Persistence of Addictive Disorders in a First-Offender Driving While Impaired Population

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Context: We compared the prevalence of alcohol use and other psychiatric disorders in offenders 15 years after a first conviction for driving while impaired with a general population sample.

Objective: To determine whether high rates of addictive and other psychiatric disorders previously demonstrated in this sample remain disproportionately higher compared with a matched general population sample.

Design: Point-in-time cohort study.

Setting: Pacific Institute for Research and Evaluation, Albuquerque, New Mexico.

Participants: We interviewed convicted first offenders using the Composite International Diagnostic Interview 15 years after referral to a screening program in Bernalillo County, New Mexico. We calculated rates of diagnoses for non-Hispanic white and Hispanic women (n=362) and men (n=220) adjusting for missing data using multiple imputation and compared psychiatric diagnoses with findings from the National Comorbidity Survey Replication by sex and Hispanic ethnicity.

Results: Eleven percent of non-Hispanic white women and 12.8% of Hispanic women in the driving while impaired sample reported 12-month alcohol abuse or dependence, compared with 1.0% and 1.8%, respectively, in the National Comorbidity Survey Replication (comparison) sample. Almost 12% of non-Hispanic white men and 17.5% of Hispanic men in the driving while impaired sample reported 12-month alcohol abuse or dependence, compared with 2.0% and 1.8%, respectively, in the comparison sample. These differences were statistically significant. Rates of drug use disorders and nicotine dependence were also elevated compared with the general population sample, while rates of major depressive disorder and posttraumatic stress disorder were similar.

Conclusion: In this sample, high rates of addictive disorders persisted over 10 years among first offenders and greatly exceeded those found in a general population sample.


Over the past 2 decades, there has been a major decline in the percentage of traffic fatalities attributed to alcohol. Despite this, driving while under the influence or driving while impaired (DWI) continues to be a significant public health problem.\(^1,2\) Nationally, alcohol-related crashes still remain at the unacceptably high rate of 32% of all fatal crashes. In 2008, an alcohol-related fatal crash occurred approximately every 45 minutes, totaling 11,773 deaths.\(^3\) Internationally, because of a variety of risk factors, including impaired driving, motor vehicle crashes will be the third most serious threat to human health in the world by 2020.\(^4\) How many lives are lost because of DWI by other drugs, alone or in combination with alcohol, is unknown.\(^5,6\) In addition to the considerable emotional and physical pain caused by these crashes, the estimated economic cost of alcohol-related crashes in 2000 was $51 billion.\(^7\) As a society, we must do more to reduce the toll that impaired driving takes on our citizens.

Driving while impaired is a common crime. More Americans are arrested for DWI than for any other crime except drug possession.\(^8\) This is an arrest rate of 1 for every 139 licensed drivers in the United States, constituting in 2008 more than 1.48 million drivers.\(^9\) A DWI conviction is a significant event, for it identifies people who are at high risk of having or developing substance use disorders. However, the criminal justice system alone cannot prevent these offenders from repeating the offense. Most states mandate that offenders...
undergo screening to determine their need for treatment services, but offenders often underreport their substance use and related problems, leading to a substantial underidentification of those with alcohol and drug use disorders. A high percentage of these offenders continue to drive after drinking, with 20% to 50% rearrested for DWI. These high rearrest rates are alarming; yet, arrests are the tip of the iceberg. One study estimated that for every arrest, an impaired driver makes 50 to 200 trips that go undetected. As a result, the National Highway Traffic Safety Administration places a special emphasis on reaching high-risk populations, including repeat offenders and drivers with high blood alcohol concentrations.

Information on the longitudinal progression of alcohol use disorders among convicted DWI offenders has important implications, but we know little regarding the long-term course of addictive disorders among convicted DWI offenders. Cavaiola and colleagues evaluated factors associated with repeat offenses at 12-year follow-up among 77 first offenders, but they did not ascertain alcohol use or other psychiatric disorders. McCord studied 466 men from childhood to adulthood and examined factors associated with having a DWI conviction. She found that such men were more likely than those not convicted to be alcoholic and to have a conviction for other serious crimes. Our previous study interviewed a sample of 1396 offenders 5 years after conviction for a first DWI offense with a court mandate to undergo screening. Among participants, 85% of women and 91% of men met diagnostic criteria for lifetime alcohol dependence or abuse. Thirty-three percent of women and 40% of men reported a 12-month alcohol abuse or dependence disorder. These rates and rates of drug use disorders far exceed the rates of substance use disorders in a matched general community sample, wherein fewer than 3.5% reported a lifetime alcohol or drug use disorder.

We conducted the current study to provide information on the extent to which the high rates of addictive disorders found 5 years after screening persist and how the prevalence of these disorders compares with their prevalence in the general community. To this end, we attempted to locate and interview this cohort 15 years after a screening referral. The objectives were to determine the rates of current alcohol and drug use disorders and other psychiatric disorders in this population and to compare these rates with those obtained from a comparable sample surveyed from the general community.

**METHODS**

**DESIGN OVERVIEW**

We selected the study population from a database of convicted DWI offenders referred to the Lovelace Comprehensive Screening Program between April 1989 and March 1992. We interviewed 1396 offenders 5 years after this referral (initial study), then located and reinterviewed this cohort 15 years after the initial screening referral (follow-up study). This is a point-in-time cohort study of a subgroup of individuals who were first-time offenders 15 years earlier. The primary analyses compared the DWI sample with participants in the National Comorbidity Survey Replication (NCS-R) conducted between 2001 and 2003.

**SETTING AND PARTICIPANTS**

The screening program had a contract with the Bernalillo County Metropolitan Court, Albuquerque, New Mexico, to provide a comprehensive evaluation of first offenders to determine whether they had an alcohol- or drug-related disorder. The court referred those deemed to have these disorders to community-based treatment options, and they were followed up to determine whether they completed the treatment process. Traffic records and self-reported information indicated that about 80% were truly first offenders. This offender population was similar in age and marital status to other convicted DWI offender populations but had a higher proportion of Hispanic and American Indian individuals compared with other US studies. The mean blood alcohol concentration for DWI offenders in the screening program was 16%, around the middle of the range for mean blood alcohol concentrations of arrested drunk drivers elsewhere in the United States.

For the initial study, we selected 1208 consecutive female and 1407 male referrals. We contacted subjects between June 1994 and June 1997 to determine the prevalence of psychiatric disorders. This was a community-based sample, since these offenders were selected regardless of whether they completed screening or the court referred them to treatment. We have published the details regarding selection, location, and tracking of the study sample. We sent information about the nonlocated subjects to the National Death Index to match against death certificates. Of 2615 selected subjects, 56 had died, and we could not locate 497 of the 2615; we located 2062 who were alive and interviewed 1396 of them (Figure). Approximately 10 years later, we tried to locate and reinterview the 1396 participants interviewed for the initial study. We submitted a list of identifiers for all subjects who, during the tracking process, had either died or we could not locate to the Centers for Disease Control and Prevention in January 2008, and staff there matched this list to the National Death Index. Of 1396 subjects, 100 participants had died, and staff located 905 living subjects. We interviewed 716 subjects; 57 refused passively or were incapacitated, and 132 refused to be interviewed. Comparisons of those interviewed at 15-year follow-up with those originally selected and not known to be deceased (n = 2459) revealed that men, Mexican nationals, those with an arrest warrant, those without telephones, and those who did not complete screening were underrepresented in the 15-year follow-up sample (eTable, http://www.archgenpsychiatry.com).

For the follow-up study, the primary data source for locating clients was screening program record data; we used other databases as well. Bilingual (English and Spanish) staff used a comprehensive location protocol that the Pacific Institute for Research and Evaluation institutional review board approved. Protocols included a letter sequence, telephone calls, and home visits. Once located, willing participants provided written informed consent, and we gave them $100 to complete the interview. We trained our interviewers in administering the diagnostic instrument. We interviewed by telephone the out-of-town individuals (about 18% of those interviewed) and about 10% of those residing in state who lived far from the research site and/or were unable to visit the research site. We reviewed all interviews to monitor consistency and discussed discrepancies to standardize coding.

The diagnostic interview included demographic information and a computerized version of the Composite International Diagnostic Interview. The World Health Organization and the US Mental Health Administration initially requested...
this interview to estimate prevalence rates of specific psychiatric disorders. Composite International Diagnostic Interview questions are fully scripted, close ended, highly structured, and appropriate for nonclinician interviewers to use. The version used, the 10th revision, provides DSM-IV diagnoses based on an individual’s responses. Disorders assessed for the present study included rates of 12-month alcohol and drug abuse and dependence, nicotine dependence, major depressive disorder (MDD), and posttraumatic stress disorder (PTSD). We limited nonsubstance-use–related diagnoses to MDD and PTSD because they were the 2 most prevalent disorders in the DWI offender population. Twelve-month prevalence is the percentage of subjects who, having met the diagnostic criteria once for a lifetime disorder, experienced symptoms of that disorder within the 12 months prior to the interview. We also asked subjects, "How often did you drive when you thought you might be over the legal blood alcohol limit [herein designated as driving over the limit] for drunk driving in the past 3 months?" We compared the self-reported rates of driving over the limit among those with no alcohol diagnosis, alcohol abuse, and lifetime alcohol dependence.

**STATISTICAL ANALYSIS**

The NCS-R is a nationally representative sample of 9282 English-speaking adults, conducted approximately contemporaneously with the final DWI interviews. It provides a suitable benchmark against which we could compare the DWI offender data. Both studies used the same diagnostic interview. We used SAS version 9.1.3 for all analyses. Means, standard deviations, and frequencies were the descriptive statistics.

We restricted the primary sample chosen for these comparisons to those who self-identified as being non-Hispanic white or Hispanic ethnicity. The DWI sample comprised 134 individuals whose ethnicity we could not match with comparable individuals from the comparison sample. The majority of them (n=96) were Native American. In the comparison sample, we included Native American individuals under “all other,” and they constituted 17.6% of that sample. Removing the 134 from the DWI sample resulted in a final matched sample of 582 individuals.

To address known sex differences in the prevalences of psychiatric comorbidity between men and women, we weighted the sample by age, adjusted the analysis by education, and conducted separate analyses by ethnicity and sex. This yielded 4 separate sex-ethnicity groups: sex crossed with non-Hispanic white vs Hispanic ethnicity. In both the NCS-R and DWI studies, we used a single item to assess ethnicity. We computed age in 2003 for all DWI subjects. For the DWI–NCS-R comparisons, we applied weights, calculated separately for each stratum, to the DWI sample to equate the 2 samples by age categories. The primary analyses were weighted logistic regressions. To adjust for years of education, we entered this variable into the analyses as a covariate. We accounted for multiple comparisons across strata and diagnoses by using a partial Bonferroni α level of .005 to determine statistical significance.

We used multiple imputation in our primary analyses because of missing data in the DWI sample. Multiple imputation for missing data has multiple advantages over earlier approaches to missing data, such as listwise deletion; it allows for the inclusion of cases with 1 or more missing values while taking into account the uncertainty introduced into the analysis by the imputation process. We did not impute for the minimal missing data in the comparison sample. The variables included in the imputation model were an indicator variable for which cases had died: age; sex; education; blood alcohol concentration reading at the initial DWI arrest; ethnicity; 3 binary variables to indicate whether the participants at the initial interview were married, divorced, or single; and the status at the time of the initial interview of diagnoses for alcohol abuse, alcohol dependence, drug abuse or dependence, nicotine dependence, MMD, and/or PTSD. We generated 10 multiply imputed samples using Markov chain Monte Carlo to accommodate nonmonotone missing data patterns.

To determine whether inaccuracies in the imputation might affect our results, we conducted a sensitivity analysis. There, we made the extreme assumption that all missing observations would be contrary to results obtained from the imputations, namely, that all missing cases would have no alcohol, drug, or other diagnoses. We also conducted simple comparisons of the study participants in the DWI and comparison samples.
RESULTS

As found in the original study,18 the DWI sample exhibited age-adjusted rates of alcohol and drug use disorders as well as nicotine dependence that greatly exceeded those in the comparison sample (Table 1). Unlike those in the original study, rates of MDD and PTSD were significantly higher than those found in respective comparison samples. Rates of alcohol abuse or dependence among DWI offenders were significantly higher than those found in the comparison sample. Rates of MDD and PTSD were comparable with the comparison sample. Rates of alcohol and drug use disorders were more than 6 times higher in the DWI population, compared with a general population (Table 1). The overall rate of self-reported driving over the limit in the 90 days before the last interview was 10%. Of 11 subjects with no lifetime alcohol diagnosis, no one reported driving over the limit; of 286 subjects with a lifetime alcohol abuse diagnosis, 7% reported driving over the alcohol limit; and among 279 with lifetime alcohol dependence, 14% reported this condition (Fisher exact P=.01). For drug abuse or dependence and for nicotine dependence, we found statistically significant differences among both ethnic groups of female offenders and women in the respective comparison samples. Hosmer-Lemeshow tests indicated an adequate fit for the statistical models.

Table 1. Estimated Rates of Self-Reported 12-Month Recency Diagnoses, DWI Offenders, and NCS-R Samples, Equated for Agea

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>DWI Sample</th>
<th>Comp</th>
<th>DWI Sample</th>
<th>Comp</th>
<th>DWI Sample</th>
<th>Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol abuse</td>
<td>18 (6.4)</td>
<td>24 (0.9)</td>
<td>25 (7.3)</td>
<td>4 (1.4)</td>
<td>13 (5.5)</td>
<td>41 (1.8)</td>
</tr>
<tr>
<td>Alcohol dependence</td>
<td>9 (3.1)</td>
<td>13 (0.5)</td>
<td>15 (4.4)</td>
<td>2 (0.7)</td>
<td>8 (3.4)</td>
<td>21 (0.9)</td>
</tr>
<tr>
<td>Alcohol abuse or dependence</td>
<td>16 (11.2)</td>
<td>26 (1.0)</td>
<td>26 (12.8)</td>
<td>5 (1.8)</td>
<td>12 (11.8)</td>
<td>45 (2.9)</td>
</tr>
<tr>
<td>Drug abuse or dependence</td>
<td>9 (3.2)</td>
<td>5 (0.2)</td>
<td>21 (6.2)</td>
<td>1 (0.4)</td>
<td>8 (3.4)</td>
<td>16 (0.7)</td>
</tr>
<tr>
<td>Nicotine dependence</td>
<td>38 (23.9)</td>
<td>84 (3.2)</td>
<td>28 (13.7)</td>
<td>9 (3.3)</td>
<td>12 (11.6)</td>
<td>66 (2.9)</td>
</tr>
<tr>
<td>Major depressive disorder</td>
<td>36 (12.6)</td>
<td>271 (10.2)</td>
<td>36 (10.4)</td>
<td>17 (6.2)</td>
<td>16 (6.5)</td>
<td>137 (6.0)</td>
</tr>
<tr>
<td>PTSD</td>
<td>24 (8.1)</td>
<td>123 (4.6)</td>
<td>35 (9.9)</td>
<td>19 (6.9)</td>
<td>60 (2.4)</td>
<td>45 (2.0)</td>
</tr>
</tbody>
</table>

Abbreviations: Comp, NCSR comparison group; DWI, driving while impaired; NCS-R, National Comorbidity Study–Replication comparison group; PTSD, posttraumatic stress disorder.

Table 2. ORs of 12-Month Psychiatric Disorders (DWI Offenders vs NCS-R Sample)a

<table>
<thead>
<tr>
<th>Psychiatric Disorder</th>
<th>Non-Hispanic White Women</th>
<th>OR (95% CL)</th>
<th>P Value</th>
<th>Non-Hispanic White Men</th>
<th>OR (95% CL)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol abuse</td>
<td>6.81 (3.19, 14.51)</td>
<td>&lt;.001</td>
<td>0.004</td>
<td>3.09 (1.25, 7.64)</td>
<td>0.02</td>
<td>0.07</td>
</tr>
<tr>
<td>Alcohol dependence</td>
<td>8.01 (2.27, 28.2)</td>
<td>&lt;.001</td>
<td>0.01</td>
<td>4.34 (1.39, 13.6)</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Alcohol abuse or dependence</td>
<td>12.9 (6.99, 24.0)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>6.71 (3.46, 13.0)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Drug abuse or dependence</td>
<td>26.5 (4.71, 148.7)</td>
<td>&lt;.001</td>
<td>0.007</td>
<td>7.24 (1.76, 29.7)</td>
<td>0.008</td>
<td>0.04</td>
</tr>
<tr>
<td>Nicotine dependence</td>
<td>6.03 (3.25, 11.2)</td>
<td>&lt;.001</td>
<td>0.004</td>
<td>3.19 (1.45, 7.01)</td>
<td>0.005</td>
<td>0.04</td>
</tr>
<tr>
<td>Major depressive disorder</td>
<td>1.44 (0.641, 3.2)</td>
<td>&lt;.001</td>
<td>0.001</td>
<td>1.31 (0.425, 4.05)</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>PTSD</td>
<td>1.98 (0.762, 5.14)</td>
<td>&lt;.001</td>
<td>0.001</td>
<td>1.60 (0.742, 3.46)</td>
<td>0.002</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Abbreviations: CL, confidence limits arrest; DWI, driving while impaired; OR, odds ratio; NCS-R, National Comorbidity Study–Replication comparison group; PTSD, posttraumatic stress disorder.

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tion, even in the distant past, identifies a subgroup of people with high rates of current substance use disorders. Rates of alcohol abuse or dependence in the DWI population were more than 5 times higher than in the comparable general population sample. This has important public health implications, for those in our study with lifetime alcohol dependence reported twice the rate of driving over the limit compared with subjects reporting no diagnosis or alcohol abuse. The first-offender population in our study also was at high risk for crash involvement. Of the 1396 offenders in the initial study, 588 (42.2%) were subsequently involved in a crash, with 347 (24.9%) involved in 1 crash, 158 (11.3%) in 2 crashes, and 83 (5.9%) in 3 or more crashes (S.C.L. and B.J.S. “Current Drinking and Driving Over the Limit 15 Years After a First DWI Conviction,” unpublished data, 2011).

Based on these findings, we recommend enlisting health and mental health care providers to address DWI issues in clinical contexts to help identify and intervene with those at risk for chronic impaired-driving behavior. We suggest asking directly about a patient’s DWI history. Clinical practice guidelines for those with chronic addictions recommend intensive addiction treatment followed by outpatient treatment for a period.29 These individuals also may benefit from ongoing monitoring and early reintervention following treatment discharge.29 Such practices promote abstinence and reduce the likelihood of rearrest.29 Medication-assisted treatment is another promising, if underused, treatment modality.29 One preliminary study revealed that an extended-release form of injectable naltrexone reduced drinking in a small sample of chronic DWI offenders.30 Moreover, a post hoc analysis showed an association between this medication, combined with psychosocial support among alcohol-dependent patients who had maintained at least 4 days of continuous abstinence before starting treatment, and a significant reduction in alcohol consumption during holiday periods, when alcohol-related crashes peak.32 Excessive alcohol intake during major holidays contributes to about 40% of all traffic fatalities.33 These studies suggest that treatment including medication and monitoring of sobriety may be an effective means for reducing chronic recidivism.

To our knowledge, this study is the first to determine the persistence of addictive disorders in a nontreatment DWI sample having a high prevalence of addictive and other psychiatric disorders. Alcohol and drug use disorders are chronic relapsing conditions.34 Thus, we anticipated that rates of alcohol and drug use disorders among DWI offenders with a demonstrated high prevalence of addictive disorders might continue to exceed those found in a community sample. Several longitudinal studies have followed up patients treated for alcohol dependence for 10 years or more to determine long-term outcomes.35–39 Remission rates vary tremendously in these samples, and methodological differences make it difficult to compare recovery rates.40 Findings for treatment samples do not generalize to DWI offenders, as treated populations are more likely than community samples to have severe dependence and other comorbid psychiatric disorders.33 We found that rates of current substance use disorders decreased substantially from those ascertained at the initial interview. This is consistent with findings that prevalence rates of substance use disorders decline with age.42 Subjects with substance use disorders in the original sample were also more likely to be deceased at the 15-year follow-up interview than those interviewed initially (S.C.L. and B.J.S. “Current Drinking and Driving Over the Limit 15 Years After a First DWI Conviction,” unpublished data, 2011).

Rates of alcohol use disorders found in the DWI sample exceeded prevalence rates from other national surveys that did not use the Composite International Diagnostic Interview to determine diagnoses. Two nationally representative surveys—the National Institute on Alcohol Abuse and Alcoholism 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions and the National Institute on Alcohol Abuse and Alcoholism 1991–1992 National Longitudinal Alcohol Epidemiologic Survey—ascertained prevalence rates of 12-month DSM-IV alcohol abuse and dependence in 2001 and 2002 using face-to-face interviews. In the National Epidemiologic Survey on Alcohol and Related Conditions and the National Longitudinal Alcohol Epidemiologic Survey, the prevalences were 6.93% for men and 2.55% for women.43

The NCS-R, National Epidemiologic Survey on Alcohol and Related Conditions, and National Longitudinal Alcohol Epidemiologic Survey studies all found that alcohol use disorders are much more prevalent among men than women. The discrepancy between rates of addictive disorders in the DWI and comparison groups in our study was much higher for women than for men, with both sexes in the DWI sample having nearly equal rates of alcohol and drug use disorders. Rates of nicotine dependence were particularly elevated in the female offender subgroups. These findings are consistent with other studies in which the percentage of DWI offenders meeting lifetime criteria for alcohol dependence is similar to, or higher, among women than men.44–46

In contrast to findings in the initial study,18 rates of MDD and PTSD in this study were comparable with those found in the community sample. For the analysis, we used a multiple imputation procedure that accounted for deaths and other possible biases, and the sample sizes were adequate. Therefore, the lack of significance probably is not due to selective attrition, though we cannot rule that out entirely.

A major limitation of this study is the low participation rate, a problem inherent to longitudinal studies of criminal justice populations.47–50 Those with a good reason to avoid detection (those with arrest warrants or who were in the country illegally), as well as hard-to-reach subjects with no telephones, were either not located or were more likely to refuse participation. Although we attempted to adjust for biases introduced by loss to follow-up, rates of psychiatric disorders in this population may not be representative of the general US population of DWI offenders. The sensitivity analysis confirmed the direction of results in all instances, however. Another study limitation is that the interview used for both studies, the NCS-R version of the Composite International Diagnostic Interview, may have underestimated the prevalence of substance dependence symptoms unless the respondents were positive for abuse. The DWI offenders may
be more likely to qualify for a diagnosis of abuse because repeated driving under the influence of alcohol is 1 criterion for alcohol abuse. Other study limitations are the limited number of psychiatric diagnoses compared, sampling from a single locale, the use of self-report measures to ascertain psychiatric diagnoses using structured interviews for both the DWI and NCS-R studies, and no clinical confirmation of psychiatric disorders. We had to eliminate Native American individuals and those of other races from the primary analysis because of insufficient sample sizes.

In conclusion, compared with a matched community sample, this longitudinal study found extremely high rates of addictive disorders among convicted first DWI offenders, particularly among women, 15 years after a screening referral and similar rates of MDD and PTSD.

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Additional Contributions: Jan Alroy, Michael Lackey, Vivian Fernandez, and Catherine Cummins conducted the interviews and Elizabeth Woźniak prepared the manuscript. We thank all the study participants.

RESEARCH REFERENCES


Correction

Error in Figure. In the Original Article titled “Limbic Activation Associated With Misidentification of Fearful Faces and Flat Affect in Schizophrenia” by Gur et al, published in the December 2007 issue of the Archives (2007; 64[12]:1356-1366), the top rightmost panel of Figure 4 on page 1364 is incorrect. The line for the controls should not be flat. This article was corrected online.

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