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Working title:

National Estimates of Alcohol Use Disorders among Drivers

Debra Furr-Holden¹

John Lacey¹

Tara Kelley-Baker¹

Mark Johnson¹

Robert B. Voas¹

¹Pacific Institute for Research and Evaluation, Public Services Research Institute,
Calverton, MD

Corresponding author:

Debra Furr-Holden, Ph.D.

11710 Beltsville Drive, Suite 125

Calverton, MD 20705

Phone: 301-755-2718 Fax: 301-755-2799 e-mail: dfurr-holden@pire.org

I. Background

A. An Overview of DUI Research

In the latter half of the 1990s, a study published by the Traffic Injury Foundation in Canada argued that the high BAC levels of crash-involved drivers and the substantial over-involvement of repeat DUI offenders demonstrated that “hard core” drinking drivers were the principal group involved in alcohol-related crashes (Simpson et al., 1996). That study was published at a critical time for safety advocates who were calling for the U.S. Congress to pass legislation requiring the states to enact a common .08 per se BAC limit. The .08 policy was strongly opposed by the hospitality industry that argued that such a low limit would criminalize “social drinkers.” The industry seized on the Simpson et al. (1996) study to campaign against the effort to pass .08 legislation. Nonetheless, Congress enacted legislation that provided incentives for states to pass .08 laws. Currently, all 50 states have passed such legislation.

In this process, however, safety advocates joined with the hospitality industry in pressing for stronger sanctions for high BAC and repeat DUI offenders. Some of these sanctions have been included in the Transportation Equity Act for the 21st Century (TEA-21) that provides incentive funds to states that pass such legislation and threatens diversion of highway construction funds for those that do not. Nevertheless, the extent to which repeat offenders are overrepresented in alcohol-related crashes remains controversial and is significant to policymaking because of the costs involved in the extended jail, house arrest, vehicle interlock, and probation programs being imposed on DUI offenders judged to be “hard core.” Hedlund and Fell (1995) and Jones and Lacey (1998, 2000), although noting the overrepresentation of repeat offenders in fatal crashes, pointed out that they still accounted for only a small proportion of total crashes. The use of a high BAC at the time of arrest as a signal that the individual is a “hard core” offender or dependent on alcohol is questionable based on Marowitz, DeYoung, and Yu’s (1996) findings of only a relatively modest relationship between BAC and recidivism among California DUI offenders.

Baker and Chen (2001) used data from the 1993 National Mortality Followback Survey (NMFS), coupled with the Fatality Analysis Report System (FARS), the 1996 NRS and the 1993 National Survey of Drinking Driving Attitudes and Behavior (NSDDAB) to study the characteristics of fatally injured drivers. In the NMFS, relatives or close associates were queried about drinking problems of the fatally injured drivers using the CAGE instrument (Ewing, 1984). Using the NMFS-FARS dataset, the authors concluded that 25% of drivers killed in single-vehicle crashes, 10% of at-fault drivers killed in multivehicle crashes, and 6% of those killed in not-at-fault multivehicle crashes were judged to be problem drinkers. In 1993, single-vehicle crashes accounted for 57.5% of all fatal crashes, and multivehicle crashes accounted for 42.5% (NHTSA, 1994). Thus, according to this criterion, less than one-fifth of fatally injured drivers are problem drinkers. The authors also remarked that “Histories of alcohol consumption, alcohol

dependence, and drinking and driving practices were not determined for roadside survey respondents, and therefore, their relative importance could not be measured for that component of the study” (p. vii). Thus, the debate continues as to the relative importance of AUD in fatal crashes and the nighttime weekend driving population.

Alcohol-related crashes were substantially reduced between 1980 and 1995, but since 1995, there has been little change in the number of alcohol-related crashes (Stewart & Fell, 2002). A frequent argument for the current significance of the high BAC offenders is that the drop in alcohol-related crashes resulted from a reduction in impaired driving by the “easy to deter” drinking drivers, but the “hard core” drinking drivers remain to be controlled. However, as shown in Figure 1, the reductions in alcohol-positive driver involvements in fatal crashes that occurred during that period were evenly spread through the full range of BAC levels. Thus, there is no evidence with respect to the distribution of BAC levels that there has been a change in the characteristics of crash-involved drivers.

One missing piece of evidence in the controversy regarding the role of alcohol-abusive and alcohol-dependent drivers in crashes is their prevalence on the road. DeYoung, Peck, and Helander (1997) have developed a method of estimating prevalence of repeat DUI offenders from archival data, but this involves several assumptions that are difficult to verify. A more direct measurement is needed of the prevalence of drivers with AUDs on U.S. roadways that will permit a better determination of the relative risk they present for involvement in alcohol-related crashes. To date, the NRSs have only collected BAC data. The extent to which the incident BAC of a driver stopped at random on the road is related to his or her AUD status is unknown. Many with high BAC levels may be classified as moderate drinkers who, on that particular evening, consumed more than their normal amount. Conversely, some with low or zero BAC levels may be periodic binge drinkers who did not consume any alcohol on the particular night they were stopped for the survey.

In past surveys, questions about drinking problems have been avoided, in part due to time constraints on the interview length, but also because of concern that such questions would reduce participation in the breath test that follows the interview. NHTSA’s funding of a preparation program for the 2006 survey provides the opportunity to determine what questions the public is comfortable in answering, the feasible length for an interview, and the extent to which questions (which may have to be asked after the breath test) covering AUDs impact cooperation in the subsequent breath and saliva tests. If credible information on alcohol use disorders (namely, heavy drinking, abuse,

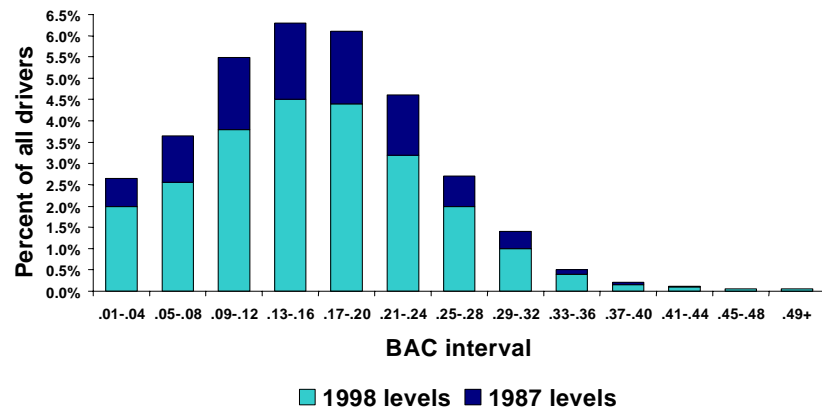


Figure 1. Reduction from 1987 to 1998 in the Percentage of All Drivers in Fatal Crashes Who Were Drinking

and dependence) can be collected during a nationwide driver survey, it should be possible to better inform decision makers regarding the risk posed by repeat and high BAC DUI offenders.

B. National Roadside Surveys from Previous Years

A roadside survey is a research activity generally conducted on weekend evenings in which a police officer is engaged to direct randomly selected motorists into a safe location where drivers can be approached by research specialists, who will request their participation in an anonymous survey that usually lasts 3 to 5 minutes and includes a breath test of their BACs. The first roadside survey was conducted by Holcomb (1938) in Evanston, Illinois, in 1938. This was followed some time later by surveys in New York by Haddon (Haddon & Bradess, 1959; McCarroll & Haddon Jr., 1962), which were coupled with data collection on crash-involved drivers to permit estimates of the relative risk of crash involvement at various BAC levels. The classic case control survey was the Grand Rapids study conducted in 1963 by a team under Borkenstein (Borkenstein, Crowther, Shumate, Ziel, & Zylman, 1974). That study of drivers involved in crashes and drivers not involved in crashes using the road at the same times and places resulted in the construction of a BAC crash risk curve that widely influenced the passage of impaired driving laws based on specified BAC limits throughout the world. Since the 1960s, roadside surveys also have been used to evaluate safety programs (Voas, 1972; Levy, Voas, Johnson, & Klein, 1977; Voas & Hause, 1987; Ross & Voas, 1990; Voas, Holder, & Gruenewald, 1997).

The NRS program began in 1973 when Wolfe (1975), under a contract with NHTSA, conducted a survey at a time when alcohol-related crashes appeared to be increasing. Wolfe repeated the survey in 1986 with funds from IIHS (Lund & Wolfe, 1991). A decade later, NHTSA and IIHS combined funded a third survey that was conducted by Voas (Voas et al., 1998). Figure 2 compares the results from the three surveys showing the substantial decline in weekend nighttime drivers with measurable BACs (see Appendix C for full article). BAC data from these surveys, when combined with BAC data from the census of fatally injured drivers in the FARS, can be used to create crash-risk estimates as a function of BAC for both male and female drivers of varying ages (Zador, Krawchuk, & Voas, 2000b).

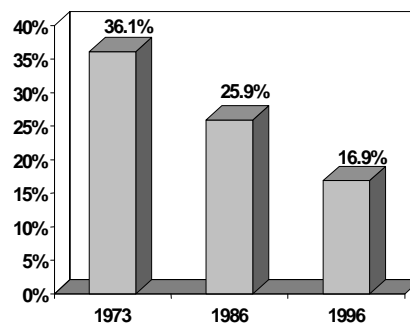


Figure 2. Percentage of Weekend Nighttime Drivers with Positive BACs on U.S. Roads

C. Measuring Alcohol Use Disorders

There is a range of diagnostic tools available to identify alcohol use disorders with varying utility and application. Although the accuracy of the procedures used in diagnosing AUDs in the DUI population is limited, there are several valuable scales that have been studied to date. Conley (2001) evaluated the construct validity of the Michigan Alcoholism

Screening Test (MAST) and the Alcohol Use Disorders Identification Test (AUDIT) for the current Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) alcohol dependence. These tests were administered to 126 DUI offenders presenting for court-ordered inpatient treatment. DSM-IV alcohol disorders were evaluated for a representative subset of clients using National Longitudinal Alcohol Epidemiological Surveys (NLAES). Both instruments exhibited acceptable internal consistency and correlated moderately well with each other ($r=0.617$). The MAST correlated more strongly ($r=0.602$) than the AUDIT ($r=0.432$) with DSM-IV diagnoses (Conley, 2001). At the roadside, however, there is concern about administration of the MAST, which has more detail on impairment and may be too lengthy to be feasible as a rapid roadside assessment tool. The AUDIT, however, is a brief 10-item screening divided into subscales. The first three items – (1) How often do you have a drink containing alcohol? (2) How many drinks containing alcohol do you have on a typical day when you are drinking? (3) How often do you have five or more drinks on one occasion? – comprise the consumption subscale and have a 0.8 correlation with the entire scale (Chung, Colby, Barnett, & Monti, 2002). This high correlation with the entire AUDIT scale renders them ideal for a rapid roadside signal for prevalent heavy alcohol consumption. Moreover, there is a growing body of evidence that suggests the AUDIT in its entirety is an appropriate signal for DSM-IV alcohol abuse and dependence (e.g., Chung et al., 2002; Aertgeerts et al., 2000; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The last seven items of the scale have been conceptualized as measuring alcohol-dependence and alcohol-related consequences. Although several studies have shown that these items moderately correlate with DSM diagnoses, there is concern over the differential performance of each subscale on the AUDIT as it correlates to actual DSM diagnosis (e.g., Chung et al., 2002; Maisto, Carey, Carey, Gordon, & Gleason, 2000). Additionally, to fully explore AUDs in a broad context, it is necessary to study lower-level alcohol syndromes including alcohol abuse, which can occur in the absence of heavy drinking or alcohol dependence (Chung et al., 2002; Volk, Steinbauer, Cantor, & Holzer, 1997).

The AUDIT consumption subscale shows the best metric qualities as a measure for heavy drinking with high construct and criterion validity (Chung et al., 2002; Conley, 2001) and test-retest reliability (Babor, de la Fuente, Saunders, & Grant, 1992). The criteria for DSM-IV alcohol abuse and dependence are more complex than simply identifying patterns of heavy drinking. Categorization of alcohol abuse requires some problem items (i.e., trouble with the law or inability to fulfill social roles), and dependence diagnoses require items covering either tolerance or withdrawal (American Psychiatric Association [APA], 1994). Thus, to fully explore alcohol-use disorders, additional measures beyond the AUDIT will be required. The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) from the NLAES is viewed as an appropriate tool for measuring alcohol abuse and dependence (Cottler et al., 1997; Pull et al., 1997). The AUDADIS is a comprehensive, fully structured diagnostic tool developed for use in the NIAAA-sponsored NLAES survey, a large population-based study in the United States of AUDs and co-occurring health conditions (Grant & Dawson, 1997). Diagnoses from the AUDADIS are produced by algorithms that generate International Classification of

Disease—Tenth version (ICD-10) and DSM-IV AUDs. The metric properties of the AUDADIS have been studied in great detail across cultures (e.g., Canino et al., 1999; Chatterji et al., 1997; Üstün et al., 1997; Hasin et al., 1997; Vrsti et al., 1998) and settings (e.g., Hasin et al., 1997; Volk et al., 1997). The abuse scale has acceptable validity, namely concordance rates with DSM-IV abuse above 0.5 (Üstün et al., 1997). The dependence scale of the AUDADIS also has high metric properties. The test-retest reliability ($Kappa=0.68$) exceeds clinical standards for a measurement instrument (Üstün et al., 1997; Grant & Harford, 1995; Grant, Kushner, & Kim, 2002). As a measure of validity, the AUDADIS has a 0.61 correlation with the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) and a 0.69 correlation with the Diagnostic Interview Schedule (DIS). These good reliability coefficients also provide additional support for the validity of the dependence syndrome and somewhat less so for the abuse syndrome.

D. Significance of Research

There are substantial societal resources being allocated to address the perceived risk posed by AUD drivers who are believed to be “hard core” DUI offenders as evidenced by the passage of state laws providing for more severe penalties for high BAC first DUI offenders. AUD measures validated in other contexts (telephone and household surveys) and treatment programs are available for application in the roadside survey context; however, it is important to demonstrate their feasibility in the context of a roadside survey. Although these instruments have acceptable psychometric properties in medical settings, before applying them in non-medical and particularly roadside contexts, it is important to explore any variation in performance attributable to the shift in context. In addition, given the low probability of arrest for intoxicated drivers, this epidemiologic investigation of the prevalence of AUDs among drivers and quantification of the association between incident BAC and AUD is a critical first step in understanding the extent of the problem on a population level. The result will provide data to make scientifically informed decisions about policies intended to reduce impaired driving and an evidence base for primary prevention for all drivers and secondary prevention efforts for high BAC drivers.

II. Methods

This study was undertaken to determine the feasibility of collecting information on alcohol abuse and dependence from a random sample of drivers using the roads on weekend evenings and to estimate the prevalence of AUDs among this high-risk population of drivers. It was incorporated into the National Highway Traffic Safety Administration (NHTSA) funded Pilot Study for the next National Roadside Survey (NRS) scheduled for 2006. The four goals of this roadside administration of AUD items were to: (1) assess the feasibility of and establish a protocol for integrating a brief 15-item alcohol use disorder (AUD) screener in the existing National Roadside Survey Pilot Program, (2) calculate response rates for the AUD screen in the context of the existing National Roadside Survey Pilot Program, (3) estimate the prevalence of AUDs among weekend nighttime drivers in a sample of drivers contacted at the roadside, and

(4) to estimate the relationship between AUD status and cross-sectional BAC (measured at the roadside). To achieve these goals, a brief 15-item AUD screener was constructed. The screener was first validated as a feasible tool for implementation at the roadside. The success of the Feasibility Phase of testing was assessed using three criterion, namely: (1) respondents would answer items related to alcohol use at the roadside, (2) the roadside responses to the screener were replicable in another context (e.g., phone administration, and (3) roadside measures were valid against other criterion measures. The second phase of this work involved administration of the screener in a 6-state nationwide Pilot Program which allowed estimation of AUD prevalence and the relationship between AUD status and BAC.

A. The Assessments and diagnoses

1. Heavy drinking

To assess alcohol use disorders, a 15-item screener was constructed. The first three items were derived from the Alcohol Use Disorders Identification Test (AUDIT) and represent the AUDIT consumption subscale, also known as the AUDIT-C (Chung et al., 2002; Conley, 2001; Babor, de la Fuente, Saunders, & Grant, 1992). Scores of 6 or more signal heavy drinking for men and scores of 5 or more signal heavy drinking for women using the AUDIT-C. The values that correspond to AUDIT-C response options are included on the AUDIT-C Screener (Table 1).

2. Alcohol Abuse

Derived from the AUDADIS, Table 1 presents the items used to measure DSM-IV alcohol abuse and dependence. (AUDADIS; Grant & Dawson, 1997; Cottler et al., 1997; Pull et al., 1997). Items 4-7 on the screener are used to assess alcohol abuse. The way the AUDADIS is constructed, there is one item per DSM-IV symptom for alcohol abuse. A positive response to any of these items signals alcohol abuse. To meet criteria for alcohol abuse however alcohol dependence must first be ruled out, so there is a hierarchy for categorizing the disorder (APA, 1994). Items 8-15 on the screener are also derived from the AUDADIS and were used to classify alcohol dependence. Items 8 and 9 both tap into the domain of tolerance. Items 10-15 are each representative of one DSM-IV diagnostic symptom. A total therefore of 7 diagnostic symptoms are represented across the 8 items. A positive response to 3 of any of the 7 symptoms signals alcohol dependence.

B. Phase One Feasibility Procedures

To implement the Feasibility Program the investigative team gained cooperation of a local police department in the northern Mid-Atlantic Region. Cooperation was facilitated through ongoing police operations with which PIRE is currently associated in one of several locales (e.g., Maryland, Delaware, Virginia, West Virginia, and in the).

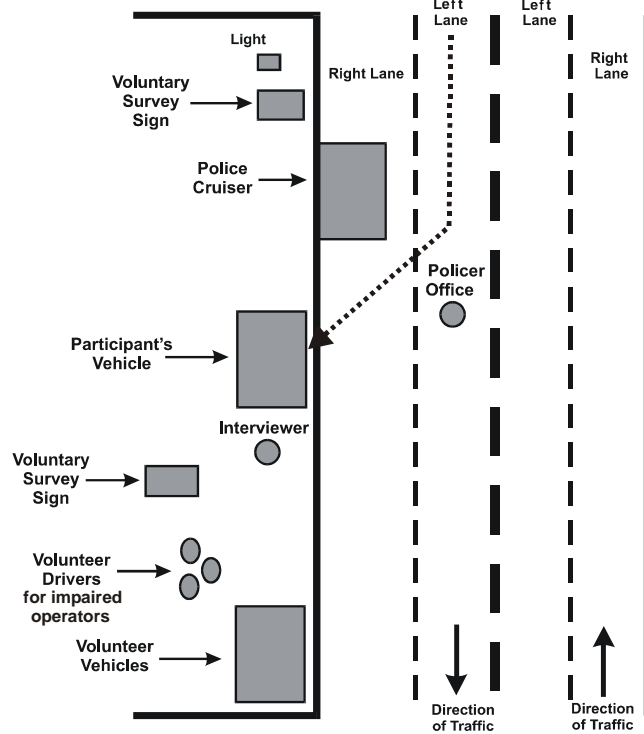


Figure 3. Example of a Survey Site on a Four-Lane Road

After the cooperating department was identified, the investigative team identified a safe, well-lit location in which to conduct the survey (in this case, a closed gas station lot where the proprietor agreed to leave the lights on), and recruited an off-duty police officer to direct traffic into interview bays marked off by cones. The specific survey location was identified on a roadway with sufficient traffic volume between 10 p.m. and 2 a.m. on Fridays and Saturdays to generate the number of cases necessary for the study. The procedures for selecting motorists for this roadside survey were identical to the previous three NRSs and the dozens of other surveys conducted over the last 30 years. The police officer at the prompt of the interviewer or survey supervisor directed the next car to the

off-road interview location. (See Figure 3 for a diagram of the actual positioning of the officer, the staff, and the participants). The setup of the roadway, including signage and warning of a potential stop were in compliance with highway traffic safety standards.

1. Subject recruitment and survey administration

We began contact with the driver using the standard NRS protocol (see Lestina et al., 1999 for a detailed published report) and informed consent procedure. After agreement to the survey was obtained, the existing NRS survey questionnaire was administered. Once the traditional questionnaire was completed, the SD-400 breath-test was administered. A passive alcohol sensor (PAS) was used if a respondent was unable to produce a breath test due, for example, to severe asthma or labored breathing. The participant was offered an incentive to provide a saliva sample (as a part of the NRS protocol) and lastly a \$5 incentive to complete the AUD screener. This add-on procedure for the AUD screener was intended to avoid compromising the integrity of the existing NRS and its comparability with previous years. The AUD screener, although an add-on to the NRS program, has a separate consent statement. During this phase of the feasibility test, we also queried participants about their assessment experience and solicited their opinions on how we can most effectively obtain cooperation.

After determining that respondents would be willing to answer items related to their alcohol use, the second stage of feasibility testing was conducted. In this portion of the program a sample of weekend nighttime drivers was recruited from the same jurisdiction as the first phase. Drivers were asked to provide an anonymous breath sample for alcohol analysis and consent was obtained for the AUD screener. Upon completion of the screener, respondents were given an index card with a unique ID number and a toll free number to call to complete a follow-up survey. Respondents were given an inactive \$25 Walmart gift card and asked to call the number within 48 hours to complete the follow-up interview. Respondents were verified as the selected individual at call back using identifying information provided on the survey and queried about the night of the survey (e.g., what day the survey was completed, what time the interview was conducted, etc.). After respondents were verified and upon completion of the follow-up survey, gift cards, already in the respondents' possession, were activated. This procedure made it possible to maintain anonymity of respondents and also gave respondents an incentive to complete the follow-up survey. A licensed clinical psychologist administered follow-up interviews. These data were collected between April and June, 2005.

C. Phase Two: 6-State Pilot Program

1. Selection of sampling units

After establishing the feasibility of the AUD screener for use at the roadside and within the NRS Program, a full-scale Pilot Study was conducted to fully exercise the stratified, random sampling procedure used in the 1996 NRS and to implement the same roadside procedures. The sample was drawn from the General Estimates System (GES) of the National Automotive Sampling System (NASS), a sample of 60 PSUs representing the contiguous United States. A stratified random sample of six PSUs were drawn from the NASS. The stratification procedure used ensured that three PSUs east and three west of the Mississippi were drawn and that at least one psu in each section of the country was rural. This was done to provide a cross-section of the conditions likely to be encountered in the 2006 NRS. Within each PSU, a police jurisdiction with a minimum of 20 sworn officers was randomly selected. Agreement was sought from the jurisdiction to permit the survey and also to allow off-duty police to assist in stopping cars. The one randomly selected police jurisdiction that refused to participate was replaced with another randomly selected jurisdiction from the same region of the U.S. In the 1996 NRS, 54% of the police departments approached agreed to support the survey. In this pilot test, 5 out of 6 of the jurisdictions approached agreed to participate.

Within each police departmental area, a mile-square grid was laid down and two cells of the grid were randomly selected. Within each cell, two road segments were selected and the actual survey site chosen on-site to permit safe stopping of vehicles. The sample consists of up to two police departments within each of six PSUs, with two survey sites within each jurisdiction.

2. Survey procedures

The AUD screening was implemented as an adjunct to the 2006 NHTSA NRS. The AUD screener takes approximately 3-5 minutes to administer and was implemented while the respondent was providing the oral fluid sample. For respondents who refused to provide an oral fluid sample, but agreed to the AUD screener it was conducted immediately after the NRS questionnaire. The protocol for implementing the NRS and AUD administration is summarized as follows:

1. Officer directed the car off the roadside
2. Car was directed into the interview area and intercepted by interviewer/surveyor
3. Consent for NRS questionnaire (if respondent refused an anonymous breath sample was requested)
4. Breath sample requested and breath test is administered
5. Consent for the AUD screener, then consent for oral fluid sample
6. AUD screener administered (for respondents providing oral fluid this is done simultaneously while the OF swab is in their mouth)
7. Brief participant satisfaction survey
8. Car waived out of survey area

III. Results

A. Response Rates and Sample Size

Table 1 displays the sample size and corresponding response rates for AUD screener items from the 6-state Pilot study

Table 1. AUD 15-item Screener Response Rates

Roadside Survey sample size	Number of past year drinkers eligible for AUD screener	Response rate*	AUD sample size	# ineligible for AUD Screener due to lack of alcohol consumption
716	530	516/530 = 97.36%	516	171

*Response rate calculated based on number of respondents eligible. Eligibility criteria included being English Speaking, aged 18 and older and reporting past year consumption of alcohol.

B. Alcohol Use Disorder Estimates

Based on the 15-item screener data obtained at the roadside, binge drinking within the past year (see attachment) was the most prevalent alcohol-related diagnosis with 35.7%

of all respondents reporting binge drinking in the past year (n=184/561). Alcohol abuse was the second most reported problem drinking behavior with 8.3% of respondents meeting criteria for non-dependent alcohol abuse (n=43/561). An estimated 6.8% of respondents met criteria for alcohol dependence (n=35/561). These estimates converge with other estimates from the general population derived from national household surveys (SAMHSA, 2004).

Table 2. AUD Screener Prevalence Estimates

AUD	Prevalence
Binge Drinking	35.7%
Alcohol Abuse	8.3%
Alcohol Dependence	6.8%

IV. Discussion

Drivers were able to both validly and reliably answer brief screening items related to their alcohol use patterns in the past year and as well, demonstrated a relationship between impaired weekend nighttime driving and AUD status.

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Table 1. Brief AUD Screener

AUDIT-C Heavy Drinking Questions				
1. In the past year, how often did you have a drink containing alcohol?				
never(0)	monthly or less(1)	2-4 times/month(2)	2-3 times/week(3)	4 or more times/week(4)
2. In the past year, how many drinks containing alcohol did you have on a typical day when you were drinking?				
1 or 2(0)	2-4(1)	5 or 6(2)	7-9(3)	10 or more (4)
3. In the past year, how often did you have six (five for a woman) or more drinks on one occasion?				
never(0)	less than (1) monthly	monthly(2)	weekly(3)	daily/almost daily(4)
AUDADIS Abuse Questions (prefaced by 'In the past year')*				
4. Did your drinking often interfere with taking care of your home or family or cause you problems at work or school?				
5. Did you more than once get into a situation while drinking or after drinking that increased your chances of getting hurt—like driving a car or other vehicle or using heavy machinery after having had too much to drink?				
6. Did you get arrested, held at a police station or have legal problems because of your drinking?				
7. Did you continue to drink even though it was causing you trouble with your family or friends?				
AUDADIS Dependence Questions(prefaced by 'In the past year')**				
8. Have you found that you have to drink more than you once did to get the effect you want?				
9. Did you find that your usual number of drinks had less effect on you than it once did?				
10. Did you more than once want to try to stop or cut down on your drinking, but you couldn't do it?				
11. Did you end up drinking more or drinking for a longer period than you intended?				
12. Did you give up or cut down on activities that were important to you or gave you pleasure in order to drink?				
13. When the effects of alcohol were wearing off, did you experience some of the bad after effects of drinking – like trouble sleeping, feeling nervous, restless, anxious, sweating or shaking, or did you have seizures or sense things that weren't really there?				
14. Did you spend a lot of time drinking or getting over the bad after effects of drinking?				
15. Did you continue to drink even though it was causing you to feel depressed or anxious or causing a health problem or making one worse?				

*Coded with yes or no responses. An answer of yes to any item signals a positive for the specified symptom and adds one point to the total score. A total score of 1 or more signals alcohol abuse.

**Coded with yes or no responses. An answer of yes to any item signals a positive for the specified symptom and adds one point to the total score.. If either item 8 or 9 are positive, then criteria for withdrawal are met, but these items either separate or combined contribute only one point to the diagnostic score, for a total possible score of 7. A total score of 3 or more signals alcohol dependence.