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Alcohol and drug use among young adults driving to a drinking location

Robert B. Voas[a,*], Mark B. Johnson[a], Brenda A. Miller[b]

[a] Pacific Institute for Research and Evaluation, 11720 Beltsville Drive, Suite 900, Calverton, MD 20705, United States
[b] Pacific Institute for Research and Evaluation, 1995 University Avenue, Suite 450, Berkeley, CA 94704, United States

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ABSTRACT

Background: Clubs that feature electronic music dance events (EMDEs) draw young adults aged 18–34 who are at high-risk for alcohol-related crashes to locations where alcohol sales are the principal source of revenue. Up to 30% of these attendees may also use drugs. This provides an important context in which to study driving arrangements that reflect concern with impaired driving. We explored whether drivers were using less alcohol and fewer drugs at exit than their passengers were and whether a driver for the group ever changed after consuming too much during the evening.
Methods: Using biological measures of alcohol consumption (breath tests) and drug use (oral fluid tests), 175 drivers and 272 passengers were surveyed among young adults arriving at and departing from EMDEs in San Francisco.
Results: Upon exit from the drinking locations, only 20% of the drivers, compared to 47% of the passengers, had a high breath alcohol concentration (defined as a BrAC of .05 g/dL or greater). Further, there was evidence that drivers with high BrACs switched to passenger status on exit and former passengers with lower BrACs replaced those drivers. However, there were no differences in the prevalence of drug use among drivers and passengers.
Conclusions: These findings suggest that the effort by young adult drivers to avoid alcohol-impaired driving appears to be reducing the number of drivers with high BrACs returning from drinking locations, such as EMDEs, by about one third. However, there is no similar pattern for drugged driving.

1. Introduction

Electronic music dance events (EMDEs) where disc jockeys play recorded music are a popular feature of local nightlife in a number of metropolitan areas. Event promoters collect entrance fees, and club owners profit from alcohol sales. Young adults who are the fans of the featured disk jockeys are drawn to the events for a night of dancing and, for some, heavy drinking. Although drug use is discouraged by club management, studies indicate that about one in five attendees had been using drugs upon arrival at the EMDE, and a small amount of use occurs on the site (Miller et al., 2009a). These club events attract young adults aged 18–34, the age group that has the highest percentage (31% in 2010, National Center for Statistics and Analysis, 2012) of drivers with illegal breath alcohol concentration (BrAC $\geq$ .08) in fatal crashes. That age group is also the primary target of the National Highway Traffic Administration (NHTSA) in its national impaired-driving enforcement and public information programs (e.g., see Linkenbach and Perkins, 2005). Young adults arriving by car at EMDEs are generally small close-knit groups of friends who have traveled together to drinking events in the past and share many common characteristics related to alcohol and drug use (Miller et al., 2009a,b, in press).

The EMDE environment where alcohol and drugs are consumed by attendees at high risk for involvement in alcohol-related crashes provides a fertile ground for studying the driving practices of young adults. We hypothesize that, although driving decisions are influenced by multiple factors, identification of the person driving and the driver's substance use status upon arrival at and departure from the club reflects a group's driving practices and the level of effort made to avoid impaired driving. In this study, based on driver status and alcohol and drug measurements, we indirectly tested four driving-related actions designed to reduce impaired driving: (a) individuals reduce alcohol and drug consumption when planning to drive; (b) drivers, if acting as designated drivers, further reduce alcohol consumption; (c) drivers switch to passenger status if drinking heavily; and (d) light-drinking passengers are selected to drive when drivers switch to passenger status. Specifically, we tested five general hypotheses related to young adult impaired-driving risk status: (1) Compared to passengers, drivers exhibit lower impaired-driving risk; (2) Compared to

* Corresponding author at: Impaired Driving Center, Pacific Institute for Research and Evaluation, 11720 Beltsville Drive, Suite 900, Calverton, MD 20705, United States. Tel.: +1 301 755 2720; fax: +1 301 755 2799.
E-mail address: voas@pire.org (R.B. Voas).

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nondesignated drivers, designated drivers exhibit lower impaired-driving risk; (3) Drivers who switch to passenger status on exit exhibit a higher impaired-driving risk than other drivers do; (4) Passengers who replace drivers have lower driving-risk indicators than other passengers; (5) Passengers who replace drivers have lower driving-risk indicators than the drivers they replace.

2. Methods

2.1. Recruitment

Over a 30-week period from June through November 2010, we interviewed 1148 attendees at 38 nighttime EMDEs at 8 clubs in San Francisco (Miller et al., in press; Johnson et al., 2012). These two reports describe the recruitment and data-collection procedures in detail. At entrance and at exit, we collected four types of data: (a) verbal interviews conducted by research assistants, (b) paper-and-pencil self-administered surveys of drug and alcohol use and club experiences, (c) oral assays for drug tests, and (d) breathalyzer tests for blood alcohol levels. This study is limited to an analysis of the drug and alcohol biological measures and questions covering the driving role (driver, designated driver, or passenger) and the drinking intentions of groups of EMDE patrons arriving by car.

Research sites were set up next to club entrances and staffed with a team of 8–10 researchers. Using portal methodology (Voas et al., 2006), a random procedure for recruiting groups was implemented by selecting the first person who crossed an imaginary line on the sidewalk as they approached the club entrance. Participants were recruited as groups because 95% of the patrons of EMDEs arrive in groups, and individual members are generally unwilling to remain behind when their group enters or leaves the club. The informed consent process was approved by the Pacific Institute for Research and Evaluation's Institutional Review Board. Our interviewers assured the potential participants that the survey was anonymous, that it would require 10–15 min at entry and at exit, and that they would be paid $10 at entrance and $20 at exit for their participation. A wristband with a unique identifier allowed the linking of entrance and exit data without personal identifiers, and 93% of those contacted at entry was reinterviewed at exit. Outdoor recruitment was difficult. Our records indicate that approximately 40% of the people we approached did not stop to listen to our recruitment efforts. Of the EMDE patron groups, approximately two-thirds (63%) participated.

2.2. Sample description

Of the 1148 patrons we interviewed at the EMDEs, 447 (in 175 vehicle groups) traveled to the sites by automobile. They constitute the sample for this study. The median age was 31, and 50.1% were male. A third (33.7%) of the participants was White (non-Hispanic); a quarter (24.6%), Hispanic; a fifth (21.2%), Asian; and a fifth were Black, multiracial, or other. Half (55.2%) were college graduates, 57.7% had full-time employment, 19.6% were full-time college students, and 19.7% described themselves as gay, lesbian, or bisexual.

2.3. Data collection

We collected five types of data for this study: (1) *The driver versus passenger status* was ascertained for each individual in the group at entry and exit. In addition, group members were asked at entry whether their group had a designated driver (DD), and if they did, the group's driver was classified as a "DD" for this study; (2) *Drinking intentions* were determined at entry. Participants were asked their drinking intentions for the evening (not drinking, drinking but not get buzzed, get buzzed but not drunk, get drunk or very drunk); (3) *Breath samples for BrAC levels* were collected at entry and at exit using the Intoxilyzer 400 (CMI, Inc., Owensboro, Kentucky); (4) *Oral fluid samples for illegal drug analysis* were collected using the Quantisal™ collection device (Immunalysis Corporation, Pomona, California) and forwarded to the Immunalysis Inc. laboratory for analysis. Participants were coded as using an illicit drug if positive for cannabis (THC), cocaine (+metabolites), amphetamines, methamphetamines, ecstasy and other club stimulants (e.g., MDA, MDMA, MDEA), hydromorphone, hydrocodone, oxycodone, oxymorphone, morphine, ketamine, PCP, or heroin; (5) *Demographic predictors* (age, sex, race/ethnicity, educational level, and employment status) were collected from all participants at entry.

2.3.1. Driving risk. The breath measure of alcohol (BrAC) and the illegal drug use derived from the oral fluid sample were used to define the risk of impaired driving. Although laboratory studies (Moskowitz and Fiorentino, 2000) have found evidence for impairment at BrACs as low as .02 g/dL, case control, relative risk studies (Blomberg et al., 2009) have generally identified a BrAC .05 g/dL as the level at which crash risk is clearly elevated, and most industrialized nations have established that BrAC as the illegal level for driving. We therefore selected a BrAC of .05 g/dL or higher as our indicator of risk for alcohol-impaired driving. Establishing a drug concentration level that reflects impairment is substantially more difficult. Some progress has been made in identifying specific concentration levels of certain illegal drugs that impair driving (Elvik, 2012; Li et al., 2012). However, the many substances involved and the more complex relationship of blood concentration to driving impairment has tended to support the establishment of legal limits that make any detectible level in a driver an offense (DuPont et al., 2012; Li et al., 2012; Reisfield et al., 2012). The U.S. Office of National Drug Control Policy (2010) recommends that states enact per se laws specifying that any measurable amount of an illicit drug constitutes impaired driving, and 12 states have done so (Lacey et al., 2010). We therefore accepted any measurable amount of an illegal drug as our drugged-driving risk indicator for this study.

2.3.2. Drinking intentions. We collected drinking-intention information (not drinking, drinking but not get buzzed, get buzzed but not drunk, get drunk or very drunk) from each individual upon arrival at the EMDE. This was an important moderating measure because of its logical relationship to the quantity of drinking at the site, which was reflected in an increase of BrACs at the EMDE and the ultimate BrAC and the percentage of drivers with high BrACs at exit. Because of its importance in moderating the impaired-driving risk variable, we included it in the analyses of the five hypotheses evaluated in this study.

2.4. Data analysis

Upon exit from the clubs, 175 of the 447 participants who traveled to the club by vehicle indicated they were going to drive, and 272 indicated they would be passengers. Dependent measures included (a) self-reported drinking intentions measured at entry (5-point scale with responses ranging from "not drink" to "get very drunk"), (b) entry BrAC and exit BrAC and the increase in BrAC from entrance to exit (all three as continuous scores), (c) a dichotomous indicator of whether the participant's BrAC was .05 g/dL or higher at exit, and (d) a dichotomous indicator of whether the participant was using an illegal drug at entrance and exit. Analyses were conducted using generalized linear modeling in SAS (ver. 9.2; SAS Institute Inc., Cary, NC), which provided flexibility in analyzing continuous versus binomial outcomes. We divided the sample into four orthogonal groups: those who were drivers to and from the club ($n = 147$), those who were passengers to and from the club ($n = 245$), those who arrived as passengers but left as drivers ($n = 28$), and those who arrived as drivers but left as passengers ($n = 27$). Additionally, survey responses were used to identify who from the "consistent" driver group were *designated* ($n = 116$) versus *nondesignated* drivers ($n = 23$) (8 cases had missing data). These latter two groups were compared to test Hypothesis 2.

Initial analysis tested whether any demographic predictors (age, sex, race/ethnicity, educational level, and employment status) were significantly related to the alcohol and drug use variables. Only race/ethnicity significantly predicted a BrAC $\geq$ .05 g/dL at exit ($p < .05$). More Hispanic participants (50.9%) had high BrACs relative to White (non-Hispanic), Asian, and Other participants (ranging from 32.2 to 33.3%). (The relationship between race/ethnicity and drug use at exit was marginally significant, $p < .07$.) Therefore, race was included as a categorical covariate in all subsequent analyses. Further, preliminary analysis found no evidence that vehicle group significantly accounted for variability in high BrACs in our sample; thus, peer group was not included as a random variable in the models.

We analyzed the whole dataset using planned comparisons, with each of the five risk hypotheses involving a separate contrast. Controlling for race/ethnicity, we applied each contrast to each of seven outcomes: drinking intentions, entry BrAC, exit BrAC, increase in BrAC, percentage with BrACs $\geq$ .05, and percentage positive for an illegal drug at entrance or exit. Specifically, for Hypothesis 1, we contrasted the "consistent" driver and the "consistent" passenger groups. For Hypothesis 2, we contrasted the DD versus non-DD groups (from among the "consistent" drivers). For Hypothesis 3, we contrasted "consistent" drivers with "switched" drivers (i.e., drivers who switched to passenger status at exit). For Hypothesis 4, we contrasted "consistent" passengers with "switched" passengers (i.e., passengers who switched to driver status at exit). Finally, for Hypothesis 5, we contrasted "switched" drivers with "switched" passengers (i.e., those who switched roles at exit).

3. Results

Mean BrACs and prevalence rates for each of the seven dependent measures for the two groups contrasted for each of the five hypotheses are listed in Table 1. The groups are organized into pairs in five rows: (1) passenger versus drivers; (2) DDs versus non-DDs, (3) "consistent" drivers versus "switched" drivers; (4) "consistent" passengers versus "switched" passengers; and (5) "switched" passengers versus "switched" drivers. In Table 1, statistically significant comparisons (within each row-pair) are indicated by bold ($p \geq .01$) and italic ($p \geq .05$) fonts.

3.1. Comparing drivers to passengers (Hypothesis 1)

We predicted that drivers, relative to passengers, would display fewer impaired-driving risk indicators. As shown in row 1a versus