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Identifying Social Mechanisms for the Prevention of Adolescent Drinking and Driving

Meng-Jinn Chen, Joel W. Grube, Peter Nygaard, and Brenda A. Miller

Prevention Research Center, Pacific Institute for Research and Evaluation

Abstract

This study identifies social mechanisms that might help prevent youth from being involved in driving under the influence of alcohol (DUI) and riding with drinking drivers (RWDD). Data collected through telephone surveys with 1,534 adolescents and young adults aged 15–20 years (mean = 17.6, SD = 1.6) in California, USA were analyzed. Structural equation modeling analyses showed that DUI and RWDD were strongly related to drinking in unstructured situations, modeling of DUI by peers and parents, and perceived peer approval or disapproval of DUI. DUI outcome expectancies were indirectly related to DUI and RWDD through situational drinking. Parental monitoring and DUI law enforcement were also indirectly related to DUI and RWDD through DUI expectancies and other mechanisms. The findings, overall, suggest that parental influence remains important even through late adolescence. Parental monitoring, in particular, might help to reduce unstructured socializing with peers, drinking, and affiliation with peers who engage in DUI. Parental monitoring may also foster beliefs about the risks of DUI. Conversely, parents' own DUI behavior may normalize drinking and DUI behaviors, thus countering monitoring efforts.

Keywords

drinking and driving; riding with drinking drivers; parental monitoring; late adolescence

1. Introduction

Motor vehicle crashes are the leading cause of death for young people aged 15–24 in the United States (Hoyert et al., 2005). Many of these fatal crashes are alcohol-related. In 2004, 22% of drivers aged 16–20 involved in fatal crashes had been drinking and 17% had blood alcohol concentration (BAC) levels in excess of .08 (NHTSA, 2006). In addition, the National Youth Risk Behavior Survey of 2003 indicates that 12% of the 9–12 graders in the US engaged in driving under the influence of alcohol (DUI) and 30% of them engaged in riding with a drinking driver (RWDD) during the 30 days prior to survey (Grunbaum et al., 2004). The Harvard School of Public Health College Alcohol Study of 2001 also indicates that among college students who were younger than 21 years old, 26% engaged in DUI and 24% of them rode with a driver who was high or drunk during the 30 days prior to survey (Wechsler et al., 2003). Despite extensive prevention efforts, alcohol-related fatalities among young drivers have remained stable over the past 10 years (NHTSA, 2006), suggesting that additional preventive efforts may

Corresponding author: Meng-Jinn Chen, Prevention Research Center, Pacific Institute for Research and Evaluation, 1995 University Ave., Suite 450, Berkeley, CA 94704, USA, Telephone: 1-510- 883-5731, Fax: 1-510- 644-0594, Email: mengjinn@prev.org, grube@prev.org, pnygaard@prev.org, bmiller@prev.org

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be necessary. To provide additional insights into strategies that may help reduce DUI and RWDD by youth, the present study examines the social processes through which youth learn about drinking and driving.

DUI among youth largely has been approached through legal sanctions that focus on reducing youth alcohol use and alcohol use in conjunction with driving. In many cases, such approaches have proven to be very effective. For instance, reductions in alcohol consumption, DUI, crashes, and alcohol-related crashes among young people have been associated with the institution of higher minimum drinking ages (e.g., Douglass, 1980; Hughes and Dodder, 1992; O'Malley and Wagenaar, 1991; Wagenaar et al., 2000), zero tolerance laws (Voas et al., 2003; Wagenaar et al., 2001), and graduated licensing (Begg and Stephenson, 2003; Langley et al., 1996; Shope and Molnar, 2003; Shope et al., 2001). In addition, increased enforcement efforts such as implementation of sobriety checkpoints and police patrols near college campuses have been found to be associated with decreased DUI among college students (Clapp et al., 2005). More general controls on availability of alcohol (e.g., price) have also been found to reduce drinking and DUI among youth. Saffer and Grossman (1987) estimated that a 100% increase in the real beer tax in the US would reduce highway mortality among 18 to 20-year-old drivers by 27%. Research using data from the US National Longitudinal Survey of Youth suggests that doubling the tax on beer would reduce alcohol consumption among young people by 3% to 6% (Pacula, 1998). Other approaches to reducing DUI and RWDD among youth include designated driver programs, safe rides programs, and educational interventions. The evidence for the effectiveness of these latter approaches, however, is scant (Grube and Nygaard, 2005).

Although policy approaches to underage DUI and RWDD are important, it is also necessary to consider the broader social environment wherein DUI behavior is learned and embedded. Social learning perspectives on behavior (e.g., Akers, 1985; Akers & Lee, 1996; Bandura, 1977, 1986; Sutherland et al., 1992) posit that an individual learns behaviors primarily through observation and association with others (e.g., differential association). According to this perspective, DUI and RWDD behaviors by youth result from internalized norms and values about drinking and driving that are learned from parents and other sources of influence (e.g., peers, media). That is, youth may form beliefs about DUI and RWDD and their potential consequences through observation of such behaviors by others and from the expressed approval or disapproval of others, as well as through direct personal experiences. These observations and experiences are then represented in memory as outcome expectancies, perceived norms, and efficacy beliefs which, together, influence the performance of DUI and RWDD.

Peer influences are central in many theories of adolescent problem behavior (e.g., Akers, 1985; Bandura, 1986; Jessor, 1987; Jessor et al., 1991; Newcomb and Bentler, 1988; Oetting and Beauvais, 1987; Sutherland et al., 1992). In general, these theories posit that youth are more likely to engage in deviant or risky behaviors if they have friends who do so. Thus, youth who drink and drive, compared with those who do not, report that their peers engage in DUI more often and are less disapproving of DUI (e.g., Fortini, 1995; Grube and Voas, 1996; Klepp and Perry, 1990; Klepp et al., 1991). Others argue, however, that situational opportunity is as important as differential association in juvenile delinquency. In particular, deviant behaviors among youth are found to be significantly related to time spent in unstructured socializing with peers (Osgood et al., 1996; Osgood and Anderson, 2004), even if these peers are not especially deviant (Haynie and Osgood, 2005). In addition, research suggests that drinking by young people in public places is controlled, at least in part, by the situation (e.g., peer encouragement and size of the group), rather than being a reasoned behavior regulated by alcohol expectancy beliefs or efficacy skills (Knibbe et al., 1991). Thus, DUI or RWDD among youth may be a consequence of unstructured socializing with peers in away-from-home locations where

alcohol use is encouraged, drinking and driving is not discouraged, and transportation is required.

Family influences, especially those of parents, are also recognized as important risk or protective factors of youth problem behaviors (e.g., Arnett, 1995; Dishion et al., 1995; Hawkins et al., 1992; Resnick et al., 1997). Greater parental monitoring or parents' knowledge of their child's daily activities are found to be associated with less deviant behavior, risky behavior, and substance use among adolescents (e.g., Chuang et al., 2005; DiClemente et al., 2001; Haynie and Osgood, 2005; Laird et al., 2003; Osgood and Anderson, 2004; Parker and Benson, 2004). More importantly, parents may counter peer influences through monitoring (e.g., Dishion and McMahon, 1998; Simons-Morton and Chen, 2005; Wood et al., 2004), good parent-child relations (e.g., Brook et al., 1998; Haynie and Osgood, 2005; Hirschi, 1969; Parker and Benson, 2004; Rankin and Kern, 1994), and a positive role modeling (Li et al., 2002). Conversely, research also shows that when parents are substance users, youth may model parents' substance use, particularly if they have a relatively good relationship with parents (Andrews et al., 1997). Thus, the effect of parental monitoring on adolescent alcohol use and DUI may be undermined by parents' own alcohol use and DUI behaviors. However, much of what we know about the influence of parents is based upon studies of children and young adolescents. Parental influence during the transition period of late adolescence has received relatively less attention.

In the present study, we tested a conceptual model that included potentially important social processes underlying youth drinking and driving behaviors (Figure 1). This model is largely influenced by social learning theory (e.g., Akers, 1985; Akers & Lee, 1996; Bandura, 1977, 1986; Sutherland et al., 1992), the theory of situational opportunity (e.g., Osgood et al., 1996; Osgood and Anderson, 2004), and problem behavior theory (e.g., Jessor, 1987; Jessor et al., 1991). The model hypothesizes that (a) DUI and RWDD are direct consequences of drinking alcohol during unstructured socializing with peers; (b) DUI and RWDD are directly related to affiliation with peers who DUI; (c) parents, peers, and DUI law enforcement all help shape adolescent DUI outcome expectancies which in turn influence the likelihood and frequency of DUI and RWDD; (d) parental monitoring and law enforcement function as social controls against youth drinking, DUI, and RWDD; and (e) parental monitoring and DUI law enforcement indirectly influence DUI and RWDD through more proximal factors such as DUI expectancies, peer-related normative beliefs about DUI, and situational alcohol use.

2. Method

2.1 Procedure

The study comprised a telephone interview with adolescents and young adults aged 15–20 who lived in California. At the time the study was conducted, the minimum age to obtain a driver learning permit in California was 15.5 years. In addition, a graduated driver licensing program was implemented for drivers under age 18 (see pp. ii–iii in Masten and Hagge, 2003 for details). The licensing stages included a supervised practice period, license restrictions (e.g., restrictions on nighttime driving and teenage passengers), and an accelerated post-licensing control action program (i.e., severity of penalty increases with traffic violations). The illegal BAC level was .01% and above for drivers under age 21.

Data were collected throughout the state of California using computer-assisted telephone interviews (CATI) conducted from July 1998 to July 2000. The primary sample was generated using random-digit-dial (RDD) procedures based on all currently working exchanges and prefixes in the state. Asian and Latino American households were over-sampled by drawing additional telephone numbers using a surname-listed sample. African American households were over-sampled by drawing additional telephone numbers from geographic areas with

higher concentrations of African American households. Up to 10 attempts were made to contact each telephone number in the sample. When a residential household was contacted, a brief screening interview was conducted to determine eligibility (e.g., presence of a 15–20-year-old youth). When more than one household member qualified for the study, the most recent birthday method was used to select one to participate in the study. Once eligibility was established, parental consent and respondent assent were obtained and the interview was conducted or scheduled.

Completed interviews were obtained from 1,534 respondents, yielding an adjusted completion rate of 47% when the estimated number of eligible households among non-contacted numbers was taken into account. This is a likely underestimate of the true response rate because a greater proportion of non-contacted compared with contacted households are likely to be ineligible (e.g., not working residential numbers). The cooperation rate among contacted households was, in fact, 61%. Although concern is sometimes expressed regarding telephone coverage, according to the 2000 Census, 98.5% of California households had telephone service in the home (US Census, 2000).

2.2 Sample

The study sample was 45% male and had a mean age of 17.6 years ($SD = 1.6$). The majority of the sample (83%) lived with parents all or most of the time in the past 12 months; only 7% did not live with parents at all. The sample was 21% African American, 20% Asian American or Pacific Islander (hereafter, Asian), 18% Caucasian, 32% Latino, and 9% multi- or other ethnicity.

2.3 Measures

DUI—Frequency of DUI was measured by asking the respondents the number of days in the past 12 months they drove within an hour of having at least 1 drink of alcohol. They were also asked the number of days they drove after drinking too much to drive safely and after having enough to drink to get into trouble with the police if stopped. These measures were log transformed prior to the analyses because of skewness. The internal consistency of these items is very good (Cronbach's $\alpha = .93$).

RWDD—Respondents indicated the number of days in the past 12 months they rode with a driver (a) who drove within an hour of having at least 1 drink of alcohol, (b) who had consumed too much to drive safely, and (c) who had enough to drink to get into trouble with the police if stopped. These measures were log transformed because of skewness. The Cronbach's α was .89.

Unstructured socializing and situational drinking—Respondents indicated number of days in the past 12 months of being in social settings that may be conducive to DUI or RWDD, including party, bar or pub, restaurant, hanging out with friends in an outdoor area (e.g., park, parking lot, or street corner), and cruising around with friends in a car. The number of days on which drinking occurred in each of these settings was also ascertained. Frequency of engaging in heavy drinking (5 drinks or more for males and 4 drinks or more for females) and frequency of feeling drunk in the past 12 months were also obtained. All of these measures were log transformed because of skewness.

DUI expectancies—Respondents rated how unlikely or likely (1 [very unlikely] – 4 [very likely]) they thought it was that a series of negative consequences would happen to them personally if they were to drive within an hour of having 3 or more drinks of alcohol. These items covered three domains: (a) *legal risk* (be stopped by the police, lose driver's license, get arrested); (b) *physical risk* (be injured in a crash, injure someone else, lose control of the car,

be unable to drive safely); and (c) *social risk* (get into trouble with parents, appear irresponsible to peers). The Cronbach's α for these items was .91.

Normative beliefs—Normative beliefs were measured by asking about (a) perceptions of the extent to which parents and peers approved or disapproved of DUI (i.e., proscriptive norms) and (b) perceptions of the extent to which these significant others engaged in DUI (i.e., descriptive norms). Specifically, respondents indicated how much their father and mother (or male/female guardians) would approve or disapprove if they were to drive within an hour of having 3 drinks, on a 4-point scale (1 [strongly approve] – 4 [strongly disapprove]). Responses to these two items were moderately correlated ($r=.62$). A mean score was taken to indicate an overall level of *perceived parent disapproval of DUI*. A similar item was asked about perceived approval or disapproval by respondent's best friend. Those who had a spouse, live-in partner, or steady boy/girl friend were also asked to estimate perceived approval or disapproval by these individuals. A mean score was taken over these items to indicate an overall level of *perceived peer disapproval of DUI*. *Perceived DUI by parents* was measured by asking respondents to indicate the number of days in the past 12 months they thought that their father and mother (or male/female guardians) drove within an hour of having 3 or more drinks of alcohol. Data were obtained separately for father and mother. Those who reported not living with either mother or father were given a score of 0 (indicating no influence) for that measure. These measures were log transformed and included in the analyses as separate variables because they were only very modestly correlated ($r = .27$). Similar items were asked to indicate the number of days in the past 12 months they thought that best friend, spouse, live-in partner, or steady boy/girl friend drove within an hour of having 3 or more drinks of alcohol. Scores of these measures were summed (and log transformed) to indicate an overall level of *perceived DUI by peers*.

Parental monitoring—Respondents were asked how often when they went out at night in the past 12 months (1 [never] – 4 [most of the time]) their parents or guardians (a) knew where they went, (b) knew who they were with, (c) checked if they drank alcohol when they came home, (d) talked with friends' parents about what they planned to do, (e) told them to be home at a specific time, and (f) waited up for them. The Cronbach's α for these items was .78.

Perceived DUI law enforcement—Respondents indicated how much they disagreed or agreed (1 [strongly disagree] – 4 [strongly agree]) that (a) the police make a great effort to catch drinking drivers under the age of 21 and (b) the police set a high priority on catching drinking drivers of all ages. These two questions were moderately correlated ($r=.60$). A mean score was taken to represent perceived DUI law enforcement.

Control variables—Age, gender, race/ethnicity, bonding with parents, weekend night-time driving, and times seeing a sobriety checkpoint were included in the analyses as control variables. A dummy variable was constructed for gender (1 = male). Separate dummy variables were constructed for African American, Asian American, Latino American, and *other* with Caucasian American being the reference group. Bonding with parents was measured by asking respondents to indicate on separate scales how close they felt to their father/male guardian and mother/female guardian (1 [not at all close] – 4 [very close]) and how often (1 [never] – 5 [very often]) they did something for fun with either father or mother. These three questions, modestly correlated ($r=.30 - .37$), were included separately in the analyses. Weekend night-time driving was measured by asking respondents the number of days driving after 9 pm on weekends in the past 30 days (i.e., Fridays and Saturdays, a maximum of 10 days). The number of times seeing a sobriety checkpoint in the past 12 months was ascertained and log transformed because of skewness.

2.4 Data analysis

Analyses were conducted separately for DUI and RWDD. Although we acknowledge that persons who engage in DUI are also likely to engage in RWDD and vice versa, this strategy was used because only data from persons who drove in the past 12 months could be used in the DUI model ($N = 1,009$) whereas all cases could be included in the RWDD model ($N = 1,534$). Missing data were replaced using the expectation-maximization imputation procedure in SPSS (SPSS Inc., 1989–2005).

The main data analyses were conducted using maximum likelihood structural equation modeling with EQS (Bentler, 1985–2004). Measurement models were solved at the first step of the modeling to examine whether indicators were adequately related to their underlying latent constructs and to determine how the main constructs in the conceptual model were correlated. Latent variables were specified for multi-item constructs including parental monitoring, DUI outcome expectancies, situational alcohol use, DUI and RWDD. Lagrange multiplier tests and Wald tests were used to help modify the models. Following Hu and Bentler's (1999) recommendation, the ML-based comparative fit index (CFI) and root mean squared error of approximation (RMSEA) were used to evaluate model fit. A CFI value greater than .90 and a RMSEA value less than .06 were considered an indication of good model fit. Because the data were not normally distributed, robust estimates of the parameter standard errors were obtained.

After fitting the measurement models, structural models were solved to test the hypothesized relationships illustrated in Figure 1. Age, gender, race/ethnicity, bonding with parents, weekend night-time driving, and times seeing a sobriety checkpoint were included in the analyses as control variables.¹

3. Results

3.1 Descriptive statistics

Half of the sample (47%) reported drinking alcohol in the past 12 months. About 89% of the sample had been to parties, 34% had been to a bar or pub, 89% had been to a restaurant, 74% had hung out with friends in outdoor areas, and 75% had cruised around in a car with friends. For those who reported socializing in each setting, the corresponding percentage drinking alcohol was 40%, 17%, 13%, 26%, and 15%, respectively.

Overall, 66% of the sample reported driving a car in the past 12 months; 42% had a regular driver's license, 20% had a provisional license or learner's permit, and 38% had no license of any type. Among those who reported driving in the past year, 70% had driven on weekend nights in the past 30 days. About 10% of the sample reported DUI and 45% reported RWDD in the past 12 months.

3.2 Model fitting

Although the initial DUI measurement model fit the data reasonably (CFI = .88, RMSEA = .050 [90% CI = .048 – .052]), four error covariances (see Figure 2) were added to the model and significantly improved the model fit (CFI = .92, RMSEA = .041 [90% CI = .038 – .043]). The initial RWDD model fit the data adequately (CFI = .90, RMSEA = .046 [90% CI = .044 – .048]). Adding the same four error covariances to the model further improved the model fit (CFI = .94, RMSEA = .036 [90% CI = .034 – .038]). Figure 2 presents the latent variables,

¹Separate analyses were conducted with unstructured socializing (regardless of alcohol use) and situational drinking. These two sets of analyses yielded similar findings. Only the results for drinking in unstructured situations are presented.

their indicators and corresponding factor loadings. All indicators loaded significantly on the designated latent constructs ($ps < .001$).

Significant structural relationships among the main constructs from the final structural models are presented in Figures 3 (DUI) and Figure 4 (RWDD). Significant direct and indirect effects from all predictors of DUI and RWDD are presented in Table 1. In addition, significant direct associations between control variables and the main constructs in the DUI and RWDD models are presented in Table 2.

3.3 DUI

The DUI model fit the data very well (see Figure 3) and accounted for 43% of the variance in DUI. DUI was directly and positively related to situational drinking and perceived peer DUI, and negatively related to perceived peer disapproval of DUI. Situational drinking was positively related to perceived DUI by father and peers, and negatively to perceived parental monitoring and DUI expectancies. DUI expectancies, in turn, were positively related to perceived parental monitoring, perceived peer disapproval of DUI, and perceived DUI law enforcement. They were negatively related to perceived DUI by father and peers. Perceived DUI by peers was positively related to perceived DUI by father and mother, and negatively to perceived parental monitoring. Perceived peer disapproval of DUI was positively related to perceived parent disapproval of DUI and negatively to perceived DUI by father. None of the control variables was directly associated with DUI (Table 1). As hypothesized, the associations between parental monitoring and DUI law enforcement and DUI were indirect and negative.

3.4 RWDD

The RWDD model also fit the data very well (see Figure 4) and accounted for 41% of the variance in RWDD. RWDD was directly and positively related to situational drinking and perceived DUI by father, mother, and peers, and negatively related to perceived peer disapproval of DUI. Situational drinking was positively related to perceived DUI by father and peers, and negatively to DUI expectancies, perceived parental monitoring, and perceived DUI law enforcement. DUI expectancies were positively related to perceived parental monitoring, perceived DUI law enforcement, and perceived peer disapproval of DUI, and negatively to perceived DUI by father and peers. Perceived DUI by peers was positively related to perceived DUI by father and mother and negatively to parental monitoring. Perceived peer disapproval of DUI was positively related to perceived parent disapproval of DUI and negatively to perceived DUI by father.

RWDD was also directly related to race/ethnicity, age, gender, and closeness to father (Table 1). Thus, when all other variables were considered, African American and Latino youth reported more RWDD than youth in the other racial groups; males reported more RWDD than females; younger youth reported more RWDD than older youth; and youth who were closer to father reported less RWDD.

4. Discussion

This study identified important social mechanisms that might help inform efforts to prevent DUI and RWDD among adolescents and young adults. The analyses showed that parents, peers, and law enforcement are all important correlates of youth DUI beliefs and behaviors. Parents, in particular, by way of bonding, monitoring, expression of disapproval, and positive role modeling, appear to be an important social control mechanism for these risky behaviors. Specifically, parents may help regulate youth affiliation with DUI peers and alcohol use while socializing with peers; they are also significant in shaping DUI beliefs.

DUI and RWDD among these youth were strongly related to alcohol use in unstructured socializing settings and to affiliation with peers who engaged in DUI. The two most common drinking settings are parties and hanging out with friends in an outdoor area. In either of these situations parents are unlikely to be present. In contrast, fewer of them reported drinking in highly regulated settings such as a restaurant, bar, or pub. The situational opportunity perspective posits that young people's unstructured leisure time yields time and opportunities for deviant acts; the presence of peers encourages deviant acts; and the absence of parents or authority figures reduces the potential social controls against deviant acts (e.g., Osgood et al., 1996). Our data suggest that positive family processes may not only directly prevent risky or problem behaviors among adolescents, but also help develop positive assets or strengths in youth for preventing such behaviors. Helping youth to develop a repertoire of responses in advance of risky situations is one effective approach and has been implemented in family-based prevention strategies (e.g., Spoth, 1999).

The positive associations between perceived parent DUI and perceived peer DUI suggest that having parents who engage in DUI may enable youth to affiliate with peers who engage in DUI. The direct and positive association between perceived DUI by parents and RWDD suggests that some of the RWDD incidents reported by the respondents may have occurred with parents as the drivers. Thus, it might be beneficial for prevention programs to also address adult behavior, at least in their interactions with youth.

Although negative DUI expectancies were not directly related to DUI and RWDD, they were directly and negatively related to situational drinking. Thus, youth who perceived negative consequences of DUI as more likely were less likely to drink alcohol in unstructured socializing settings. This finding suggests that prevention should focus, to some extent, on educating youth about the possible negative consequences of alcohol use and teaching them skills to resist peer pressure and to avoid risky alcohol use (e.g., Marlatt and Witkiewitz, 2002). Our analyses also showed that parental monitoring was a strong correlate of DUI expectancies, suggesting that the risks of DUI and RWDD may be effectively conveyed to youth through parents. Parental involvement thus may be an important supplement to and strengthen the effects of policy, law enforcement, and educational efforts.

In keeping with the general literature on deterrence, awareness of sobriety checkpoints was positively related to youth perception of DUI law enforcement. Perceived DUI law enforcement, in turn, was indirectly and modestly related to DUI and RWDD. The deterrent effect of laws, in general, is affected by the probability of their imposition, the swiftness with which they are imposed, and their severity (Ross, 1982). The probability of being detected and having penalties imposed may be particularly important. In this regard, some researchers suggest that policies that increase the probability of detection and arrest for drinking and driving may be more effective in reducing alcohol-related traffic fatalities than policies that increase penalties (Benson et al., 1999; Grosvenor et al., 1999). At best, however, the probability of detection and having penalties imposed is slight. Although severe, penalties for DUI offenses involving minors may seldom be enforced and thus might be expected to generate only a modest deterrent effect (Hafemeister and Jackson, 2004). A recent qualitative study (Nygaard and Grube, 2005), for example, found that a substantial number of young people in the study reported having friends and acquaintances who had been stopped by the police for DUI, but did not suffer legal consequences. Such inconsistencies in enforcement may undermine deterrent effects.

Some racial/ethnic differences are noteworthy. Although Asian youth were as likely as Caucasian youth, and more likely than youth in Latino, black and other groups, to drive a car and to drive at night on weekend (analyses not shown), they were not at a higher risk for DUI. Our data suggest several protective factors for Asian adolescents. First, Asian adolescents

reported drinking alcohol less frequently in settings that were conducive to DUI. Second, they reported less DUI by peers. Third, they perceived less DUI by parents. Fourth, they perceived more parental monitoring. In comparison to Caucasian adolescents, Latino adolescents reported more parental monitoring and less DUI by mother, perceived greater DUI law enforcement, and drank alcohol less frequently in settings that were conducive to DUI. They, however, were more likely to engage in RWDD than Caucasians. One explanation is that the Latino youth perceived less disapproval of DUI by parents. In addition to familial norms and values, structural differences among families, such as those related to socio-economic status, should also be taken into account. For example, Latino adolescents were less likely to drive and might therefore be more likely to ride with drinking drivers simply out of necessity. Youths without access to cars may be more vulnerable to RWDD in general. It remains for future research to investigate whether racial/ethnic differences in familial norms, leisure time activities, and access to transportation play a significant role in youth DUI and RWDD.

The findings from this study should be considered in light of several limitations. First, rates of drinking in this study sample were lower than those reported in the Monitoring the Future (MTF) study. In part, this difference may be attributable to our over-sampling minorities who typically drink less than Caucasian youth. After weighting with the 2000 Census data for California to adjust for over-sampling of minority groups, rates of drinking were comparable with the National Household Survey on Drug Abuse (NHSDA) data. For example, after weighting, 40% of our 16-year-old and 59% of our 18-year-old respondents reported drinking in the past 12 months compared to 46% and 62% of the 10th and 12th graders in the 2000 NHSDA data and 65% and 73% of the 10th and 12th graders in the 2000 MTF data (Table F. 6, Wright, 2002). The discrepancies with the MTF data may be due to differences in the setting where participants were recruited (i.e., school versus home). Secondly, these differences may reflect methods effects. The greater anonymity and confidentiality afforded by classroom questionnaire survey may increase reporting on the MTF relative to telephone interview in the present study and in-home computer-assisted self-administered interview in the NHSDA (e.g., Harrison, 2001). Thirdly, using telephone surveys to collect data excludes households without telephone service and thus may lead to bias. However, a great majority of California households (98.5%) had telephone services at the time of the study (US Census, 2000). Thus, only a small portion of homes would not be reachable by telephone, and not all of the households without telephone service would meet our sampling criteria. Another limitation is our inability to address biases associated with non-responders, i.e., households which otherwise would have met our criteria but whom we failed to reach. It is impossible to determine how non-participants differed from study sample given the RDD data collection procedure implemented. Finally, findings are based on cross-sectional data and must be interpreted with caution. It is difficult to infer causality from such data. Further research with alternative research designs may provide more definitive insights into DUI and RWDD among youth.

Overall, our findings suggest that DUI and RWDD among adolescents result from a complex interplay of many social factors, some acting directly and some indirectly. Thus, a comprehensive approach to youth DUI and RWDD is necessary. No single strategy can be entirely effective in reducing and preventing these behaviors. Interventions with parents and family, through education, and through policies and law enforcement all seem important.

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References

- Akers, RL. *Deviant Behavior: A Social Learning Approach*. Belmont, CA: Wadsworth; 1985.
- Akers RL, Lee G. A longitudinal test of social learning theory: adolescent smoking. *J Drug Issues* 1996;26(2):317–343.
- Andrews JA, Hops H, Duncan SC. Adolescent modeling of parent substance use: The moderating effect of the relationship with the parent. *J Fam Psychol* 1997;11(3):259–270.
- Arnett J. The young and the reckless: adolescent reckless behavior. *Current Directions in Psychological Science* 1995;4(3):67–71.
- Bandura, A. *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall, Inc.; 1977.
- Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall, Inc.; 1986.
- Begg D, Stephenson S. Graduated driver licensing: The New Zealand experience. *J Safety Res* 2003;34:99–105. [PubMed: 12535912]
- Benson BL, Rasmussen DW, Mast BD. Deterring drunk driving fatalities: an economics of crime perspective. *International Review of Law Economics* 1999;19:205–225.
- Bentler, PM. *EQS for Windows, 6.1*. Encino, CA: Multivariate Software; 1985–2004.
- Brook JS, Cohen P, Jaeger L. Developmental variations in factors related to initial and increased levels of adolescent drug involvement. *J Genet Psychol* 1998;159(2):179–194. [PubMed: 9595701]
- Chuang Y-C, Ennett ST, Bauman KE, Foshee VA. Neighborhood influences on adolescent cigarette and alcohol use: mediating effects through parent and peer behaviors. *J Health Soc Behav* 2005;46:187–204. [PubMed: 16028457]
- Clapp JD, Johnson M, Voas RB, Lange JE, Shillington A, Russell C. Reducing DUI among US college students: results of an environmental prevention trial. *Addiction* 2005;100:327–334. [PubMed: 15733246]
- DiClemente RJ, Wingood GM, Crosby R, Sionean C, Cobb BK, Harrington K, Davies S, Hook EW III, Oh MK. Parental monitoring: Association with adolescents' risk behaviors. *Pediatrics* 2001;107(6):1363–1368. [PubMed: 11389258]
- Dishion, TJ.; French, DC.; Patterson, GR. The development and ecology of antisocial behavior. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental Psychopathology: Vol 2. Risk, Disorder, and Adaptation*. New York: Wiley; 1995. p. 421–471.
- Dishion TJ, McMahon RJ. Parental monitoring and the prevention of child and adolescent problem behavior: A conceptual and empirical formulation. *Clin Child Fam Psychol Rev* 1998;1(1):61–75. [PubMed: 11324078]
- Douglass, RL. The legal drinking age and traffic casualties: A special case of changing alcohol availability in a public health context. In: Wechsler, H., editor. *Minimum-Drinking-Age Law*. Lexington, MA: Lexington Books; 1980. p. 93–132.
- Fortini M-E. Youth, alcohol, and automobiles: Attitudes and behaviors. *Drug and Alcohol Abuse Reviews* 1995;7:25–39.
- Grunbaum JA, Kann L, Kinchen S, Ross J, Hawkins J, Lowry R, Harris WA, McManus T, Chyen D, Collins J. Youth Risk Behavior Surveillance—United States, 2003 (Abridged). *J Sch Health* 2004;74(8):307–324. [PubMed: 15554117]
- Grosvenor D, Toomey TL, Wagenaar AC. Deterrence and the adolescent drinking driver. *J Safety Res* 1999;30(3):187–191.
- Grube, JW.; Nygaard, P. Alcohol policy and youth drinking: Overview of effective interventions for young people. In: Stockwell, T.; Gruenewald, PJ.; Toumbourou, J.; Loxley, W., editors. *Preventing harmful substance use: The evidence base for policy and practice*. New York: Wiley; 2005. p. 113–127.
- Grube JW, Voas RB. Predicting underage drinking and driving behaviors. *Addiction* 1996;91:1835–1849.
- Hafemeister, TL.; Jackson, SL. National Research Council and Institute of Medicine. *Reducing underage drinking: A collective responsibility, background papers* [CD-ROM] Committee on Developing a Strategy to Reduce and Prevent Underage Drinking. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press; 2004. The effectiveness of sanctions

and law enforcement practices targeted at underage drinking that does not involve the operation of a motor vehicle.

- Harrison LD. Understanding the differences in youth drug prevalence rates produced by the MTF, NHSDA, and YRBS studies. *J Drug Issues* 2001;31:665–694.
- Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychol Bull* 1992;112(1):64–105. [PubMed: 1529040]
- Haynie DL, Osgood DW. Reconsidering peers and delinquency: How do peers matter? *Soc Forces* 2005;84(2):1109–1130.
- Hirschi, T. Causes of delinquency. Berkeley, CA: University of California Press; 1969.
- Hoyert, DL.; Kung, HC.; Smith, BL. National Vital Statistics Reports, Vol. 53, No. 15. National Center for Health Statistics: Hyattsville, MD; 2005. Deaths: Preliminary data for 2003. Available at: http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53_15.pdf
- Hu L-T, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling* 1999;6:1–55.
- Hughes SP, Dodder RA. Changing the legal minimum drinking age: Results of a longitudinal study. *J Stud Alcohol* 1992;53:568–575. [PubMed: 1434633]
- Jessor, R. Risky driving and adolescent problem behavior: Theoretical and empirical linkage. In: Benjamin, T., editor. *Young Drivers Impaired by Alcohol and Drugs*. London: Royal Society of Medicine Services, Ltd; 1987. p. 97–110.
- Jessor, R.; Donovan, JE.; Costa, FM. Beyond Adolescence: Problem Behavior and Young Adult Development. New York: Cambridge University Press; 1991.
- Klepp, K-I.; Perry, CL. Adolescents, drinking, and driving: Who does it and why?. In: Wilson, RJ.; Mann, RE., editors. *Drinking and Driving: Advances in Research and Prevention*. New York: Guilford; 1990. p. 42–67.
- Klepp K-I, Perry CL, Jacobs DR. Etiology of drinking and driving among adolescents: Implications for primary prevention. *Health Educ Q* 1991;18:415–427. [PubMed: 1757265]
- Knibbe RA, Oostveen T, van de Goor I. Young people's alcohol consumption in public places: reasoned behaviour or related to the situation? *Br J Addict* 1991;86:1425–1433. [PubMed: 1777737]
- Laird RD, Pettit GS, Bates JE, Dodge KA. Parents' monitoring-relevant knowledge and adolescents' delinquent behavior: Evidence of correlated developmental changes and reciprocal influences. *Child Dev* 2003;74(3):752–768. [PubMed: 12795388]
- Langley JD, Wagenaar AC, Begg DJ. An evaluation of the New Zealand graduated driver licensing system. *Accid Anal Prev* 1996;28:139–146. [PubMed: 8703271]
- Li C, Pentz MA, Chou C-P. Parental substance use as a modifier of adolescent substance use risk. *Addiction* 2002;97:1537–1550. [PubMed: 12472638]
- Marlatt GA, Witkiewitz K. Harm reduction approaches to alcohol use: Health promotion, prevention, and treatment. *Addict Behav* 2002;27:867–886. [PubMed: 12369473]
- Masten, SV.; Hagge, RA. Report no. CAL-DMV-RSS-03-205. Sacramento, CA: California Department of Motor Vehicles; 2003. Evaluation of California's Graduated Driver Licensing Program. Available at: http://www.dmv.ca.gov/about/profile/rd/r_d_report/Section%201/205-GDL%20Report.pdf
- Traffic Safety Facts 2004. Washington, DC: U.S. Department of Transportation; 2006. National Highway Traffic Safety Administration (NHTSA).
- Newcomb, MD.; Bentler, PM. Consequences of Adolescent Drug Use. Newbury Park, CA: Sage; 1988.
- Nygaard P, Grube JW. Mixed messages: Contributions to adolescent drinking and driving. *Addiction Research and Theory* 2005;13(5):411–426.
- Oetting ER, Beauvais F. Peer cluster theory, socialization characteristics, and adolescent drug use: A path analysis. *J Counse Psychol* 1987;34(2):205–213.
- O'Malley PM, Wagenaar AC. Effects of minimum drinking age laws on alcohol use, related behaviors, and traffic crash involvement among American youth: 1976–1987. *J Stud Alcohol* 1991;52(5):478–491. [PubMed: 1943105]
- Osgood DW, Anderson AL. Unstructured socializing and rates of delinquency. *Criminology* 2004;42(3): 519–549.

- Osgood DW, Wilson JK, O'Malley PM, Bachman JG, Johnston LD. Routine activities and individual deviant behaviors. *Am Sociol Rev* 1996;61:635–655.
- Pacula RL. Does increasing the beer tax decrease marijuana consumption? *J Health Econ* 1998;17:557–585. [PubMed: 10185512]
- Parker JS, Benson MJ. Parent-adolescent relations and adolescent functioning: Self-esteem, substance abuse, and delinquency. *Adolescence* 2004;39(155):519–530. [PubMed: 15673227]
- Rankin JH, Kern R. Parental attachments and delinquency. *Criminology* 1994;32:495–515.
- Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, Tabor J, Beuhring T, Sieving RE, Shew M, Ireland M, Bearinger LH, Udry JR. Protecting adolescents from harm: Findings from the National Longitudinal Study on Adolescent Health. *JAMA* 1997;278:823–832. [PubMed: 9293990]
- Ross, HL. *Legal Policy and Social Control*. Lexington, MA: Lexington Books; 1982. *Detering the Drinking Driver*.
- Saffer H, Grossman M. Drinking age laws and highway mortality rates: Cause and effect. *Econ Inq* 1987;25:403–417.
- Shope JT, Molnar LJ. Graduated driver licensing in the United States: evaluation of results from early programs. *J Safety Res* 2003;34:63–69. [PubMed: 12535907]
- Shope JT, Molnar LJ, Elliott MR, Waller PF. Graduated driver licensing in Michigan: Early impact on motor vehicle crashes among 16-year-old drivers. *JAMA* 2001;286:1593–1598. [PubMed: 11585482]
- Simons-Morton B, Chen R. Latent growth curve analyses of parent influences on drinking progression among early adolescents. *J Stud Alcohol* 2005;66:5–13. [PubMed: 15830898]
- Spoth, R. Family-focused prevention intervention research: A pragmatic perspective on issues and future directions. In: Ashery, RS.; Robertson, E.; Kumpfer, K., editors. *NIDA Research Monograph: Drug Abuse Prevention through Family Interventions*. Rockville, MD: National Institute on Drug Abuse; 1999. p. 459-510.
- SPSS Inc.. Chicago, IL: SPSS; 2005. *SPSS 14.0 for Windows*.
- Sutherland, EH.; Cressey, DR.; Luckenbill, DF. *Principles of Criminology*. 11th ed. Philadelphia: Lippincott; 1992.
- United States Census. Census 2000 Summary File 3 (SF 3) - Sample Data: California. 2000. Available online at: www.census.gov/main/www/cen2000.html
- Voas RB, Tippetts AS, Fell J. Assessing the effectiveness of minimum legal drinking age and zero tolerance laws in the United States. *Accid Anal Prev* 2003;35:579–587. [PubMed: 12729821]
- Wagenaar AC, Murray DM, Toomey TL. Communities Mobilizing for Change on Alcohol (CMCA): effects of a randomized trial on arrest and traffic crashes. *Addiction* 2000;95(2):209–217. [PubMed: 10723849]
- Wagenaar AC, O'Malley PM, LaFond C. Lowered legal blood alcohol limits for young drivers: Effects on drinking, driving, and driving-after-drinking behaviors in 30 states. *Am J Public Health* 2001;91(5):801–804. [PubMed: 11344892]
- Wechsler H, Lee JE, Nelson TF, Lee H. Drinking and driving among college students: The influence of alcohol-control policies. *Am J Prev Med* 2003;25(3):212–218. [PubMed: 14507527]
- Wood MD, Read JP, Mitchell RE, Brand NH. Do parents still matter? Parents and peer influences on alcohol involvement among recent high school graduates. *Psychol Addict Behav* 2004;18(1):19–30. [PubMed: 15008682]
- Wright, D. DHHS Publication No. SMA 02-3732, NHSDA series H-16. Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies; 2002. *State Estimates of Substance Use from the 2000 National Household Survey on Drug Abuse: Volume II. Supplementary Technical Appendices*.

Figure 1. Hypothesized relationships among the main constructs in the DUI and RWDD models

Figure 2. Latent variables and factor loadings from the measurement models

Note: All numbers are standardized coefficients. The double-arrow lines indicate the error covariances that were added to improve the model fit.

Figure 3. DUI model

Variables in circles are latent variables and variables in squares are measured variables.

Significant direct associations between control variables and these main constructs are presented in Table 2 Model fit: CFI=.93, RMSEA=.036 (90% CI = .034-.039). * $p < .05$, $^{\dagger}p < .01$, $^{\ddagger}p < .001$.

Figure 4. RWDD model

Variables in circles are latent variables and variables in squares are measured variables.

Significant direct associations between control variables and these main constructs are

presented in Table 2. Model fit: CFI=.94, RMSEA=.034 (90% CI = .032–.035). * $p < .05$, [†] $p < .01$, [‡] $p < .001$.

Table 1

Significant predictors of DUI and RWDD

	DUI (N = 1009)		RWDD (N = 1534)	
	Direct Effect	Indirect Effect	Direct Effect	Indirect Effect
<i>Main constructs</i>				
Situational drinking	.55 [‡]		.39 [‡]	
DUI expectancies		-.13 [‡]		-.08 [‡]
Perceived parental monitoring		-.17 [‡]		-.13 [‡]
Perceived DUI by mother		.03 [*]	.10 [‡]	.03 [*]
Perceived DUI by father		.14 [‡]	.15 [‡]	.12 [‡]
Perceived parent disapproval of DUI		-.06 [‡]		-.03 [‡]
Perceived DUI law enforcement		-.02 [‡]		-.03 [‡]
Perceived DUI by peers	.09 [‡]	.21 [‡]	.22 [‡]	.14 [‡]
Perceived peer disapproval of DUI	-.16 [‡]	-.02 [‡]	-.06 [*]	-.01 [‡]
<i>Control variables</i>				
Fun time with parents		-.05 [‡]		-.05 [‡]
Closeness to mother		-.01 [*]		-.02 [‡]
Closeness to father		-.02 [‡]	-.06 [*]	-.04 [‡]
Weekend nighttime driving		.05 [‡]		.06 [‡]
Seeing sobriety checkpoints				-.004 [‡]
<i>Race/Ethnicity</i>				
Asian American		-.16 [‡]		-.14 [‡]
African American		-.12 [‡]	.05 [*]	-.08 [‡]
Latino American		-.09 [‡]	.14 [‡]	-.08 [‡]
Other		-.05 [‡]		-.03 [‡]
Male		.07 [‡]	.05 [*]	.05 [‡]
Age		.08 [‡]	-.05 [*]	.10 [‡]

Note: Cell numbers are standardized regression coefficients.

*
p < .05,

‡
p < .01,

‡
p < .001.

Table 2

Significant direct associations between control variables and main constructs

	DUI model	RWDD model
Perceived parental monitoring		
Asian American	.10 [†]	.05 [*]
Latino American	.12 [‡]	.10 [‡]
Male	-.08 [†]	-.09 [‡]
Age	-.45 [‡]	-.45 [‡]
Weekend nighttime driving		-.06 [*]
Fun time with parents	.18 [‡]	.18 [‡]
Closeness to mother	.08 [*]	.08 [†]
Closeness to father	.11 [†]	.10 [†]
Perceived DUI by mother		
Asian American	-.13 [‡]	-.14 [‡]
Latino American	-.11 [‡]	-.11 [‡]
Closeness to mother		-.08 [*]
Perceived DUI by father		
Asian American	-.12 [‡]	-.10 [‡]
Weekend nighttime driving		.06 [†]
Closeness to father		-.08 [†]
Perceived parent disapproval of DUI		
Latino American		-.07 [*]
Male	-.07 [*]	-.10 [‡]
Age	-.15 [‡]	-.09 [†]
Weekend nighttime driving	.10 [†]	.09 [‡]
Seeing sobriety checkpoints	-.09 [†]	
Closeness to father	.07 [*]	.07 [†]
Perceived DUI by peers		
Asian American	-.07 [†]	-.06 [†]
Age		.11 [‡]
Perceived peer disapproval of DUI		
African American		.05 [*]
Male	-.14 [‡]	-.11 [‡]
Fun time with parents	.11 [‡]	.07 [†]
Perceived DUI law enforcement		
Latino American	.09 [†]	.10 [‡]
Male	.08 [†]	.07 [†]
Seeing sobriety checkpoints	.14 [‡]	.13 [‡]
Fun time with parents		.07 [*]
Closeness to father	.10 [†]	.09 [†]
Situational drinking		
Asian American	-.19 [‡]	-.18 [‡]
African American	-.22 [‡]	-.19 [‡]
Latino American	-.11 [†]	-.13 [‡]
Other (race/ethnicity)	-.09 [†]	-.08 [†]
Male	.06 [*]	.07 [†]
Weekend nighttime driving	.10 [‡]	.11 [‡]
Fun time with parents		-.06 [*]
RWDD		
African American		.05 [*]
Latino American		.14 [‡]
Male		.05 [*]
Age		-.05 [*]
Closeness to father		-.06 [*]

Note. Cell numbers are standardized regression coefficients.

* $p < .05$,

† $p < .01$,

‡ $p < .001$.