuana RWI w/peer vs. no marijuana RWI			Marijuana RWI w/adult vs. no marijuana RWI		
	OR	[95% CI]	<i>p</i>	OR	[95% CI]	<i>p</i>
Wave 4 RWI						
Yes	2.34	[1.50, 3.66]	<.001	3.56	[1.30, 9.81]	.01
No	ref.			ref.		
Race/ethnicity						
Hispanic	0.54	[0.32, 0.91]	.02	0.59	[0.11, 3.07]	.53
African American	1.40	[0.81, 2.42]	.22	1.97	[0.54, 7.21]	.31
Other ^a	1.42	[0.48, 4.18]	.52	1.39	[0.18, 10.75]	.75
White	ref.			ref.		
Family affluence						
Moderate	0.57	[0.23, 1.43]	.23	0.86	[0.18, 4.12]	.85
High	0.86	[0.33, 2.24]	.75	0.10	[0.01, 0.95]	.05
Low	ref.			ref.		
Parental education						
High school	1.03	[0.55, 1.94]	.92	9.15	[1.83, 45.82]	.01
Some college	1.37	[0.66, 2.87]	.40	4.84	[0.87, 26.88]	.07
Bachelor	ref.			ref.		
Wave 5 heavy episodic drinking						
Yes	2.38	[1.47, 3.83]	<.001	5.45	[1.65, 17.99]	.01
No	ref.			ref.		
Wave 5 marijuana use						
Yes	10.89	[7.09, 16.74]	<.001	2.98	[1.61, 5.51]	<.001
No	ref.			ref.		
Residence status						
Own place	0.95	[0.44, 2.05]	.90	2.63	[0.96, 7.20]	.06
On campus	2.55	[0.97, 6.70]	.06	—	—	—
Other	1.66	[0.53, 5.20]	.39	2.01	[0.34, 11.76]	.44
At home	ref.			ref.		
School status						
Not attending university	0.89	[0.36, 2.21]	.80	1.56	[0.16, 15.20]	.70
Attending tech./comm. school	0.96	[0.42, 2.21]	.92	1.44	[0.36, 5.84]	.61
Attending university	ref.			ref.		

Notes: Marijuana RWI = riding with a marijuana-impaired driver; OR = odds ratio; CI = confidence interval; ref. = reference; tech./comm. = technical/community. A dash (—) indicates that data are not shown because of invalid maximum likelihood estimates. ^aOther race/ethnicity was composed of Asian, Hawaiian/Pacific Islander, American Indian, and Alaskan native.

sample ages and regions, the dates of the surveys, and how the questions were asked (the Leadbeater et al. survey asked if the participant had “ever” RWI, whereas we asked about RWI in the last 12 months). The high rate of peer RWI is consistent with previous studies that established that teens and emerging adults (a) tend to use substances with their peers (Andrews et al., 2002), including contexts that involve driving (Leadbeater et al., 2008) and (b) tend to take more risks in the presence of peers, particularly after drinking (Albert & Steinberg, 2011).

Previous RWI and concurrent substance use were significantly associated with RWI prevalence at W5. In a previous study, we found that past RWI increased the likelihood of future RWI among teenagers (Vaca et al., 2016), but we did not have the driver-specific RWI data to measure the association between previous RWI, substance-specific RWI, or driver-specific RWI. The current study shows that previous RWI was associated with an increased likelihood of subsequent MJ- and ALC-related RWI with both peers and older adults. Marijuana users 2 years after high school were more likely to

ride with an MJ-, ALC-, or ID-impaired driver, particularly impaired peers. Heavy episodic drinking and marijuana use were associated with RWI with both impaired peers and impaired older drivers, with minor exceptions.

Hispanics were less likely than Whites to report RWI with MJ-impaired peers, despite the relatively lower prevalence of marijuana use in young Hispanic/Latinos of 7.2%, compared with 8.4% for Whites and 10.7% for African Americans (National Center for Health Statistics, 2017). However, Hispanic study participants were more likely to ride with ID-impaired older adult drivers, possibly because of higher rates of DWI in Hispanic communities (CDC, 2011; Chang et al., 1996). In our previous study with a younger sample (11th graders) (Li et al., 2013), we reported lower rates of DWI and higher rates of RWI among Hispanic youth compared with White youth, which we attributed to lower driver license rates among Hispanics. In the current sample, 65.3% of Hispanics were licensed, which would likely reduce rates of RWI. However, additional research is needed on this topic.

TABLE 5. Association (multinomial logistic regression) of Wave 5 illicit drug RWI with demographic and substance use variables

Variable	Illicit drug RWI w/peer vs. no illicit drug RWI			Illicit drug RWI w/adult vs. no illicit drug RWI		
	OR	[95% CI]	<i>p</i>	OR	[95% CI]	<i>p</i>
Wave 4 RWI						
Yes	1.90	[0.71, 5.14]	.20	0.93	[0.23, 3.85]	.92
No	ref.			ref.		
Race/ethnicity						
Hispanic	0.60	[0.20, 1.80]	.36	4.62	[1.09, 19.59]	.04
African American	0.40	[0.14, 1.10]	.08	1.66	[0.21, 13.29]	.63
Other ^a	—	—	—	—	—	—
White	ref.			ref.		
Family affluence						
Moderate	0.59	[0.16, 2.22]	.44	1.01	[0.22, 4.65]	.99
High	0.43	[0.13, 1.42]	.16	0.27	[0.02, 3.41]	.31
Low	ref.			ref.		
Parental education						
High school	0.34	[0.08, 1.43]	.14	1.75	[0.12, 25.92]	.68
Some college	0.96	[0.52, 1.77]	.88	2.12	[0.17, 26.61]	.56
Bachelor	ref.			ref.		
Wave 5 heavy episodic drinking						
Yes	1.20	[0.49, 2.91]	.69	1.07	[0.44, 2.65]	.88
No	ref.			ref.		
Wave 5 marijuana use						
Yes	9.34	[3.95, 22.07]	<.001	4.26	[1.00, 18.20]	.05
No	ref.			ref.		
Residence status						
Own place	3.38	[1.11, 10.34]	.03	0.72	[0.15, 3.43]	.68
On campus	16.23	[2.02, 130.60]	.01	—	—	—
Other	1.95	[0.49, 7.73]	.34	0.97	[0.12, 8.02]	.97
At home	ref.			ref.		
School status						
Not attending university	6.85	[0.98, 47.62]	.05	0.79	[0.28, 2.25]	.66
Attending tech./comm. school	11.50	[1.57, 84.33]	.02	2.78	[0.41, 18.61]	.29
Attending university	ref.			ref.		

Notes: Illicit drug RWI = riding with an illicit drug-impaired driver; OR = odds ratio; CI = confidence interval; ref. = reference; tech./comm. = technical/community. A dash (—) indicates that data are not shown because of invalid maximum likelihood estimates. ^aOther race/ethnicity was composed of Asian, Hawaiian/Pacific Islander, American Indian, and Alaskan native.

Relatively little is known about the extent to which environmental changes during early adulthood are associated with RWI, but our findings support the hypothesis that emerging adults with relatively more independent environmental circumstances have higher RWI risk. Those who were not attending a 4-year college and those who were attending a technical/community college were more likely to ride with an ID-impaired peer driver compared with those attending a 4-year college. Furthermore, those who lived on their own or on campus were more likely to ride with an ID-impaired peer driver compared with those who lived at home. Previous research suggests the potential for reducing adolescent substance use by improving family-related risk and protective factors (Bertrand et al., 2013; Sloboda et al., 2012), but further research is needed to determine how best to reduce RWI and DWI during the transition to independent adult living.

To our knowledge, this study is the first to report the prevalence of RWI among emerging adults riding with a

peer or an older adult driver according to substance-specific driver impairment. The study also identified factors related to RWI, including independent living, previous RWI, and substance use by the passengers and drivers, particularly peers. The findings suggest the need for more precisely tailored programs designed to reduce RWI with impaired drivers according to substance use and age. Although parents may still be important influences on behavior in the years after high school, there is a clear need for interventions directed at peer norms and behaviors with respect to both RWI and DWI.

The high rates of MJ-impaired RWI have important implications. As more states in the United States legalize marijuana, its use may become more prevalent among teenagers and young adults, with increases in impaired driving and riding and crashes, as reported in a recent Colorado study (Salomonsen-Sautel et al., 2014). In addition to possible increases in crash risk as MJ use increases, young drivers who reported using MJ may be more likely to drive under the influence of alcohol (Arnold & Tefft, 2016), which is an

important crash cause for all age groups (Blomberg et al., 2009). The high prevalence of riding with MJ- and ALC-impaired peer drivers suggests the importance of evidence-based programs and practices designed to reduce DWI among young drivers (Hadland et al., 2017; Li et al., 2014b; O'Malley & Johnston, 2013).

Study limitations that may limit generalization of the findings include the relatively small sample size, particularly for some categories of RWI. Also, only a limited number of covariates were collected and analyzed, including important social context linked to RWI. Although the study examined driver age, the relationships with the peers and older adults is unknown. The research could not determine RWI with a driver who had used more than one drug, which is common among drivers injured or killed in crashes (Kelly et al., 2004).

Conclusions

RWI was prevalent in emerging adults, with 33% of participants reporting RWI at least once in the past year. MJ-related RWI prevalence was greater than ALC-related prevalence and occurred more often with an impaired peer than with an older adult driver. Heavy episodic drinking and MJ use were associated with MJ-, ALC-, and ID-related RWI. Previous RWI was associated with riding with an MJ-impaired peer or older adult driver as well as an ALC-impaired peer or older adult driver. Not living at home and not attending a 4-year college were associated with riding with an ID-impaired peer driver. The findings support the need for precisely tailored programs to prevent impaired driving according to substance use and age, possibly including peer norms regarding substance use and impaired driving (e.g., “. . . real friends don't let friends RWI . . .”) and harm-reduction strategies such as transportation planning before using substances that can cause impairment.

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