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Drinking and Driving in the United States: Comparing Results from the 2007 and 1996 National Roadside Surveys

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Abstract

Objectives—The objectives of this study were to (a) use data from the 2007 National Roadside Survey (NRS) to determine the characteristics of weekend nighttime drivers with positive blood alcohol concentrations (BACs) on U.S. roads in 2007; (b) determine the relationship of the driving environment and trip characteristics associated with drinking drivers; and (c) compare the findings for the 2007 NRS with those for the 1996 NRS.

Methods—Like the 1996 NRS, the 2007 NRS used a stratified random national roadside survey sample of the contiguous 48 states and collected nighttime data on Fridays and Saturdays between 10 PM and 3 AM. Officers directed 8,384 drivers into off-road parking areas where our research team asked them to participate in the survey.

Results—Of those approached, 7,159 (85.4%) provided a breath test. Results revealed that 12% of the nighttime drivers had positive BACs, and of those, 2% were higher than the .08 BAC illegal limit in the United States. Since the 1996 NRS, we found significant reductions in the percentage of BAC-positive drivers across different demographic groups. Age was among the most significant factors associated with a weekend driver having a positive BAC. The probability that a driver would be drinking peaked in the 21- to 25-year-old age group. Male drivers were more likely than female drivers to be drinking, and Asian and Hispanic drivers were less likely than White drivers to be drinking. Drinking drivers were more likely to be driving short distances (5 or fewer miles), late at night (between 1 and 3 AM), and to be coming from a bar or restaurant. Finally, 26% of the drivers who reported that they would drive less than 5 miles on the night of the survey had positive BACs, compared to only 16% who indicated they would drive between 6 and 20 miles and 10% who planned to drive more than 20 miles.

Conclusions—The 2007 NRS provides another benchmark in the four-decade record of drinking drivers on American roads and provides a basis for measuring progress in combating driving under the influence during the coming decade.

Keywords

Impaired driving; roadside surveys; DUI; underage drivers; RBS

INTRODUCTION

Motor-vehicle-related injuries and fatalities are a significant health problem in the United States, with alcohol-impaired driving proving to be a major contributing factor to the incidence and severity of motor-vehicle crashes (Baker and Chen 2001; Phillips and Brewer 2011; Rivera et al. 1997). The National Highway Traffic Safety Administration (NHTSA) reported that 33,808 people in the United States died in traffic crashes in 2009 (National Center for Statistics and Analysis [NCSA], 2010b). Of these fatalities, 10,839 people died in crashes involving a driver with a blood alcohol concentration (BAC) of .08 or higher. Although alcohol-related fatalities have declined since 1982 when NHTSA began monitoring them through the Fatality Analysis Reporting System (FARS), alcohol-impaired-driving fatalities still accounted for 32% of all traffic deaths in 2008 (NCSA, 2010b). This equates to one person (on average) in the United States being killed every 48 minutes in an alcohol-impaired-driving crash (NCSA, 2010a). However, of the 159 million self-reported cases of driving under the influence (DUI) of alcohol or narcotics, only 1.4 million drivers were arrested for DUI (Federal Bureau of Investigation 2009; Quinlan et al. 2005). Research suggests that only one driver is arrested for DUI for every 300 to 1,000 episodes of alcohol-impaired driving (Beitel et al. 2000, Voas and Hause 1987). Clearly, drinking and driving continues to be a leading, preventable cause of death in the United States (Mann et al. 2006; NHTSA, 2006). To address this problem, we must identify today's drinking drivers and the conditions under which they are driving.

One method for tracking the extent of the impaired-driving problem has been roadside surveys, which have been widely conducted to collect BAC data from the driving population (Beirness and Beasley 2010; Dussault et al. 2000; Jackson 2008; Otero 1996; Penttilä et al. 2004; Schulze et al. 2011; Vanlaar 2005). In the United States, three National Roadside Surveys (NRS) have previously been conducted, during which a representative, random sample of nighttime weekend motorists was stopped, interviewed, and breath tested. Nighttime weekends were selected to capture the days of the week and the time of the day in which the prevalence of the alcohol-impaired problem has proven to be the highest. The first NRS, sponsored by NHTSA, was conducted in 1972 (Wolfe 1974); the second, sponsored by the Insurance Institute for Highway Safety (IIHS), was conducted in 1986 (Lund and Wolfe 1991); and the third, funded by both IIHS and NHTSA, was conducted in 1996 (Voas et al. 2000, 1998). The fourth and most recent 2007 NRS was sponsored by NHTSA with additional funding from the National Institute on Alcohol Abuse and Alcoholism (NIAAA), the National Institute on Drug Abuse (NIDA), and the National Institute of Justice (NIJ) (Lacey et al. 2009b). The 2007 NRS replicated the methodology from previous surveys for interviewing and collecting breath-test data from nighttime drivers but extended the methodology to cover drug involvement of drivers and Friday daytime drivers, which is reported elsewhere (Lacey et al. 2009b, 2011).

This paper uses the data collected in the 2007 NRS (Lacey et al. 2009b, 2011) to (a) determine the characteristics of weekend nighttime drivers with positive blood alcohol concentrations (BACs) on U.S. roads in 2007; (b) determine the relationship of the driving environment and trip characteristics that are associated with drinking drivers; and (c) compare the findings for the 2007 NRS with those from the 1996 NRS.

METHODS

Sampling

For a detailed description of the 2007 NRS sampling procedure, see Lacey et al. (2009b, 2011). Our sampling system, following the practice of the three earlier national surveys, used a multistage sampling system that represented the drivers at risk for crash involvement

in the 48 contiguous states in 2007 (the year the roadside data were collected). The initial sample structure was taken from the National Automotive Sampling System/General Estimates System (NASS/GES; NHTSA, 1995), which was constructed to provide a basis for making nationally representative estimates of highway crashes. This system involved four steps. First, we selected the primary sampling units. These included cities, large counties, or groups of counties from within four regions of the United States and three levels of population density. Second, we randomly selected 30 square-mile-grid areas within each primary sampling unit (PSU) and then randomly numbered them to form an order of priority from among the total of all the square-mile sectors comprising the PSU area. Next, we recruited the cooperation of local law enforcement agencies that had jurisdiction over the selected grids. Third, we identified appropriate survey sites (i.e., a safe area large enough for the survey operation and with sufficient traffic flow) within the square-mile-grid areas. This resulted in the selection of five survey sites within each PSU for data collection. Finally, we randomly selected drivers to be interviewed from the traffic passing the site. Ultimately, 8,384 nighttime drivers entered the survey site and were determined to be eligible (i.e., aged 16 or older, drivers of noncommercial vehicles, English or Spanish speakers) for participation. Of the eligible participants, 7,159 (85.4%) provided a breath sample, and 6,920 (82.5%) responded to the questionnaire.

Despite these high response rates, we explored the possibility of selection bias by (a) eliciting a reason for refusal; (b) obtaining a passive sensor reading on all motorists entering the survey site; (c) offering monetary incentives (\$100) to a random group of refusers to change their minds and provide a sample; and (d) performing sensitivity analyses. The outcome of this effort, which was reported in Lacey et al. (2010), indicated that some of those who refused could have been alcohol positive. The evidence suggests, however, that most of those who refused participation did so because of survey saturation and for reasons unrelated to alcohol. Analyses in this study are based on those who responded to the questionnaire.

Survey Procedures

As noted, the 2007 NRS procedures closely followed the methodology used in the previous three surveys (see Lacey et al. 2009b; Lund and Wolfe 1991; Voas et al. 1998; Wolfe 1974;). The basic procedure included a brief questionnaire and a breath test. As in previous NRS studies, the nighttime survey was conducted from 10 PM to midnight (early nighttime) on Fridays and Saturdays and from 1 AM to 3 AM (late nighttime) on Saturdays and Sundays.

The police officer working with the survey team directed the potential respondent into the survey site where a survey team member then directed the respondent into one of the four-to-six research bays. An interviewer then approached and recruited the driver's participation. If the individual agreed to participate, the interviewer conducted the survey and requested a breath sample. For a detailed description of the survey procedure, see Lacey et al. (2009b, 2011).

Interviewers recorded the responses to the traditional NRS questions on a handheld, portable digital assistant (PDA). The interviewers obtained breath samples from drivers using the Intoxilyzer 400 (manufactured by CMI, Inc., Owensboro, KY), a preliminary breath-test (PBT) device. The 22 items in the survey covered topics such as the annual mileage driven, the origin and destination of the current trip, drinking, drinking and driving, and various demographics (age, race, ZIP code, education, and employment status). For consistency with previous NRS studies, we also collected the observational identification of the driver's race and ethnicity. New to the 2007 NRS, however, was the self-reported information on race and ethnicity from drivers who completed the survey.

Analyses

Overall, the goals of this effort required (a) a comparison of findings from the 1996 NRS and 2007 NRS and (b) a closer examination of potential contributors to drinking and driving using the 2007 NRS. To compare results from the two surveys, we looked at point estimates and tested statistical significance comparing the 95% confidence intervals (CIs) obtained for the variables of interest at each survey. If the CIs from the two surveys did not overlap, we concluded that the distributional differences were statistically significant.

To investigate in more detail the contribution of each variable of interest to drinking and driving, we used only the 2007 NRS, as our access to the 1996 NRS database was limited. To analyze the 2007 NRS, we first applied descriptive analysis. The association with the BAC level of each of the available demographic, socioeconomic, and driving situational factors was investigated separately through simple descriptive analyses (chi-square tests). Next, we examined the joint contribution of all the factors under consideration using logistic regression. This step allowed us to ascertain the relative contribution of the individual factors and their interactions to the drinking-and-driving problem. We applied logistic regression to model the contribution of the factors of interest to the likelihood of a driver having a BAC of $> .00$, $.05$, or $.08$. This likelihood was studied separately, in three different regressions. We decided against running a single multilevel regression with BAC responses separated into three levels. We believe that, for policymakers, comparing the likelihood of registering a BAC $.08$ (current illegal limit) against a BAC $< .08$, or a BAC $.05$ (an illegal limit proposed by some) against a BAC $< .05$, is more relevant than comparing each of them against a BAC $= .00$. Because the literature shows that the prevalence of high BAC levels increases late at night, we added a variable to account for the two periods: 10 PM to midnight and 1 to 3 AM. Partitioning data for drivers' comparisons created some low-population cells, particularly for BAC $.08$ drivers who were "aged 66 and older" (0%) or had "work" as their nighttime trip destination (0%). To deal with this limitation, we eliminated from our logistic regressions the "age 66+" and "work destination" categories. Other specific groups with a small sample size of BAC $.08$ were Asians ($n=7$), the miscellaneous "other" racial/ethnic group ($n=4$), and the "other" occupation ($n=1$). All these categories were kept in the analyses but not discussed, either because the sample size precluded a meaningful interpretation (e.g., Asians) or because the interpretations of the miscellaneous "other" categories were not deemed relevant.

All the analyses were run using STATA 11 (StataCorp LP, College Station, Texas). To account for the sampling design followed by the 2007 NRS, we applied the STATA "svy" command. The weights accounted for the likelihood that only some PSUs and some drivers were selected, the number of vehicles in the PSU, and the traffic volume at the selected site (Lacey et al. 2009b, 2011).

RESULTS

Comparing the 1996 and 2007 NRS

Age, gender, and race—Table 1 displays BACs by age, gender, and race/ethnicity, comparing the 2007 NRS with the 1996 NRS. BAC ranges are grouped into those drivers who are alcohol-positive at BACs of $> .00$, $.05$, and $.08$. The alcohol-positive categories overlap (i.e., the $.08$ drivers are included in the other two BAC positive groups; the $.05$ drivers are included in the $> .00$ group). For each level of each demographic variable, the percentages of those at BACs of $> .00$, $.05$, and $.08$ are provided, with their associated CIs.

Overall, as noted by Lacey et al. (2009a), compared to the 1996 survey, the percentage of drivers on the road with positive BACs of $> .05$ and $> .08$ in 2007 was significantly reduced. Further, we found statistically significant drops in the percentages of BAC-positive drivers across different demographic groups since the 1996 NRS. Specifically, the prevalence of drinking and driving with positive BACs or BACs of $.05$ and higher has dwindled noticeably for young drivers between the ages of 21 and 25, although the drop in the prevalence of drunk driving (i.e., with BACs $\geq .08$) was not statistically significant for that age group. Drivers aged 26 to 45, on the other hand, have reduced their drinking and driving across all three BAC levels. Such across-the-board downward trends are also true for both male and female drivers, as well as for White, Black, and Hispanic drivers.

Occupation—Table 2 shows the prevalence of the different BAC levels for each of the employment categories, comparing the two waves of NRS. We observed a noticeably large and statistically significant decrease among unemployed drivers in the percentages of BAC-positives from the 1996 to the 2007 NRS (i.e., from 23.2% to 6.9%), but this downward trend was not substantial for the higher BAC levels. On the other hand, the prevalence of drinking and driving among employed and self-employed drivers fell significantly across all three BAC levels. Additionally, those who were students, retired, or on disability, or in another employment status, did not display distinct differences between 1996 and 2007.

Driving Situation and Environmental Factors

Exposure—Table 3 displays the percentage of drivers in three BAC ranges according to three measures of exposure: drivers reported driving either less than, equal to, or more than an average of 15,000 miles annually; percentage of total driving done at night; and total number of miles expected to be driven the night of the survey. We compared the first two measures only between the 1996 and the 2007 NRS, as no information on the total number of miles expected to be driven was available from the 1996 NRS data set.

As shown in Table 3, drivers at all degrees of annual driving exposure have significantly reduced their drinking and driving across almost all three BAC levels since the 1996 NRS. The only exception was the nonsignificant drop in prevalence of drunk driving (i.e., with BACs $\geq .08$) among those who drove less than average annually. We observed downward trends in drinking and driving at nighttime only among drivers who reported driving a smaller percentage of their miles at night (i.e., no more than 40%). The decreases were all statistically significant at each of the three BAC levels.

Trip origin and destination—Table 4 displays the trip origins and destinations of drivers according to the BAC level. Trip origin and destination data were not available from the 1996 NRS; therefore, only 2007 data are presented. Most nighttime drivers with a positive BAC began their trips at a bar, tavern, club, or restaurant (“bar/restaurant” in Table 4). Among those at BAC $> .00$, “bar/restaurant” was the most common trip origin, followed by “someone else’s home,” “home,” and “work/other” (all differences statistically significant at $\leq 5\%$). Although “bar/restaurant” was the most-often trip origin, when BAC $\geq .05$ or BAC $\geq .08$ drivers were considered, no statistical difference was found between “bar/restaurant” and “someone else’s home” as the most frequent trip origins. In other words, among those drivers who drank the most (BAC $\geq .05$), we found that it was equally likely that these drivers had their drinks at a bar/restaurant or at a private place, but not their own home (which we speculate suggests a private party). No driver at a BAC $\geq .05$ reported going to work as their trip destination, a commonsense but reassuring finding.

Joint contribution individual and situational factors—Table 5 shows the basic outcome of the three separate logistic regressions. Among the demographic and driving

situational variables, age indicated the greatest likelihood of finding BAC $\geq .08$ drivers. Relative to drivers aged 20 and younger, drivers aged 21 to 25 showed an odds ratio of 4.5 for a BAC $\geq .08$. Drivers aged 20 and younger were less likely to be found drinking and driving than drivers of any other age group under consideration ($p < .001$). Adults were three times more likely than underage drivers (i.e., younger than 21 years) to drive with an over-the-limit BAC. Compared with females, males were more likely to have an elevated BAC. The odds ratio for males relative to females is significantly higher than 1 for BACs of $\geq .05$ and $\geq .08$. For BAC $> .00$; however, the odds ratio for males was not statistically significantly different.

Aside from age and gender, two other variables—mileage and time of day—also are associated with drinking and driving. Drinking, as measured by any of the three BAC levels, was significantly more prevalent among those who reported driving the fewest miles on the night of the survey. It also was significantly more prevalent among those interviewed late at night rather than earlier at night.

The remaining demographic and driving situational variables in the models were mostly nonsignificant. Some exceptions included Hispanic drivers who were found less likely to be at a BAC of $> .00$ or $\geq .08$ than were White drivers ($p < .05$); drivers with some college experience were less likely to record a BAC of $\geq .08$ than drivers of other educational status (even those with a higher-education level); and drivers going to somebody else's home were more likely to record a BAC of $\geq .08$ than drivers who were going home. As expected and discussed, drivers coming from two potential drinking sites, a bar/restaurant or a friend's home, were more likely to have a positive BAC. However, the difference was not significant for drivers with illegal BACs and was not significant for a bar when considered separately from a restaurant. A possible explanation for this result is the inclusion of time of day in our models. We expect some drinking situational variables, such as "coming from a bar," to be highly correlated to the time of day and/or number of miles driven that night. To explore this possibility, we reran our logistic models excluding the time-of-day variable. Coming from a bar became statistically significant once the time of day was removed from our model.

The possibility of such confounding effects between 2 or more variables is not restricted to time and trip origin. Age and occupation also show some confounding effects, with many of the drivers aged 66 and older being retired or disabled and many of the younger drivers being students. To explore the statistical impact of these confounding effects, we ran models excluding age from our analysis. Despite exclusion, occupation remained statistically nonsignificant (as was found during our descriptive analyses; see Table 2).

In Table 5, we find the race/ethnicity variable to be statistically significant, despite this variable being nonsignificant in our descriptive analysis (Table 1). The reason for such a divergent outcome is that, in Table 5, the estimated role of race/ethnicity is adjusted by the number of miles driven. When we excluded the number of miles driven from our logistic regression model, the race/ethnicity variable became nonsignificant. This finding confirms the importance of adjusting for driving exposure in racial/ethnic driving comparisons (e.g., Voas et al. 2007).

We explored several two-way interactions based on simple models that included only the interactions and their main effects. The results presented in Table 6 include only those interactions we found to be statistically significant.

Table 6 shows that the risk-enhancing role that men play in shaping drinking driving (i.e., Tables 1 and 5) is even more prominent among Hispanics and African Americans, as well as with males aged 26 to 65. College education, however, seems to reduce drinking and

driving, specifically among males rather than among females. Young Asians seem to be relatively more reluctant to drink and drive than underage White drivers do.

DISCUSSION

Age

Our results show age was a significant factor in whether a weekend driver would have a positive BAC. The probability that a driver would be drinking peaked in the 21- to 25- year-old age group. This finding is consistent with the general epidemiological data on impaired driving (Hingson and Winter 2003). It is striking that drivers slightly older than the legal drinking age of 21 demonstrated 4.5 times the probability of exhibiting an illegal BAC when compared to drivers younger than 21. Several legal policies probably contribute to this result.

Minimum legal drinking age (MLDA) laws, present in all 50 states and the District of Columbia, restrict alcohol availability to those younger than 21 and have been shown to be related to reduced consumption and involvement in crashes (Fell et al. 2008; Shults et al. 2001). Growing out of the MLDA, zero tolerance (ZT) laws (which make it an offense for drivers aged 20 and younger to have any measureable amount of alcohol in their bodies) potentially expose young drivers to a substantially greater risk of arrest than adults and have been shown to reduce the involvement of drivers aged 20 and younger in alcohol-related crashes (Voas et al. 2003). In this study, because all states have ZT laws, 7% of the participating underage drivers were subject to being cited compared to only 2 or 3% of the adult drivers (Table 1). Graduated driver licensing (GDL) laws that affect 16- and 17-year-olds also may have played a role in the lower BACs among the underage group. Many states impose a ban on nighttime driving when the novice driver qualifies to drive unsupervised. Such laws, which have been found to reduce nighttime crashes of 16- and 17-year-olds (Williams and Shults 2010), may have eliminated some of the heavy-drinking novice drivers from the nighttime driving population.

These policies represent a major effort by the states to deal with the problem presented by underage drivers whose risk of crashing is increased more by alcohol than for older drivers (Baker et al. 1992, Peck et al. 2008, Zador et al. 2000). The 2001 National Survey of Drinking and Driving showed that drivers younger than age 20 reported the highest likelihood of being involved in a crash (23%) (Royal 2003a, 2003b). Likewise, teenagers also have the highest number of motor-vehicle fatalities per million miles driven and a much higher relative risk of being in an alcohol-related crash (Peck et al. 2008). Thus, the extent to which the MLDA, ZT, and GDL laws reduce the number of underage drinking drivers on the roads is an important gauge of their effectiveness.

Evidence that these policies influence underage drinking and driving and reduce underage alcohol-related crashes comes from the studies cited and from roadside surveys, such as the NRS. In their roadside survey, Roeper and Voas (1999) found that, although drivers aged 20 and younger reported heavier drinking than older drivers, they were less likely to have a high BAC when tested at the roadside. This finding suggests these deterrent policies are effective. An estimate of the total exposure of underage drivers is generally not available because gas tax receipts can provide only general population estimates. Roadside surveys provide both a measure of all underage drinking drivers and a measure of all drinking drivers in the survey, thus tracking an increase or a decrease in exposure of underage drinking drivers.

The young drivers in our study may have been influenced by the presence of police during recruitment. Because of the voluntary nature of the survey, drivers may choose not to enter

the survey bays and/or not participate in the study after entering the survey bays. Given the potential legal implications for younger drivers, they may have been more concerned about participation. However, as described in Lacey et al. (2009b), a refusal conversion study that asked refusing drivers to reconsider for additional incentives showed that, among drivers who accepted the incentives and continued participation, the BAC difference was not significant. Further, among underage drivers, none of those converted to continued participation were BAC positive. Although not conclusive proof, this analysis indicates that reasons other than concerns about the law motivated drivers to refuse (one of the most-cited reasons was “being in a hurry”).

Gender

In the 2007 NRS, 13% of the men, compared to 11% of the women, had been drinking. The difference was substantial in the illegal BAC range at or higher than .08, where men were three times more likely to be higher than the illegal limit (see Table 1). However, when other factors that affect the BACs of drivers were taken into account in our regression analysis, men were only 66% more likely to be at a BAC .08. These results are consistent with the extensive research on gender in relation to involvement in alcohol-related crashes. Although it requires fewer drinks for a woman to reach a given BAC than it does a man, at the same BAC, men and women exhibit the same level of crash risk (Blomberg et al. 2009; Voas et al. 2012; Zador et al. 2000). As shown in the 2007 NRS, however, male drivers are much more likely to be at high BACs on the road. With drinking-and-driving behaviors at two- to three-fold those of females (Chou et al. 2006), males are more than twice as likely as females to drive within 2 hours of drinking (32% versus 13%, respectively; Hingson and Winter 2003). Consequently, 46% of male, compared to only 29% of female, traffic deaths are alcohol-related (Hingson and Winter 2003).

Not only are males more likely to drive while impaired by alcohol (Burgess and Lindsey 1997), but they also are more likely to be the driver fatally injured in the crash. Males drive more frequently and farther than females while intoxicated (13.2 trips versus 6.6 trips, and 16.7 miles versus 8.5 miles) and take fewer safety precautions, such as using seatbelts and driving at safe speeds. Consequently, 78% of drivers fatally injured in alcohol-involved traffic crashes are men. Additionally, 86% of men compared to 67% of women fatally injured in alcohol-involved crashes have very high BACs (.15+; Hingson and Winter 2003; National Center for Statistics and Analysis 2003).

Race/Ethnicity

It is unclear why Asian drivers were only half as likely as White drivers to have positive BACs, but they were equally as likely to be over the illegal limit. The lower level of drinking overall is consistent with the extensive research literature. Asians typically have been considered a “model minority,” with high rates of abstention and low rates of heavy alcohol use (e.g., NCADI, 1997; Caetano 2003). For instance, the 2003 and 2004 National Survey of Drug Use and Health surveys show that Asians are less likely to have used alcohol during the past year or past month or to engage in binge or heavy alcohol use when compared to Hispanics, Whites, or Native Americans (OAS, 2000–2005). Previous studies have indicated that Asians have a lower prevalence of drinking and driving (e.g., Chou et al. 2005, 2006; Royal 2000) than drivers of other groups. Although the proportion of alcohol-positive drivers is lower, Tables 1 and 5 show that the prevalence of BAC .08 Asian drivers is relatively high. In other words, our finding suggests that, although Asian drivers do not drink and drive as much as drivers of other racial/ethnic groups (as expected from the literature), an important proportion of those who do drink and drive tend to drink to the level of impairment.

An interesting result was observed among Hispanic drivers. When race/ethnicity was analyzed alone (Table 1), we found that the prevalence of Hispanic and White drivers who had been drinking and who were over the limit was similar. However, the outcome of the regression analysis (Table 5) shows that Hispanic drivers were only half as likely as White drivers to have an illegal BAC. The reason for this apparent contradiction was the inclusion of the “miles driven” variable into our regression model. After adjusting for driving exposure, the likelihood of finding an impaired Hispanic driver became half that of a White driver.

The effect of driving exposure in studies about the role of race/ethnicity on impaired driving is not new. Voas and colleagues (2007) showed that studies of such a role have yielded divergent outcomes, depending on how driving exposure is accounted for. Once adjusted for exposure, this study showed a lower involvement of Hispanic drivers in drinking and driving relative to that of White drivers. That finding matches reports from self-reported national surveys (e.g., Caetano and McGrath 2005; Quinlan et al. 2005; Royal 2000; Townsend et al. 1998).

The lower prevalence of impaired driving by Hispanics detected in the 2007 NRS, although consistent with self-reported measures of impaired driving obtained from national surveys, does not match prevalence reports obtained from crash data. Studies based on the Fatality Analysis Reporting System (FARS) have consistently shown Hispanic, Indian-American, and African-American drivers as overrepresented in alcohol-related fatal crashes (e.g., Hilton 2006; Zador et al. 2000).

Hispanic and African-American drivers also were involved in one of the few dual interactions that were statistically significant: Compared to White drivers, males of these two groups were much more likely than were their female counterparts to be drinking and driving. Thus, based on other research literature, our study gives support to the complex picture showing that Hispanic and African-American drivers (particularly females of these groups) are less likely to drink and drive than their White counterparts, but once impaired, they are more likely to crash than White drivers are.

Socioeconomic Factors

Among the nighttime drinkers in the 2007 NRS, there were no differences based on educational attainment, except drivers with some college experience were about half as likely as non-high-school graduates to have an illegal BAC. The occupation variable showed statistical significance only for BAC > .00 drivers. Being a student or an employed driver increased the likelihood of having a BAC of > .00 when compared to an unemployed driver. We might speculate that this is related to less frequent drinking outside the home due to the loss of income. Among those employed and BAC positive, 16% came from a bar and 40% came from a friend's home or their own homes. Among the unemployed, those percentages were 12% and 53%, respectively.

Driving Environment

Table 3 shows that 26% of the drivers who reported that they would drive less than 5 miles on the night of the survey had positive BACs compared to only 16% who indicated they would drive between 6 and 20 miles, and 10% who planned to drive more than 20 miles. The difference was even more striking for drivers with illegal BACs, where 11% of low-mileage drivers, compared to 1% of the high-mileage drivers, were at an illegal BAC. This is consistent with the data on trip origin and destination, where travel to and from typical drinking locations (bars/restaurants and friends' homes near the home residence) were associated with positive BACs, compared to travel to work that often involved a commute.

Together, these two items emphasize the local nature of the drinking-and-driving problem. This is partly related to the time of night when drivers were interviewed. Drivers interviewed between 1 and 3 AM were five times more likely to be at an illegal BAC than were drivers interviewed between 10 PM and midnight. Because more drivers are returning home from licensed establishments and friends' homes during this period, there is an interaction between time of night and trip origin. This higher rate of driver intoxication in the early hours of the morning is mirrored in the FARS, where alcohol-related fatal crashes are four times higher after midnight (NHTSA, 2007).

In weighing the evidence on the prevalence of drinking drivers on the road collected in the 2007 NRS, it is important to keep in mind the limitations of the NRS procedures. The NRS is an estimate based on the 48 contiguous states. Sampling does not include freeways where surveys cannot be conducted safely and low-traffic roadways where surveys cannot be conducted economically. The surveys are generally limited to police jurisdictions willing to approve the research and willing to support the collection of data by providing an officer to direct traffic. Further, participation is voluntary and the environment of the roadside interview may cause some respondents to be less than candid when answering some questions. However, the high participation rate in the breath test suggests that most respondents are not intimidated by the survey procedure.

The prevalence data from the 2007 NRS should provide an important source of comparison data for studies of drivers in alcohol-related crashes. It should also inform enforcement agencies concerning the times and locations where impaired drivers are likely to be found and provide a metric for evaluating the effectiveness of their surveillance efforts. These results emphasize, once again, the significance of licensed establishments in the production of impaired drivers and should stimulate efforts to implement responsible beverage service practices and to avoid service to minors and the obviously intoxicated. Finally, the 2007 NRS provides another benchmark in the four-decade record of drinking drivers on American roads and provides a basis for measuring progress in combating DUI during the coming decade.

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Table 1
Comparison of nighttime BAC-positive drivers in relation to demographics in 1996 and 2007 NRS

	N	Alcohol Positive					
		>.00 (%)			.05 (%)		
		(CI)			(CI)		
	1996	2007	1996	2007	1996	2007	2007
Age:							
<21	964	1,062	7.5 (5.9, 9.1)	7.2 (5.6, 8.8)	2.7 (1.7, 3.7)	1.9 (1.1, 2.8)	1.3 (0.6, 2.0)
21–25	1,158	1,384	20.8* (18.3, 23.3)	15.9* (14.0, 17.8)	10.1* (8.3, 12.0)	5.8* (4.6, 7.1)	5.2 (3.9, 6.6)
26–45	2,688	2,839	21.3* (19.7, 22.8)	13.4* (12.2, 14.6)	9.5* (8.4, 10.7)	4.9* (4.1, 5.7)	5.6* (4.8, 6.5)
46–65	967	1,353	11.6 (9.7, 13.6)	10.6 (8.9, 12.2)	4.6 (3.3, 5.8)	4.0 (2.9, 5.1)	2.7 (1.7, 3.7)
66+	1,17	159	5.0 (1.8, 8.3)	8.3 (4.3, 12.4)	3.6 (0.8, 6.3)	1.1 (0, 2.6)	0.5 (0, 1.5)
							0 N/A
Gender:							
Female	1,883	3,042	13.5* (12.0, 15.0)	10.6* (9.5, 11.8)	5.5* (4.6, 6.5)	3.0* (2.4, 3.7)	2.9* (2.1, 3.6)
Male	4,072	5,147	18.3* (17.1, 19.6)	13.4* (12.5, 14.3)	8.4* (7.5, 9.2)	5.3* (4.7, 5.9)	4.8* (4.1, 5.5)
Race/Ethnicity:							
White	4,185	4,712	15.3* (14.3, 16.3)	12.5* (11.4, 13.5)	6.7* (6.0, 7.5)	4.6* (3.9, 5.3)	3.6* (3.1, 4.2)
Asian	N/A	324	N/A	9.7 (7.2, 12.1)	N/A	3.5 (2.0, 4.9)	N/A
Black	889	1,371	18.8* (15.8, 21.9)	12.2* (10.5, 13.9)	9.2* (6.9, 11.4)	3.4* (2.4, 4.3)	6.0* (4.2, 7.9)
Hispanic	597	1,473	36.4* (31.4, 41.4)	13.2* (11.6, 14.7)	15.0* (11.3, 18.7)	5.6* (4.5, 6.6)	9.3* (6.3, 12.3)
Other	N/A	307	N/A	11.1 (7.8, 14.4)	N/A	2.8 (1.1, 4.5)	N/A
							0.9 (0, 1.8)
All Drivers:	6,030	8,227	16.7 (15.7, 17.6)	12.4 (11.6, 13.1)	7.4 (6.7, 8.0)	4.4 (4.0, 4.9)	4.1 (3.6, 4.6)
							2.2 (1.9, 2.5)

Rows do not add up to 100%. Data in the BAC columns overlap (e.g., entries in > .00 also include those in the columns for .05 and .08). Ns are unweighted, and percentages are weighted. Subtotals for age, gender, or race/ethnicity do not add up to "All drivers" due to missing age, gender, or race/ethnicity.

* $p < .05$ significance level.

Table 2

Comparison of nighttime BAC-positive drivers in relation to occupation status in 1996 and 2007 NRS

		Alcohol Positive					
		N		> .00 (%)		.05 (%)	
				(CI)		(CI)	
		1996	2007	1996	2007	1996	2007
Occupation:							
Unemployed	284	238	23.2* (18.2, 28.1)	6.9* (3.5, 10.2)	9.3 (5.9, 12.7)	5.9 (2.8, 9)	2.2 (2.6, 4.2)
Student	40	650	11.3 (3.0, 19.5)	10.0 (7.6, 12.3)	10.1 (2.2, 17.9)	3.0 (1.6, 4.3)	2.3 (1.1, 3.4)
Employed and self-employed	4,723	5,447	17.9* (16.8, 19.0)	13.0* (12.1, 13.9)	8.1* (7.3, 8.8)	4.6* (4.0, 5.1)	2.3* (1.9, 2.7)
Retired or on disability	266	320	8.2 (5.5, 10.9)	7.6 (4.5, 10.7)	2.2 (0.8, 3.7)	3.8 (1.6, 6.1)	3.0 (1.0, 5.0)
Other	548	142	9.0 (6.7, 11.3)	10.2 (5.8, 14.6)	4.3 (2.7, 6.0)	1.6 (0, 3.4)	0.3 (0, 1.0)

Rows do not add up to 100%. Data in the BAC columns overlap (e.g., entries in > .00 also include those in the columns for .05 and .08). Ns are unweighted, and percentages are weighted.

* $p < .05$ significance level.

Table 3

Comparison of nighttime BAC-positive drivers in relation to driving exposure in 1996 and 2007 NRS

	N	Alcohol Positive					
		> .00 (%)			.05 (%)		
		(CI)			(CI)		
	1996	2007	1996	2007	1996	2007	2007
Yearly miles (avg.=15,000)							
Less than	1,457	1,904	18.8* (16.6, 20.9)	13.6* (12.2, 15.1)	9.1* (7.5, 10.7)	5.3* (4.4, 6.3)	4.3 (3.2, 5.4)
Average	1,694	2,152	16.9* (15.1, 18.7)	10.8* (9.4, 12.1)	6.9* (5.7, 8.1)	3.8* (3.0, 4.6)	4.6* (3.6, 5.6)
More than	2,707	2,767	15.6* (14.3, 16.9)	12.7* (11.4, 14.0)	6.8* (5.9, 7.7)	4.2* (3.4, 5.0)	3.7* (3.0, 4.4)
% of driving at night							
0–20%	2,585	3,035	18.6* (17.1, 20.2)	14.6* (13.3, 15.8)	8.1* (7.0, 9.1)	5.9* (5.1, 6.7)	4.9* (4.1, 5.7)
21–40%	1,383	1,763	18.8* (16.7, 20.9)	11.0* (9.5, 12.4)	9.4* (7.9, 11.0)	3.3* (2.5, 4.1)	4.9* (3.8, 6.1)
41–60%	1,266	1,251	12.7 (10.9, 14.6)	9.7 (8.0, 11.4)	4.0 (2.9, 5.1)	2.6 (1.7, 3.5)	1.9 (1.2, 2.7)
61–80%	462	546	13.0 (10.1, 15.8)	11.3 (8.6, 14.0)	7.0 (4.8, 9.2)	3.9 (2.2, 5.5)	3.4 (1.8, 5.0)
81–100%	155	232	5.8 (1.9, 9.6)	11.0 (6.6, 15.4)	3.0 (0.2, 5.8)	5.1 (2.0, 8.2)	1.5 (0, 3.5)
Miles driven that night							
0–5	N/A	219	N/A	25.6 (20.6, 30.7)	N/A	17.2 (12.8, 21.5)	N/A
6–10	N/A	527	N/A	16.2 (13.4, 19.0)	N/A	6.0 (4.1, 7.8)	N/A
11–20	N/A	1,014	N/A	16.2 (14.1, 18.3)	N/A	6.3 (4.9, 7.6)	N/A
More than 20	N/A	5,033	N/A	9.8 (9.0, 10.7)	N/A	2.8 (2.4, 3.3)	N/A

Rows do not add up to 100%. Data in the BAC columns overlap (e.g., entries in > .00 also include those in the columns for .05 and .08). Ns are unweighted, and percentages are weighted.

* $p < .05$ significance level

Table 4

Nighttime: Trip origin and destination by BAC (2007 NRS only)

BAC	N	Alcohol Positive		
		> .00 (%)	.05 (%)	.08 (%)
		(CI)	(CI)	(CI)
Trip origin				
From home	1,165	10.0 (8.2, 11.7)	3.7 (2.6, 4.8)	1.8 (1.0, 2.6)
From someone else's home	1,809	17.6 (15.8, 19.4)	5.6 (4.5, 6.7)	2.2 (1.5, 2.9)
From bar/restaurant	992	22.1 (19.6, 24.6)	8.3 (6.7, 9.9)	4.0 (2.8, 5.1)
From work	1,242	5.8 (4.5, 7.1)	3.0 (2.1, 4.0)	2.3 (1.5, 3.1)
From other	1,610	6.9 (5.7, 8.2)	2.1 (1.4, 2.8)	1.4 (0.9, 2.0)
Trip destination				
To home	4,512	12.8 (11.8, 13.7)	4.5 (3.9, 5.1)	2.3 (1.9, 2.8)
To someone else's home	987	12.9 (10.8, 15.0)	6.1 (4.6, 7.6)	3.6 (2.4, 4.7)
To bar/restaurant	444	15.0 (11.8, 18.2)	5.0 (3.0, 6.9)	1.6 (0.5, 2.7)
To work	190	0.5 (0, 1.4)	0 N/A	0 N/A
To other	681	10.5 (8.1, 13.0)	2.6 (1.3, 3.9)	0.9 (0.1, 1.6)

Rows do not add up to 100%. Data in the BAC columns overlap (e.g., entries in > .00 also include those in the columns for .05 and .08). Ns are unweighted, and percentages are weighted.

Table 5

Outcome of logistic regressions

	BAC > .00		BAC .05		BAC .08	
	Odds Ratio	P> z	Odds Ratio	P> z	Odds Ratio	P> z
21-25	2.519	0.000	3.500	0.000	4.539	0.000
26-45	2.273	0.000	3.138	0.000	3.249	0.000
46-65	2.050	0.000	3.117	0.000	3.693	0.001
66+	1.893	0.216	0.876	0.835	Omitted	
<i>Ref: <21</i>						
Male	1.202	0.080	1.580	0.000	1.661	0.000
<i>Ref: Female</i>						
Asian	0.518	0.004	0.545	0.023	0.947	0.869
Black	0.911	0.340	0.709	0.208	0.805	0.623
Hispanic	0.754	0.002	0.902	0.389	0.565	0.008
Other	0.974	0.874	0.475	0.031	0.325	0.015
<i>Ref: White</i>						
High school graduate	0.820	0.316	0.962	0.877	0.804	0.601
Some college	0.833	0.363	0.676	0.121	0.438	0.036
College graduate	0.944	0.753	0.928	0.755	0.800	0.628
<i>Ref: Not a high school graduate</i>						
Student	2.003	0.056	0.718	0.490	1.861	0.172
Employed/self-employed	2.651	0.006	0.974	0.944	1.563	0.292
Retired/on disability	1.591	0.363	1.262	0.745	4.280	0.136
Other	1.920	0.323	0.351	0.038	0.217	0.023
<i>Ref: Unemployed</i>						
From someone else's home	1.932	0.000	1.527	0.029	1.065	0.861
From bar/restaurant	2.170	0.000	1.989	0.008	1.687	0.191
From work	0.453	0.000	0.700	0.161	1.038	0.888
From other	0.706	0.009	0.727	0.272	1.025	0.956

	BAC > .00		BAC .05		BAC .08	
	Odds Ratio	P> z	Odds Ratio	P> z	Odds Ratio	P> z
<i>Ref: From home</i>						
To someone else's home	1.367	0.038	2.156	0.008	2.339	0.002
To bar/restaurant	1.577	0.085	1.563	0.150	0.844	0.671
To work	0.044	0.000	Omitted	0.000	Omitted	
To other	1.034	0.847	0.784	0.427	0.468	0.124
<i>Ref: To home</i>						
6–10 miles	0.515	0.036	0.266	0.000	0.365	0.014
11–20 miles	0.521	0.002	0.300	0.000	0.195	0.000
20+ miles	0.262	0.000	0.118	0.000	0.098	0.000
<i>0–5 miles</i>						
Late night	2.649	0.000	4.650	0.000	5.441	0.000
<i>Early night</i>						

BAC > .00, BAC .05, and BAC .08 denote the three (0,1) dependent variables used in each of the three logistic regressions. "Omitted" denotes a level that was excluded due to the small sample size. P>|z| denotes the 2-tailed p-values for testing the null hypothesis that the OR=1.

Table 6Significant ($p < .01$) interactions between factors in the regression analysis

	BAC		
	> .00	.05	.08
	Odds ratio	Odds ratio	Odds ratio
Gender * race/ethnicity			
Hispanic males	2.16	2.75	5.28
African-American males	ns	ns	8.86
<i>Ref: White females</i>			
Gender * age			
Males aged 26–45	1.91	7.06	Ns
Males aged 46–65	1.73	ns	Ns
<i>Ref: Females <21</i>			
Gender * education			
Males some college	ns	0.20	0.08
Males college graduate	ns	0.25	0.06
<i>Ref: Females not a high school graduate</i>			
Age* race/ethnicity			
Asians aged 21–25	0.37	Omitted	Omitted
Asians aged 26–45	0.18	Omitted	Omitted
<i>Ref: White <21</i>			