HHS Public Access

Author manuscript

J Safety Res. Author manuscript; available in PMC 2017 September 01.

Published in final edited form as:

J Safety Res. 2016 September ; 58: 15–20. doi:10.1016/j.jsr.2016.05.003.

Marijuana, alcohol, and drug impaired driving among emerging adults: Changes from high school to one-year post high school

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Abstract

Introduction—Driving while impaired (DWI) increases the risk of a motor vehicle crash by impairing performance. Few studies have examined the prevalence and predictors of marijuana, alcohol, and drug specific DWI among emerging adults.

Methods—The data from wave 3 (W3, high-school seniors, 2012, N=2407) and wave 4 (W4, one year after high school, N=2178) of the NEXT Generation Health Study with a nationally-representative cohort. W4 DWI (≥1 day of past 30 days) was specified for alcohol-specific, marijuana-specific, alcohol/marijuana-combined, illicit drug-related DWI. Multinomial logistic regression models estimated the association of W4 DWI with W3 covariates (perceived peer/parent influence, drinking/binge drinking, marijuana/illicit drug use), and W4 environmental-status variables (work/school/residence) adjusting for W3 overall DWI, demographic and complex-survey variables.

Results—Overall DWI prevalence from W3 to W4 changed slightly (14% to 15%). W4 DWI consisted of 4.34% drinking-specific, 5.02% marijuana-specific, 2.41% drinking/marijuana-combined, and 3.37% illicit drug-related DWI. W3 DWI was significantly associated with W4 alcohol-related and alcohol/marijuana-combined DWI, but not other DWI. W3 marijuana use, binge drinking, and illicit drug use were positively associated with W4 marijuana-specific, alcohol/marijuana-combined, and illicit drug-related DWI respectively. W3 friend drunkenness and marijuana use were positively associated with W4 alcohol-specific and marijuana-related DWI respectively. W3 peer marijuana use was negatively associated with W4 alcohol-specific DWI.

Conclusions—Driving under the influence of alcohol, marijuana, and illicit drugs is a persistent, threatening public health concern among emerging US adults. High-school seniors' binge drinking as well as regular alcohol drinking and marijuana/illicit drug use were independently associated with respective DWI one year after high school. Peer drunkenness and marijuana use in high school may be related to subsequent DWI of emerging adults.

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Practical applications—The results support the use of injunctive peer norms about getting drunk and smoking marijuana in guiding the development of prevention programs to reduce youth DWI.

Keywords

adolescents; impaired driving; alcohol drinking; marijuana use; illicit drug use

1. Introduction

Motor vehicle crashes are the leading cause of death among US teenagers (Centers for Disease Control and Prevention, 2009a). Driving while alcohol or illicit drug impaired (DWI) increases the risk of a motor vehicle crash by impairing performance (Hingson, Heeren, Levenson, Jamanka, & Voas, 2002). This effect is particularly problematic among adolescents; alcohol-impaired youth are five times more likely to experience a motor vehicle crash compared to alcohol-impaired adults (Peck, Gebers, Voas, & Romano, 2008). Among high school (HS) students, the national prevalence estimates of drinking and driving range from 9% (Centers for Disease Control and Prevention, 2009b; O'Malley & Johnston, 2013) to 12.5% (K. Li, Simons-Morton, & Hingson, 2013) in the past 30 days. Less data, however, is available on the prevalence of substance-specific DWI. One nationally-representative study reported the prevalence of driving after marijuana, illicit drugs or alcohol use among HS seniors (O'Malley & Johnston, 2013). However, prevalence studies drawing conclusions from nationally-representative samples are scarce with regard to substance-specific DWI among emerging adults (Fromme, Wetherill, & Neal, 2010; Kohn, Saleheen, Borrup, Rogers, & Lapidus, 2014; Whitehill, Rivara, & Moreno, 2014).

Findings from previous studies have identified several individual and social factors associated with adolescent DWI, including male gender (Sabel, Bensley, & Van Eenwyk, 2004), risky driving (K. Li et al., 2013), riding with an alcohol/drug-impaired driver (Sabel et al., 2004), poor family relationships (Dols et al., 2010), and previous driving offenses (Copeland, Shope, & Waller, 1996). Studies examining factors associated with DWI are lacking among young adults.

In addition, there is a large body of research investigating socio-environmental predictors of substance abuse among young adults. It is well known that the transition from HS to post-HS is characterized by increased levels of substance use (Bachman, Wadsworth, O'malley, Johnston, & Schulenberg, 2013). Facilitating factors, such as leaving home and going to college, are associated with increased level of substance use. Previous research has identified factors protective against this detrimental trend, such as having fewer substance-using friends and higher parental monitoring (White et al., 2006). It is possible that risk and protective factors influencing substance use such as alcohol use/heavy drinking (Schulenberg & Maggs, 2002), smoking (Anda et al., 1999), drug use (Kandel & Logan, 1984), may be in turn related to DWI during the transition from HS to emerging adulthood. To our knowledge, no studies have examined the predictive association between socio-environmental variables and DWI one year after HS.

Accordingly, it is reasonable to hypothesize, that environmental changes occurring during the transition from HS to post-HS may influence levels of DWI. Previous research has indicated that both facilitating and protective factors associated with substance use may be modified by environmental changes (Bertrand et al., 2013; Sloboda, Glantz, & Tarter, 2012). However, the extent to which changes in post-HS environment may affect DWI is unclear.

Given the paucity of research examining DWI among young adults, the purpose of this study was to examine the prevalence and predictors of DWI in the 12th grade, the first year most study participants were fully licensed to drive (no restrictions) to drive, and one year after HS using a nationally-representative sample of US youth.

2. Methods

2.1. Sampling

Data for this study was from waves 3 (W3) and 4 (W4) (12th grade and one year after HS) of the NEXT Generation Health Study, a nationally-representative, longitudinal study with a probability cohort starting in the 2009–10 school year in the US (Kaigang Li, Iannotti, Haynie, Perlus, & Simons-Morton, 2014; K. Li, Simons-Morton, Brooks-Russell, Ehsani, & Hingson, 2014). Primary sampling units were stratified by the nine census divisions. Within each census division, the sample of primary sampling units was first selected with probability proportional to the total enrollment. Within each selected primary sampling unit, 137 schools with 10th grade (W1) were randomly recruited, and 81 agreed to participate. We then randomly selected 10th-grade classes within each selected school and recruited 3,796 students to participate. From W1 to W4, a total of 2785 participants completed the survey. Out of a total of 2785 participants, 86% (N=2407) and 78% (N=2178) completed the survey in W3 and W4. Parental consent or participant's assent was obtained; participant consent was obtained upon turning 18. African American participants were oversampled to provide better population estimates and to provide an adequate sample to examine racial/ethnic differences. The study protocol was approved by the Institutional Review Board of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development and the questionnaire were administrated in the spring semester in each school year.

2.2. Measures

2.2.1. Driving while alcohol or illicit drug impaired (DWI, W3 and W4)—In W3, DWI was assessed with a single overall DWI item which asked participants how many days they drove after drinking alcohol or using illicit drugs in the past 30 days (recoded as a dichotomous variable due to the high skewness of the distribution: DWI ≥ 1 day vs. no DWI in the past 30 days). In W4, three substance-specific DWI items were collected to individually capture driving after alcohol, marijuana, or illicit drug use in the past 30 days. We created a 5-group categorical variable (alcohol-specific [did not include any other drugs], marijuana-specific [did not include any other drugs], alcohol/marijuana-combined, illicit drug-related [illicit drug only or illicit drug + alcohol or/and marijuana] DWI ≥ 1 day vs no DWI in the past 30 days) as the outcome variable. W4 DWI was used as the outcome variable and W3 DWI was used as a covariate.

2.2.2. Parental monitoring knowledge (W3)—Adolescents reported perceptions of their mother's and father's monitoring knowledge (separate items) from a 5-item scale (Brown, Mounts, Lamborn, & Steinberg, 1993) including who their friends were, how they spent their money, what they did with their free time, where they were after school, and where they went at night, with four response options (1 = don't have/see father or mother/guardian; 2= he/she doesn't know anything; 3 = he/she knows a little; and 4 = he/she knows a lot).

2.2.3. Parental support of not using alcohol (W3)—One item was used to measure student-perceived parental support of not using alcohol. The question was derived from the National Survey on Drug Use and Health (United States Department of Health and Human Services. Substance Abuse and Mental Health Services Administration. Center for Behavioral Health Statistics and Quality., 2013) and asked participants how important it was to their parents/guardians that he or she does not use alcohol (response options from 1 = not at all to 7 extremely).

2.2.4. Alcohol drinking (W3)—Drinking alcohol was measured using one question, "On how many occasions (if any) have you drunk alcohol in last 30 days?" with response options 1 = never to 7 = 40 times or more. Due to a severe floor effect and non-normal distribution of the data (the same reason for substance use and heavy episodic drinking below), the scores were then dichotomized to at least once vs. none. This question was derived from the Health Behavior in School-aged Children questionnaire (Currie et al., 2004) and measured all four waves.

2.2.5. Binge drinking (W3)—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 in a row within two hours?" with response options from 1 = none to 6 = 10 or more times. The scores were dichotomized: at least once vs. none. This question was adapted from the Monitoring the Future national survey (Johnston, O'Malley, Bachman, & Schulenberg, 2010) and measured all four waves.

2.2.6. Substance use (W3)—Substance use was measured by asking participants 10 questions derived from the Monitoring the Future national survey (Johnston et al., 2010) on how often they have ever used drugs (e.g., marijuana, ecstasy, medication to get high) in the last 12 months for all four waves with seven options from 1 = never to 7 = 40 times or more. Two dichotomous variables were then generated to indicate, (1) have used marijuana as least once vs. none in the last 12 months; and (2) have used illicit drug rather than marijuana as least once vs. none in the last 12 months.

2.2.7. Drunk and marijuana-smoking peer (W3)—The extent to which peers of the participant got drunk and smoked marijuana were measured by separate questions derived from the National Longitudinal Study of Adolescent Health (Harris et al., 2009) on how often they thought their five closest friends got drunk and smoked/used marijuana with options from 1 = never to 5 = almost always.

2.2.8. Driving licensure (W4)—Driving licensure was generated based on students' reporting if they had a license allowing independent, unsupervised driving. The analysis was limited to those who reported having independent drivers' license in W4.

2.2.9. Environmental Status Variables (W4)—Three environmental status variables were assessed including current residence, school status, and work status. Residence included three categories: parent/guardian's home, own place (for example rented room, apartment), and on campus (school dormitory or residence hall, fraternity or sorority house). School status consisted of three categories: not in school, technical/community college, and university or college. Work status included three categories: not working, part time (≤ 30 hours) and full time (30 hours or more).

2.2.10. Potential Confounders (W4)—Because access to a vehicle might affect DWI we controlled for this potential confounder in the analyses with two variables: miles driven each day (limited to 0–150 miles per day) and days driven in the last 30 days.

2.2.11. Demographic variables—Participants reported age, gender, race/ethnicity, family socioeconomic status, location (urban/rural). Family socioeconomic status was estimated using the Family Affluence Scale (Harris et al., 2009) and students were then categorized as low, moderate and high affluence (Spriggs, Iannotti, Nansel, & Haynie, 2007). Parents reported the education level of both parents and were categorized based on the highest level of education of either parent.

2.3. Statistical Analyses

Among those who did not have an independent driving license, only 7 (2 did not have license of any sort and 5 had permit for supervised practice driving) of them in total reported DWI in W4. Therefore, of the total sample of 2178 participants in W4, only 1330 participants who had obtained a driver's license were included for the analysis. In addition to those who reported no independent driving license in W4, 126 participants who were still in high school at W4 or self-reported other residences (e.g., living in barracks as part of the armed services, hospitalized for a sustained duration of time, living with family members other than their parents, and/or homeless) were excluded from this analysis because each group had too few to analyze and these environments represented qualitatively different life circumstances.

Unadjusted and adjusted multinomial logistic regression was used to examine the association between DWI in W4 and potential predictors without and with controlling for covariates. Demographic variables and potential confounders which are associated with any type of DWI in W4 at p=.10 level were be included in the adjusted model. Features of complex survey design including clustering and sampling weights were taken into account for all analyses. Domain analysis (referring to the computation of statistics for subpopulations in addition to the computation of statistics for the entire study population) was applied for the analyses when using the subsample.

3. Results

3.1. Descriptive analysis

In W4, weighted mean age was 19.16 years (SE = 0.02) and all included participants were younger than 21, the minimum legal drinking age. Out of the 2178 included participants at W3, 54.1% (weighted hereafter) were female, 12.0% were Hispanic (vs 13.2% Blacks, 71.2% Whites, and 3.63% other minorities), 15.1% were from low-affluence families (vs 50.6% and 34.3% from moderate- and high affluence families, respectively), and 3.9% of students had 1 parent with less than a high school diploma as the highest education level (vs 18.3% with high school diploma or GED, 41.8% with some college, technical school, or associate degree, and 36.1% with bachelor's or higher degree). Table 1 shows the weighted percentages of participants who reported DWI among those having independent driving license and substance use at W3 (14.3%) and W4 (15.2%).

3.2. Variable selection

To select the variables which would be included in the final models, multinomial logistic regression was conducted to examine bivariate associations of each type of DWI (compared to non-DWI) in W4 with overall DWI, potential predictors and covariates in W3 (data not shown). The independent variables which are significantly ($p < .05$) associated with any type of DWI in W4 were included in adjusted models. The final model controlled for gender, race/ethnicity, family affluence, parental education, urbanicity, miles driven each day, and days driven in the last 30 days were included in the mode as they were associated with DWI in W4 at $p = .10$ level.

3.3. Adjusted models

Table 2 shows the results of adjusted multinomial logistic regression between DWI in W4 and all predictors controlling for selected covariates. Previous DWI was associated with alcohol-specific and alcohol/marijuana-combined DWI, but not marijuana-specific and illicit drug-related DWI, in W4. Binge drinking in W3 was significantly associated with alcohol/marijuana-combined DWI, but not any other type DWI, in W4. Binge drinkers in W3 compared to non-binge drinkers were more likely to report alcohol/marijuana-combined DWI (OR=4.88, 95% Confidence interval [CI]: 1.39 17.15, p=.01); marijuana users compared to non-users in W3 were more likely to report marijuana-related DWI (OR=5.53, 95%CI: 1.49 20.51, p=.01); illicit drug users in W3 compared to non-users were more likely to report illicit drug-related DWI (OR=6.46, 95%CI: 1.10 38.09, p=.04); participants with higher perception of having friends drunk in W3 were more likely to report alcohol-related DWI (OR=1.75, 95%CI: 1.02 3.00, p=.04); and participants with higher perception of having friends using marijuana in W3 were more likely to reported marijuana-specific (OR=2.20, 95%CI: 1.10 4.39, p=.03) and alcohol/marijuana-combined (OR=3.08, 95%CI: 1.48 6.39, p<.001) DWI. Those who had high scores of having five closest friends using marijuana in W3 were less likely to report alcohol-related (OR=0.45, 95%CI: 0.23 0.88, p=.02). Those attending technical, vocational, or community colleges (OR=0.18, 95%CI: 0.04 0.92, p=.04) were less likely to report marijuana-specific DWI.

3.4. Additional analysis

To examine if regular alcohol drinking is associated with DWI in the same way as binge drinking, we re-ran the final model, replacing binge drinking with the more inclusive drinking question (i.e., drinking alcohol of any kind in last 30 days in W3). All the results remained the same except that those attending technical, vocational, or community colleges were modestly (OR=0.22, 95%CI: 0.04 1.17, p=.08) associated with marijuana-specific DWI and those who reported drinking alcohol in W3 were not significantly associated with any type of W4 DWI (data not shown).

4. Discussion

In the current study, we reported the nationally-representative prevalence of overall and substance-specific DWI (self-reported and hereafter) among emerging adults (high-school graduates) and examined the prospective association between facilitating and protective factors in senior HS and substance-specific DWI during the transition from HS to post HS. The results of this study are noteworthy because the identification of predictors of DWI in earlier age can inform the development of interventions that may prevent DWI when young drivers become adults (21% for males and 11% for females) (Caetano & McGrath, 2005).

The change in DWI prevalence among HS seniors exhibited a decreasing curvilinear trend from 2001 to 2011 (from 19.5% to 16.0) (O'Malley & Johnston, 2013). The average DWI prevalence during the last three years was 14.9% which is consistent with the current prevalence (14.3%) data of which was collected in 2012. Given that O'Malley and Johnston's study (O'Malley & Johnston, 2013) did not have the data in the year 2012, the current study contributed to the literature with the latest overall DWI prevalence for HS seniors. In addition, this study provides novel insight about the overall and substance-specific DWI for first-year HS graduates, among whom 15.15% reported overall DWI and 4.34%, 5.02%, 2.41% and 3.37% reported alcohol-specific, marijuana-specific, alcohol/marijuana-combined, and illicit drug-related DWI respectively in the last 30 days. In this cohort, overall DWI slightly increased from HS seniors to one after HS by about 1%. Marijuana-specific DWI is more common than alcohol-specific DWI, which is consistent with the finding from a non-representative college sample (Whitehill et al., 2014). The higher prevalence of marijuana-specific DWI may be due to the fact that the majority of the participants in this study were still underage for drinking. One cohort study reported an immediate increase of alcohol-specific DWI when college students turned 21, the legal drinking age (Fromme et al., 2010).

Despite the DWI prevalence remaining relatively stable from HS seniors to one-year post HS, transitional changes were observed from DWI to non-DWI as well as from non-DWI to DWI. Better understanding of the social-contextual determinants of these changes is needed to guide the development of strategies focused on preventing DWI during this transition from adolescence to adulthood.

Some evidence suggests that certain psychosocial and social-contextual variables, such as peer support, family influence, and previous substance use of an individual can influence DWI among youth (Leadbeater, Foran, & Grove-White, 2008; Maldonado-Molina, Reingle,

Jennings, & Prado, 2011). This study extended the investigation to the association between the potential covariates in the last year of HS and DWI one year post HS; however the pattern of predictors of the four specific DWI in emerging adulthood varies.

Overall DWI in the last year of HS predicted post-HS alcohol-specific DWI and alcohol/marijuana-combined DWI but not marijuana-specific and illicit drug-related DWI, although overall DWI is significantly associated with any of the four types of DWI in the unadjusted model. The non-insignificant association between overall high-school DWI and post-high-school marijuana-specific and illicit-drug related DWI suggests that high-school DWI may be primarily alcohol-related. O'Malley and Johnston's study showed that 15.1% of HS seniors reported alcohol related DWI and 11.9% marijuana-related DWI (O'Malley & Johnston, 2013). Therefore, alcohol-related DWI in HS may be more likely to be carried over post-HS. However, given the lack of longitudinal data including both specific DWI in HS and post-HS, future study is needed to warrant the hypothesis.

As expected, marijuana and illicit drug use in HS were related to marijuana-specific and illicit-drug related DWI, respectively. Binge drinking in HS was not associated with alcohol-specific DWI in W4; however it was associated with alcohol/marijuana-combined DWI. The findings suggest that substance use at early lifetime may particularly predetermine relevant risky driving under the influence. Association between binge drinking and alcohol-specific DWI was suppressed by the association between binge drinking and alcohol/marijuana-combined DWI, indicating that most binge drinkers in W3 may smoke marijuana in W4 and the co-occurrence of binge drinking and using marijuana may lead to impaired driving under joint influence of alcohol and marijuana. Additional analysis showed that 49.92% of participants reported both binge drinking and smoking marijuana and 30.53% reported one of them.

The findings show peer drinking and marijuana use in HS were independently associated with DWI after HS. Specifically, peer drunkenness was associated with alcohol-specific DWI and peer marijuana use was associated with marijuana-specific and alcohol/marijuana-combined DWI. It is not clear the extent to which peer marijuana use reflects adolescent marijuana use or peer norms consistent with risk taking. A series of studies has shown that adolescents' perception of peer norms is related to their engagement in alcohol-related behavior (Song, Smiler, Wagoner, & Wolfson, 2012), risky driving (Møller & Haustein, 2014), and driving after drinking (Kenney, LaBrie, & Lac, 2013). Curiously, perceived peer marijuana use appears to be a likely pathway leading to marijuana-related DWI, but not alcohol-specific and illicit drug related DWI. It is puzzling why perceived peer marijuana use was related to low likelihood of alcohol-specific DWI, suggesting that the mechanistic linkages leading to DWI may be substance-specific. Adolescents might reveal injunctive peer misperceptions (Litt, Lewis, Linkenbach, Lande, & Neighbors, 2014) which may lead to incorrect estimation of their peers' approval toward risk behaviors such as DWI (Kenney et al., 2013). Also, the association between perceived peer marijuana use and alcohol-specific DWI may be influenced by more complicated pathways, through which some factors may mediate the association indirectly. The non-significant association between binge drinking and alcohol-specific DWI in this study indicates the complexity of the issue. Although additional evidence is needed demonstrating the association between peer

influence and DWI, perceived peer marijuana use and peer drunkenness may be considered targeting components in HS prevention programs. Accurate peer norms about substance use may help lead to more effective interventions reducing self-approval and incidence of DWI in youth.

While previous research has reported on changing patterns in substance use from HS students to post-HS graduates (Patrick & Schulenberg, 2011), little is known about the extent to which environmental changes during this transition influences driving after drinking alcohol or using marijuana and illicit drugs among post-HS youth. Findings from the current study did not confirm the hypothesis that environmental circumstances (school status, living status, and work status) are related to DWI risk during the transition from HS to post-HS. Only post-HS attendance of technical and community college was negatively associated with the likelihood of marijuana-specific DWI.

The strengths of the study include data drawn from a nationally representative, longitudinal sample and the measurement of substance-specific DWI, and environmental variables one year after HS. Whereas most studies examining post-HS DWI are exclusive to college participants, the current study included emerging adults who were attending and not attending colleges. Study limitations were present. First, the relatively small sample size when breaking down DWI into different types may limit the power of the analysis. Second. DWI was not specified with alcohol, marijuana, and illicit drug use in W3, which limits the direct test of association of specific DWI types between W3 and W4. Third, self-reported measures (DWI and substance use) may introduce the potential for recall and social desirability bias. Fourth, not all possible risk factors were collected. For example, the study did not capture perceived importance of social events where illicit substances may be present (e.g. fraternity parties), community service, religion (Kohn et al., 2014), or history of alcohol/marijuana possession.

Conclusions

Substantial numbers of emerging adults in the US continue to put themselves and others at risk by driving under the influence of alcohol, marijuana, and illicit drugs. Previous DWI was the main predictor of DWI under alcohol-related influence. Binge drinking, as well as regular alcohol consumption, marijuana use, and illicit drug use led to the respective substance-specific DWI one year after HS. Injunctive peer norms surrounding drinking and smoking marijuana may be targets for interventions aimed at reducing DWI among youth and emerging adults.

Acknowledgments

Funding/support: This research was supported by the Intramural Research Program of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (Contract # HHSN275201200001I), and the National Heart, Lung and Blood Institute (NHLBI), the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and Maternal and Child Health Bureau (MCHB) of the Health Resources and Services Administration (HRSA), with supplemental support from the National Institute on Drug Abuse (NIDA).

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Highlights

- The nationally-representative prevalence of overall and substance-specific driving while impaired (DWI) was reported.
- High-school seniors' drinking and marijuana/illicit drug use were independently associated with respective DWI one year after high school.
- Peer drunkenness and marijuana use in high school may be related to subsequent DWI of emerging adults.

Table 1

Prevalence of DWI in high school seniors and post-high school graduates

	High school seniors (W3)			Post-high school graduates (W4)		
	N	weighted %	SE	N	weighted %	SE
DWI/30 days[#]	143	14.31	2.07	182	15.15	1.68
DWI/30 days by type[#]						
Not any type DWI	-	-	-	1033	84.85	1.68
Alcohol-specific DWI	-	-	-	48	4.34	1.21
Marijuana-specific DWI	-	-	-	51	5.02	1.02
Alcohol/marijuana-combined DWI	-	-	-	29	2.41	0.68
Drug-related DWI	-	-	-	54	3.37	0.88
Alcohol drinking in last 30 days at W3[#]	787	38.17	2.04	1044	53.15	2.38
Binge drinking within 2 hours at W3[#]	402	21.69	2.13	583	31.85	2.69
Marijuana use in last year at W3[#]	583	25.11	1.69	654	29.83	2.50
Illicit drug (not including marijuana) use in last year at W3[#]	157	7.89	1.14	162	8.32	1.36

[#]Percentage of DWI was calculated within independent driving license holders (N = 1208 at W3 and N = 1215 at W4) and percentage of substance use was calculated in the whole sample (N = 2407 at W3 and N = 2178 at W4).

Table 2

Adjusted multinomial logistic regression between W4 DWI and potential predictors

	Alcohol-specific DWI#				Marijuana-specific DWI#				Alcohol/marijuana-combined DWI#				Drug-related DWI#			
	AOR	**95% CI**		***p***	**AOR**	**95% CI**		***p***	**AOR**	**95% CI**		***p***				
W3 DWI																
No	Ref				Ref				Ref							
Yes	5.29	1.70	16.47	<.001	1.63	0.35	7.63	.54	8.92	2.40	33.13	<.001	1.47	0.40	5.38	.56
School status at W4																
Not attending school	Ref				Ref				Ref							
College/Graduate School	0.48	0.12	1.95	.31	0.13	0.02	1.17	.07	0.45	0.05	3.78	.46	1.36	0.31	6.03	.69
Tech/Voca/Comm	0.77	0.19	3.09	.71	0.18	0.04	0.92	.04	1.22	0.11	13.53	.87	1.91	0.45	8.09	.38
Residence at W4																
At home																
On campus	4.06	0.93	17.86	.06	1.93	0.21	17.32	.56	0.22	0.03	1.59	.13	0.58	0.06	5.92	.64
In own place	2.52	0.72	8.81	.15	1.10	0.14	8.52	.92	0.14	0.02	1.34	.09	1.79	0.51	6.28	.37
Binge drinking within 2 hours at W3																
No	ref				ref				ref							
Yes	1.11	0.38	3.27	.85	1.88	0.46	7.63	.38	4.88	1.39	17.15	.01	2.20	0.84	5.80	0.11
Marijuana use at W3																
No	ref				ref				ref							
Yes	0.90	0.27	2.93	.85	5.53	1.49	20.51	.01	4.36	0.21	89.71	.34	0.86	0.29	2.55	.79
Illicit drug (not including marijuana) use at W3																
No	ref				ref				ref							
Yes	1.48	0.23	9.48	.68	1.15	0.22	6.06	.87	0.36	0.05	2.42	.29	6.46	1.10	38.09	.04
Important to parent no alcohol at W3	1.08	0.85	1.37	.55	1.29	0.89	1.88	.18	1.11	0.80	1.54	.53	1.15	0.86	1.55	.35
Mother's monitoring knowledge at W3	0.90	0.38	2.16	.81	1.63	0.57	4.66	.37	4.37	0.53	35.72	.17	0.64	0.14	2.95	.57
Five best friend got drunk at W3	1.75	1.02	3.00	.04	1.05	0.55	2.01	.88	0.62	0.26	1.50	.29	0.78	0.39	1.58	.49

	Alcohol-specific DWI[#]				Marijuana-specific DWI[#]				Alcohol/marijuana-combined DWI[#]				Drug-related DWI[#]			
	AOR	**95% CI**		***p***	**AOR**	**95% CI**		***p***	**AOR**	**95% CI**		***p***				
Five best friend smoked marijuana at W3	0.45	0.23	0.88	.02	2.20	1.10	4.39	.03	3.08	1.48	6.39	<.001	1.24	0.68	2.25	.49

Note. Tech/Voca/Comm = Technological or vocational school or community college, AOR = adjusted odds ratio, CI = confidence interval.

Models were controlling for gender, race/ethnicity, parental education, family affluence, urbanicity, days driven in last 30 days, and miles driven in each day at W4.

[#]Compared to no DWI of any kind in the past 30 days.