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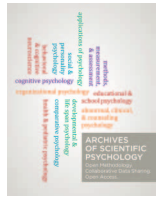

# A Prospective Study of Psychiatric Comorbidity and Recidivism Among Repeat DUI Offenders

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A B S T R A C T

In tandem with nationwide awareness and prevention campaigns, driving under the influence (DUI) behavior and consequences, like motor vehicle fatalities, have decreased significantly during the past several decades. However, alcohol-impaired driving still accounts for more than 30% of motor vehicle fatalities and rates of DUI no longer appear to be decreasing. Repeat DUI offenders, those who are convicted of DUI more than once, account for a disproportionate amount of DUI related harm. These offenders have much higher rates of psychiatric disorders than the general population, and it is possible that these disorders contribute to their DUI behavior and reduce the impact of intervention campaigns. The current article examines whether repeat DUI offenders with certain psychiatric disorders are more likely to reoffend than others. The authors assessed psychiatric disorders among 743 repeat DUI offenders upon admission to a DUI treatment program and then tracked their criminal record for 5 years. Offenders with certain patterns of psychiatric disorders were more likely than other offenders to commit a criminal offense during the 5-year follow-up. In addition, offenders with attention deficit disorder were specifically more likely to commit motor vehicle-related offenses during the 5-year follow-up. These findings suggest that for many repeat offenders, DUI is one outlet in a constellation of criminal behavior, and that psychiatric disorders increase vulnerability for criminal re-offense.



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For further discussion on this topic, please visit the *Archives of Scientific Psychology* online public forum at http://arcblog.apa.org.

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SCIENTIFIC ABSTRACT

Psychiatric comorbidity has emerged as a key element distinguishing driving under the influence (DUI) offenders from others, and, in some cases, distinguishing repeat offenders from first-time offenders. This article uses a prospective design to determine whether the comorbid disorders identified among repeat DUI offenders can predict recidivism. Seven hundred forty-three repeat DUI offenders were recruited from a 2-week inpatient treatment program at which they received a standardized mental health assessment and were followed across 5 years posttreatment to track DUI offense, motor vehicle-related offenses, and general criminal offenses. Psychiatric comorbidity, though it did not predict DUI recidivism specifically, predicted criminal reoffense more generally. In addition, there was a specific relationship between lifetime attention deficit disorder and repeated motor vehicle-related offenses. These findings suggest that for many repeat offenders, DUI is one outlet in a constellation of criminal behavior, and that psychiatric comorbidity increases vulnerability for criminal reoffense.

*Keywords:* alcohol, comorbidity, driving under the influence, impaired driving, mental health, prospective, recidivism
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Despite significant decreases in driving under the influence (DUI) behavior, offenses, and fatalities during the past 30 years (National Highway Traffic Safety Administration [NHTSA], 2006, 2013), DUI continues to be a significant public health threat. It is striking that even with these decreases, 31% of all motor vehicle (MV) fatalities involve an alcohol-impaired driver (2013). Since the late 1990s, the rate of alcohol-involved fatalities has failed to decrease significantly and remains steady (Nelson & Tao, 2012). In addition, the proportion of DUI arrests that involve individuals with prior DUI convictions has held steady at one third (NHTSA, 2008). These observations suggest that the intervention and policy efforts that were successful during the 1980s and early 1990s have been effective with most segments of the population, but not all. The population segments that continue to commit DUI offenses today likely differ from those that responded to earlier interventions in ways that make them less likely to be influenced by currently available DUI prevention efforts. Therefore, it is more important than ever to understand the risk factors that influence today's DUI offenders to recidivate.

Repeat DUI offenders continue their DUI behavior despite public prevention efforts and the individual sanctions they have received because of their previous offense(s). One study reported that 10.5% of repeat offenders had offended again within 4 years of treatment and 15.5% within 6 years of treatment, whereas another study reported that 43.8% had a subsequent DUI offense after 12 years (Beerman, Smith, & Hall, 1988; LaBrie, Kidman, Albanese, Peller, & Shaffer, 2007). Given the low arrest rates for DUI, it is likely that these repeat offenders have engaged in DUI many more times than their arrests reflect.

Much DUI research has been devoted to identifying predictors and correlates of DUI and DUI recidivism that prevention programs might then use to inform and individualize DUI treatment efforts. Psychiatric comorbidity has emerged as a key element distinguishing DUI offenders from others, and, in some cases, distinguishing repeat offenders from first-time offenders (Freeman, Maxwell, & Davey, 2011; Lapham, C'de Baca, McMillan, & Lapidus, 2006; Lapham et al., 2001; McMillen, Adams, Wells-Parker, Pang, & Anderson, 1992; Shaffer et al., 2007). Not surprisingly, rates of alcohol use disorders are highly elevated among DUI offenders; close to 100% of repeat offenders qualify for a lifetime diagnosis of either alcohol abuse or alcohol dependence (Lapham, C'de Baca, et al., 2006; Lapham et al., 2001; Shaffer et al., 2007). The same research demonstrates that other drug use disorders also are prevalent among both first-time and repeat offenders. However, recent research has shown clearly that other psychiatric comorbidity, beyond substance use disorders, also is a major concern in DUI populations (C de Bacade Baca, Miller, & Lapham, 2001; Donovan, Marlatt, & Salzberg, 1983; Glass, Chan, & Rentz, 2000; Lapham, C'de Baca, et al., 2006; McMillen et al., 1992; Shaffer et al., 2007).

Three studies in particular have investigated psychiatric disorders among DUI populations in a systematic, comprehensive fashion. All three used standardized diagnostic interviews to assess the prevalence of psychiatric disorders among samples of DUI offenders and compared rates to general population rates found using the same measures. In the first study, Lapham and colleagues (2001) assessed 1,105 offenders 5 years after they had participated in a first offender program. In addition to alcohol use disorders, for which the vast majority qualified in their lifetime, a third of Lapham et al.'s sample qualified for lifetime drug use disorders and more than 20% qualified for lifetime major depressive disorder. Rates of drug and alcohol dependence, as well as PTSD, were significantly higher than in the general population.

Two other systematic studies of psychiatric disorders among DUI populations specifically investigated repeat DUI offenders (Lapham, C'de Baca, et al., 2006; Shaffer et al., 2007). Lapham and colleagues assessed 459 repeat DUI offenders who agreed to participate in an intensive supervision program in lieu of additional jail time. All of the offenders in this sample qualified for a lifetime alcohol use disorder, more than 70% qualified for a lifetime drug use disorder, more than 30% qualified for lifetime major depressive disorder, and more than 15% qualified for lifetime PTSD.

Shaffer et al. (2007), using the same standardized assessment as Lapham, C'de Baca, et al. (2006) assessed a sample of 729 repeat DUI offenders. Almost 100% of this sample qualified for a lifetime alcohol use disorder, just under 40% qualified for a lifetime drug use disorder, and approximately 45% qualified for a lifetime diagnosis that was not substance-related. Compared to the general population, offenders in this sample had elevated lifetime rates of alcohol and drug use disorders, conduct disorder, generalized anxiety disorder, PTSD, and bipolar disorder. All three studies reported that past year rates of significant disorders were lower, but followed similar patterns.

These studies, and those before them, have established that psychiatric disorders, both substance-related and not substance-related, are elevated among DUI offenders. They have not, however, established a causal link between psychiatric comorbidity and DUI offense. To begin to establish such a link, prospective study is required. Though it cannot on its own confirm causality, prospective study can determine whether psychiatric comorbidity predicts later reoffense, thereby establishing its role as a potential risk factor. However, prospective studies of DUI recidivism are rare, and we are not aware of any prospective studies that test the association between a range of psy-

chiatric disorders and later DUI recidivism. The current study, which uses the same sample as the Shaffer et al. (2007) publication, uses a prospective design to determine whether the comorbid disorders identified among repeat DUI offenders can predict DUI recidivism across 5 years posttreatment. We hypothesize that psychiatric comorbidity, highly prevalent in repeat DUI offender populations, will also be a significant risk factor for re-offense.

## Materials and Methods

### Participants and Procedures

The participants in the current study were 743 repeat DUI offenders recruited from a 2-week inpatient treatment program. Offenders attended the program as part of their court sentence, in lieu of additional jail time. We were able to recruit 779[1] of the 1,220 offenders attending the program during our enrollment period. The remaining 441 either refused to participate ($n = 199$) or did not complete the intake assessment ($n = 242$). Of the 779 we recruited, 767 gave us permission to access their criminal record. All of these participants had criminal record data by virtue of their repeat offender status. We were not able to locate criminal record data for 24 of those 767, resulting in our final sample of 743.

The sample was 82% male with an average age of 39.4 (range: 19 to 77), and reported an average of 2.5 DUI arrests. Eighty-eight percent were Caucasian, 4% were African American, less than 1% was Asian, and less than 1% was Native American; 7% were unknown or reported another race. Two percent reported Hispanic ethnicity.

As part of their attendance at the inpatient treatment program, potential participants completed a computerized mental health assessment, the Composite International Diagnostic Interview (CIDI: Kessler & Ustun, 2004), with their counselors. Research staff later met individually with each potential participant to obtain informed consent to access the potential participant's assessment information and criminal record. Participants received a $25 gift card at the time of consent. The study received approval from the Cambridge Health Alliance Institutional Review Board.

### Instrument

We provided the inpatient treatment program with a computerized version of the CIDI and trained all staff on its use. The CIDI is a well-validated standardized mental health assessment that assesses mental health disorders using both ICD-10 and *DSM–IV* criteria. The CIDI provides both lifetime and past year diagnostic information, as well as information about age of onset, recency, and persistence of symptoms. We collaborated with the program to determine which disorders they wished to assess as part of their intake. Disorders assessed at intake to the treatment program during the course of the study included: (a) alcohol abuse and dependence (AA and AD); (b) drug abuse and dependence (DA and DD); (c) nicotine dependence (ND); (d) pathological gambling (PG); (e) major depressive disorder (MDD); (f) dysthymia (DYS); (g) bipolar disorder (BD); (h) generalized anxiety disorder (GAD); (i) posttraumatic stress disorder (PTSD); (j) conduct disorder (CD); (k) attention deficit/hyperactivity disorder (ADHD); and (l) intermittent explosive disorder (IED).[2]

### Criminal Record Information

To obtain criminal record information on our sample, for all participants who provided consent to obtain their criminal record, we provided the Massachusetts Criminal Offender Record Information (CORI) unit with a list of participants and their identifying information (i.e., birthdate and, for those who provided it, social security number). All 767 participants ought to have had criminal record data related to the offense that precipitated their involvement with the court-sentenced program. However, the CORI unit was only able to locate information for 743 of our 767 consenting participants; this circumstance possibly was due to participants providing false information to the study. We received full Massachusetts criminal records for these 743 participants via computer disk more than 5 years after the study began. Because we recruited consecutive admissions to the program during the course of just more than a year, this means that available posttreatment criminal record information ranged from 52 months posttreatment to 66 months posttreatment, with a mean time at risk of 58 months ($SD = 4$ months).

To reduce the criminal record data, we noted the date of each offense, whether it occurred before or after DUI treatment, and for those that occurred after, whether they occurred within the first, second, third, fourth, or fifth year after treatment. We grouped offenses into the following categories: person, gender, property, substance-related MV, nonsubstance-related MV, alcohol-related, drug-related, and other. For the current analyses, we focused on substance-related MV offenses as a measure of recidivism. We also assessed rates of any MV offenses and rates of any post-DUI-treatment offense.

### Analysis Plan

We first calculated descriptive information about the level of DUI recidivism in our sample across the 4–5 year follow-up period, as well as any MV offenses (including DUI offenses), and any criminal offenses (including both DUI and other MV offenses). Next, we determined associations between individual disorders (both lifetime and past year) and rates of DUI recidivism, MV offenses, and criminal offenses, as well as association between level of comorbidity (i.e., number of total disorders and presence of nonsubstance related disorders) and recidivism and other offenses. We controlled these analyses for length of follow-up by conducting them both with and without the length of follow-up truncated to the shortest follow-up period. Finally, we conducted Cox proportional hazards regression survival analyses, examining individual disorders, then comorbidity level as predictors. We conducted these separately for DUI recidivism, any MV offenses, and any offenses. In all models, we controlled for age and gender.

## Results

### DUI Recidivism and Other Criminal Offense Posttreatment

Within 1 year posttreatment, only 2.6% of our sample had been arraigned for another DUI offense; within the full 5 years follow-up period, 7.5% of the sample had reoffended. Figure 1 depicts these results continuously across time. Offense rates for any MV offense

[1] The *N* for the current study differs from that in Shaffer et al. (2007), for two reasons. First, the 2007 study excluded our first three recruited cohorts because the program staff did not attempt to administer the intake interview to all clients in those cohorts. We have chosen to include those three cohorts in this sample because their data do not differ from the data obtained from the other 27 cohorts to whom the intake interview was administered consistently. Second, the current study's sample excludes the 12 individuals who did not give permission for us to access their criminal records.

[2] The treatment program chose to begin assessing attention deficit hyperactivity disorder and intermittent explosive disorder after the study had begun; therefore, diagnostic information on these disorders is only available for a subsample of 592 of the 743 participants.

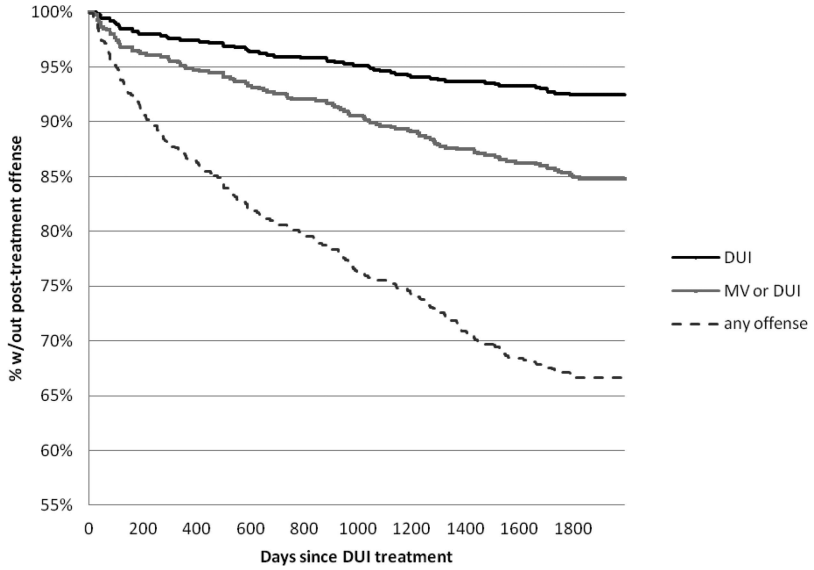


*Figure 1.* Survival curves for full sample for posttreatment driving under the influence (DUI) offense, any moving vehicle (MV) offense, and any offense.



posttreatment were necessarily higher, because that category includes DUI offense. In the first year posttreatment, 5.1% had committed an MV offense; overall, 15.2% had committed an MV offense within the 5-year follow-up period. Visual inspection of Figure 1 reveals that the survival curves for DUIs and MV offenses share similar shapes. Offense rates for any criminal offense posttreatment were necessarily the highest, because that category includes all other offenses. By the end of the first year posttreatment, 13.3% had committed a criminal offense; overall, 33.4% had committed a criminal offense within the 5-year follow-up period. The survival curve for criminal offense varies somewhat from the other two curves: In addition to having a steeper decline overall, the decline occurs more quickly, with 40% of the initial offenses occurring within the first year posttreatment, whereas only 33–35% of initial MV and DUI offenses occurred within the first year.

Our examination of posttreatment DUI offending determined that there were no age-related differences for acts of DUI recidivism. The average age of DUI posttreatment reoffenders was 37.4 ($SD$ = 10.2) years old at baseline; the average age of those who did not reoffend was 39.5 ($SD$ = 11.7) years old. Similarly, as Table 1 summarizes, there were no gender-related differences related to DUI recidivism.

In contrast, the analysis of any posttreatment MV offense suggested that those who committed at least one posttreatment MV offense were significantly younger at baseline ($M$ = 36.3, $SD$ = 10.4) than those who did not commit any posttreatment MV offense (M = 39.9, $SD$ = 11.7), $t(741) = 3.1$, $p < .01$. As with DUI recidivism, there were no gender-related differences for more general posttreatment motor vehicle offense.

With respect to committing any offense posttreatment, we observed a significant age-related difference, $t(741) = 3.8$, $p < .001$. The average age of those with criminal offenses posttreatment was 37.1 ($SD$ = 12.1) years old at baseline; the average age of those who did not offend was 40.5 ($SD$ = 10.1) years old at baseline. As before, we did not observe any gender-related differences.

## Psychiatric Comorbidity and Recidivism

Table 2 displays posttreatment criminal arraignment rates by offense type and past year psychiatric disorder status at baseline. Chi-square comparisons determined that there were significant intergroup differences in the likelihood of committing any posttreatment offense for those with and without specific disorders, but not for posttreatment DUI and any MV offending. More specifically, compared to those who did not have a past year history, we observed that arraignment rates for committing any posttreatment offense were higher among individuals who had a past year history of alcohol dependence, $\chi^2(1) = 4.9$, $p < .05$; drug abuse or dependence, $\chi^2(1) = 4.2$, $p < .05$; nicotine dependence, $\chi^2(1) = 11.7$, $p < .01$; and conduct disorder, $\chi^2(1) = 5.3$, $p < .05$.

Table 3 displays posttreatment criminal arraignment rates by lifetime psychiatric disorder status and offense type. Chi-square comparisons showed significant intergroup differences in likelihood of com-

Table 1
*Criminal Arraignments Post-Driving Under the Influence (DUI) Treatment (N = 743)*

| Treatment | % w/post-DUI treatment offense | | |
|---|---|---|---|
| | DUI | Any MV | Any offense |
| Within 1 year post-DUI treatment | 2.6% | 5.1% | 13.3% |
| Women | 1.5% | 3.7% | 13.4% |
| Men | 2.8% | 5.4% | 13.3% |
| Within 2 years post-DUI treatment | 4.0% | 7.4% | 19.4% |
| Women | 3.0% | 6.7% | 18.7% |
| Men | 4.3% | 7.6% | 19.5% |
| Within 3 years post-DUI treatment | 5.4% | 10.4% | 24.5% |
| Women | 3.7% | 8.2% | 23.1% |
| Men | 5.7% | 10.8% | 24.8% |
| Within 4 years post-DUI treatment | 6.3% | 12.9% | 30.3% |
| Women | 4.5% | 9.7% | 28.4% |
| Men | 6.7% | 13.6% | 30.7% |
| Within study period (52–66 months post-DUI treatment) | 7.5% | 15.2% | 33.4% |
| Women | 5.2% | 10.4% | 29.9% |
| Men | 8.0% | 16.3% | 34.2% |

*Note.* MV = motor vehicle. There were no significant differences between men and women in rates of posttreatment offenses.

Table 2
*Past Year Psychiatric Disorders and Criminal Arraignments Post-Driving Under the Influence (DUI) Treatment (N = 743)*

| Disorder | % w/posttreatment DUI offense | % w/any posttreatment MV offense | % w/any posttreatment offense |
|---|---|---|---|
| Addiction-related disorders | | | |
| Alcohol dependence | 8.9% | 14.8% | 39.0%* |
| Drug abuse or dependence | 10.7% | 20.0% | 44.0%* |
| Nicotine dependence | 5.3% | 17.0% | 48.9%** |
| Pathological gambling | 20.0% | 20.0% | 40.0% |
| Psychiatric disorders | | | |
| Conduct disorder | 5.3% | 26.3% | 57.9%* |
| Posttraumatic stress disorder | 11.4% | 18.2% | 42.0% |
| Major depressive disorder or dysthymia | 6.5% | 11.3% | 41.9% |
| Generalized anxiety disorder | 9.8% | 13.7% | 39.2% |
| Attention deficit disorder§ | 11.8% | 20.6% | 38.2% |
| Bipolar I or II disorder | 5.1% | 10.3% | 35.9% |
| Intermittent explosive disorder§ | 0.0% | 6.3% | 43.8% |
| All participants | 7.5% | 15.2% | 33.4% |

*Note.* Alcohol abuse was not included because the vast majority of the sample qualified for either alcohol abuse or dependence.
§ Percent for repeat DUI offender sample based on subsample of 592 cases. * Significant difference in offense rate between repeat DUI offenders w/ and w/out the disorder, $p < .05$. ** Significant difference in offense rate between repeat DUI offenders w/ and w/out the disorder, $p < .01$.

mitting any posttreatment offense among those who had a lifetime history of alcohol dependence, $\chi^2(1) = 9.5$, $p < .01$; drug abuse or dependence, $\chi^2(1) = 5.0$, $p < .05$; nicotine dependence, $\chi^2(1) = 10.2$, $p < .01$; conduct disorder, $\chi^2(1) = 11.5$, $p < .01$; and ADHD, $\chi^2(1) = 6.4$, $p < .05$; compared to individuals who did not have these disorders. We also observed a significant intergroup difference in the likelihood of committing any MV offense among those who had a lifetime history of ADHD, compared to those who did not have this disorder, $\chi^2(1) = 7.7$, $p < .01$. We did not observe any other intergroup differences for arraignment rates for any MV offense or for posttreatment DUI offense.

Table 4 shows the relationship between past year and lifetime comorbidity patterns and posttreatment criminal arraignment rates by types of offenses. Chi-square analyses determined that posttreatment arraignment rates for any offense differed significantly by both past-year and lifetime comorbidity pattern group: $\chi^2(2) = 12.4$, $p < .01$, and $\chi^2(2) = 20.9$, $p < .001$, respectively. For lifetime patterns, offenders with comorbid disorders that were not substance- or gambling-related had higher rates of posttreatment criminal offense than offenders with only substance- or gambling-related disorders; in turn, offenders with substance-related disorders beyond alcohol use disorders had higher rates of posttreatment criminal offense than offenders with only alcohol use disorders. For past year patterns, offenders with nonsubstance-related disorders and those with substance-related disorders beyond alcohol use disorders had similar rates of posttreatment criminal offense, but higher rates

Table 3
*Lifetime Psychiatric Disorders and Criminal Arraignments Post-Driving Under the Influence (DUI) Treatment (N = 743)*

| Disorder | % w/posttreatment DUI offense | % w/any posttreatment MV offense | % w/any posttreatment offense |
|---|---|---|---|
| Addiction-related disorders | | | |
| Alcohol dependence | 8.4% | 16.5% | 39.7%** |
| Drug abuse or dependence | 7.8% | 16.2% | 38.0%* |
| Nicotine dependence | 5.1% | 16.2% | 46.2%** |
| Pathological gambling | 20.0% | 20.0% | 40.0% |
| Psychiatric disorders | | | |
| Conduct disorder | 8.0% | 18.1% | 45.7%** |
| Posttraumatic stress disorder | 7.1% | 15.3% | 37.6% |
| Major depressive disorder or dysthymia | 10.7% | 17.5% | 39.8% |
| Generalized anxiety disorder | 10.8% | 16.9% | 36.9% |
| Attention deficit disorder§ | 14.6% | 27.1%** | 47.9%* |
| Bipolar I or II disorder | 7.3% | 12.7% | 40.0% |
| Intermittent explosive disorder§ | 8.8% | 14.7% | 38.2% |
| All participants | 7.5% | 15.2% | 33.4% |

*Note.* Alcohol abuse was not included because the vast majority of the sample qualified for either alcohol abuse or dependence.
§ Percent for repeat DUI offender sample based on subsample of 592 cases. * Significant difference in offense rate between repeat DUI offenders w/ and w/out the disorder, $p < .05$. ** Significant difference in offense rate between repeat DUI offenders w/ and w/out the disorder, $p < .01$.

Table 4
*Lifetime and Past Year Comorbidity Patterns and Posttreatment Criminal Arraignments (N = 743)*

| Pattern | *N* | % w/posttreatment DUI offense | % w/any posttreatment MV offense | % w/any posttreatment offense |
|---|---|---|---|---|
| Past year | | | | |
| No disorders | 122 | 8.2% | 16.4% | 32.8%** |
| AA or AD only | 312 | 6.4% | 13.5% | 26.9%** |
| Addiction-related disorders only (AA/AD, DA/DD, ND, PG) | 91 | 9.9% | 18.7% | 41.8%** |
| Mental health disorder, not addiction-related | 218 | 7.8% | 15.6% | 39.4%** |
| Lifetime | | | | |
| No disorders/AA or AD only¥ | 263 | 6.1% | 13.7% | 23.2%*** |
| Addiction-related disorders only (AA/AD, DA/DD, ND, PG) | 145 | 6.2% | 13.8% | 34.5%*** |
| Mental health disorder, not addiction-related | 335 | 9.3% | 17.0% | 40.9%*** |

*Note.* DUI = driving under the influence; MV = motor vehicle; AA = alcohol abuse; AD = alcohol dependence; DA = drug abuse; DD = drug dependence; ND = nicotine dependence; PG = pathological gambling. Rates of any posttreatment arraignment differed significantly by group; posttreatment DUI offenses and MV offenses did not differ significantly by group; lifetime categories of no disorders and alcohol use disorders were combined because only eight participants qualified for no lifetime disorders.
¥ No disorders and AA or AD only categories collapsed for lifetime because only 8 participants qualified for no disorders. ** $p < .01$. *** $p < .001$.



than offenders with no disorders or only alcohol use disorders. However, neither past-year nor lifetime comorbidity patterns related to posttreatment arraignment rates for DUI or any MV offense.

*T* tests revealed that posttreatment criminal offense, but not DUI or MV offense, differed by number of comorbid disorders, $t(741) = 3.2$, $p < .01$ for past year comorbidity, and $t(741) = 4.2$, $p < .001$ for lifetime comorbidity. Figure 2 illustrates how posttreatment offense rates increase with increased psychiatric comorbidity.

## Psychiatric Comorbidity and Recidivism: Post-Treatment Survival Analysis

All Cox regression analyses controlled for age and gender. In these models, survival differed by age for posttreatment MV offenses (Hazard Ratio [HR] = .76, 95% confidence interval [CI] = .62, .92) and any criminal offenses (HR = .80, 95% CI = .70, .90), but not DUI recidivism. Younger offenders had more steeply declining survival curves than older offenders. There were no gender differences in these models.

In these models, we did not observe differences between survival curves of individual disorders (i.e., offenders with a given disorder did not differ significantly from offenders without the given disorder)—past year or lifetime—for DUI recidivism or posttreatment MV offense, with two exceptions. Offenders with lifetime gambling disorder were significantly more likely to commit another DUI offense (HR = 3.24, 95% CI = 1.01, 10.47) than were other offenders. Offenders with lifetime ADHD diagnoses were significantly more likely to commit MV offenses (HR = 2.11, 95% CI = 1.16, 3.83) and, as Figure 3 shows, this difference emerged early during the follow-up period.

For any criminal offense, survival curves differed significantly for those with and without several different disorders. In particular, individuals who qualified for lifetime or past-year alcohol dependence (HR = 1.51, 95% CI = 1.17, 1.94, and HR = 1.34, 95% CI = 1.04, 1.74, respectively), lifetime or past year nicotine dependence (HR = 1.93, 95% CI = 1.42, 2.62, and HR = 2.03, 95% CI = 1.47, 2.81, respectively), lifetime or past year conduct disorder (HR = 1.61, 95% CI = 1.20, 2.14, and HR = 1.97, 95% CI = 1.07, 3.64, respectively), lifetime or past year PTSD (HR = 1.49, 95% CI = 1.05, 2.10, and HR = 1.56, 95% CI = 1.09, 2.23, respectively), past year major depression or dysthymia (HR = 1.52, 95% CI = 1.01, 2.29), or lifetime ADHD (HR = 1.73, 95% CI = 1.11, 2.68), had more quickly declining curves and were more likely to be arraigned for a posttreatment offense than those without each of these disorders.

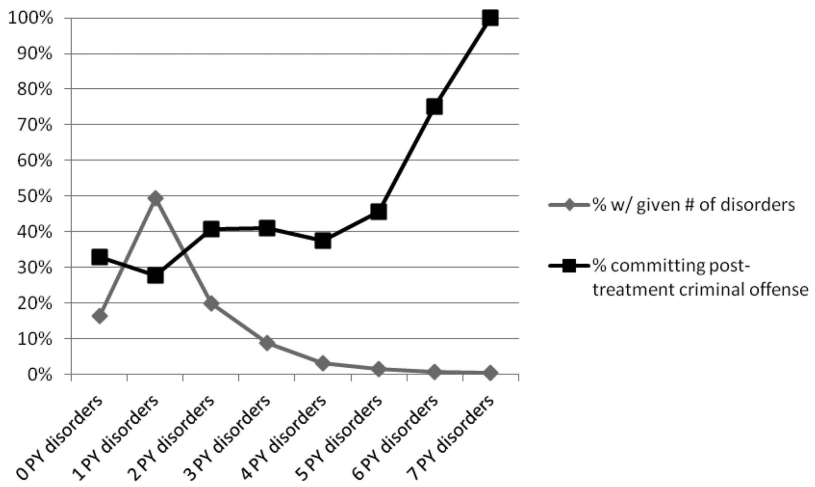


*Figure 2.* Rate of criminal offense (of any kind) posttreatment by # of past year disorders at baseline.

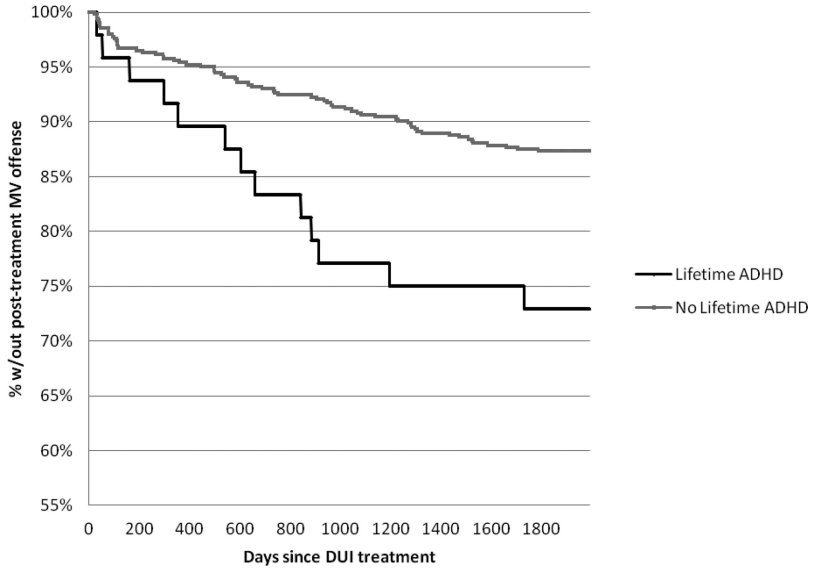


*Figure 3.* Lifetime attention deficit hyperactivity disorder (ADHD) and posttreatment moving vehicle (MV) offense.

A second set of Cox regression survival analyses, again controlling for age and gender, examined how comorbidity patterns related to a propensity for offending. We observed no differences between survival curves of individuals with only alcohol-related disorders, individuals with other substance use or gambling disorders, and individuals with nonsubstance-related disorders—past year or lifetime—for DUI recidivism or posttreatment MV offenses. However, for any criminal offense, survival curves differed significantly by both lifetime and past-year comorbidity patterns. Helmert contrasts showed that this difference primarily was due to steeper declines among individuals who experienced disorders in addition to alcohol use disorders, compared to those with only alcohol use disorders (HR = 1.43, 95% CI = 1.17, 1.75, and HR = 1.46, 95% CI = 1.21, 1.77, respectively, for lifetime and past-year comorbidity patterns). Figure 4A and 4B illustrate these differences. For both lifetime and past-year comorbidity patterns, individuals who qualified for other mental health disorders in addition to alcohol use disorders had more quickly declining curves and were more likely to be arraigned for a posttreatment offense than those with only alcohol use disorders.

## Discussion

Overall, DUI recidivism was low in our sample. Only 7.5% of the sample had reoffended in Massachusetts by the 5-year follow-up. Though low, this rate is not anomalous when compared to other studies of repeat DUI offenders undergoing intervention (Lapham, Kapitula, C'de Baca, & McMillan, 2006). Despite the relatively low DUI offense rates, overall criminal offending was high. At follow-up, 33.4% of the sample had committed some kind of criminal offense, including DUI offense. (For comparison, less than 4% of the general U.S. population is arrested in a given year; Federal Bureau of Investigation, 2013). Previous DUI and criminal history research indicates that the severity of criminal profile increases as the severity of DUI behavior increases (Beerman et al., 1988; LaBrie et al., 2007). DUI recidivism is higher for offenders with more serious previous criminal involvement, particularly crimes against persons (LaBrie et al., 2007). The high prevalence of criminal activity among our sample supports the idea that DUI might be one expression of a larger pattern of risky and criminal behaviors.

Possibly because DUI offense rates in our sample were low, we did not find specific relationships between psychiatric comorbidity and DUI. However, we did observe a link between psychiatric comorbidity and a continued pattern of general criminal offense. Previous epidemiological studies not confined to DUI offenders also have identified this relationship (see Hodgins, 1998). In our sample, we found that arraignment rates for committing any posttreatment offense were higher among individuals with psychiatric comorbidity, particularly those with alcohol dependence, nicotine dependence, PTSD, ADHD, or a past history of conduct disorder. In addition, reoffense survival curves declined more steeply for individuals with lifetime comorbidity that extended beyond substance-related disorders. Research suggests that individuals with this type of lifetime comorbidity might represent a particular type of DUI offender, for whom drinking and the alcohol use problems that follow are a form of self-medication (see Nelson & Tao, 2012). It is interesting to note that a lifetime history of psychiatric disorders in addition to substance use disorders appears to increase risk for criminal reoffense beyond that of offenders with only lifetime substance use disorders; however, for past-year comorbidity patterns, risk of reoffense is not noticeably different between those with substance use disorders and those with additional disorders. It might be that the risk imparted by nonsubstance use disorders is cumulative and lasting, whether or not the individual is currently experiencing symptoms. On the other hand, experiencing current symptoms of any disorder sufficiently increases risk for reoffense so that incremental differences in type and number of current disorders matter little.

ADHD merits particular attention in our sample. Unlike other disorders, ADHD had a specific relationship with posttreatment MV offense: offenders who qualified for lifetime ADHD were at greater risk of posttreatment MV offenses than other offenders. This finding aligns with existing DUI typology studies. Research suggests that there might be at least two distinct subtypes of DUI offender: a group with severe alcohol problems and comorbidity for whom substance use might be a form of self-medication, as discussed earlier, and another with a history of antisocial and risky behaviors, of which

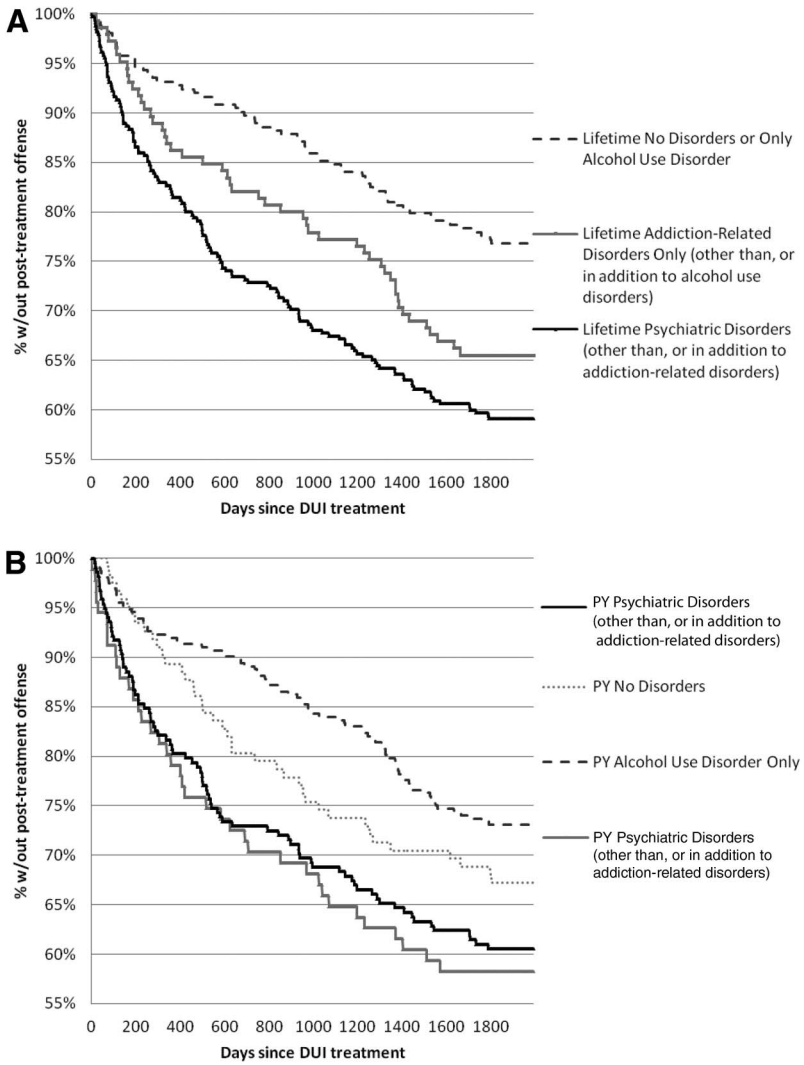


*Figure 4.* A: Lifetime psychiatric comorbidity pattern and posttreatment criminal offense; B: Past year psychiatric comorbidity pattern and posttreatment criminal offense. DUI = driving under the influence.

alcohol problems are only one type (Hubicka, Kallmen, Hiltunen, & Bergman, 2010; Nelson & Tao, 2012). In other words, there are "problem drinkers who drive" and "problem drivers who drink" (Simpson, 1977, as quoted in Peck, Arstein-Kerslake, & Helander, 1994). Individuals with ADHD symptoms could engage in DUI behavior as part of a larger profile of risky driving behavior. This is supported by previous findings that the relationship between sensation seeking and DUI behavior is mediated by general risky driving behavior (Schell, Chan, & Morral, 2006). Sensation-seeking and impulsivity are correlates of ADHD that likely contribute to risky driving behavior.

Research also indicates a reciprocal relationship between alcohol consumption and abuse and ADHD attentional deficits. Individuals with ADHD are more likely to develop alcohol use disorders than others and take longer to recover from the effects of intoxication (Roberts, Milich, & Fillmore, 2013; Weafer, Fillmore, & Milich, 2009). Among these individuals with ADHD, greater deficits in attentional inhibition relate to increased levels of alcohol consumption (Weafer, Milich, & Fillmore, 2011). In turn, alcohol increases these inhibitory deficits (Fillmore, Blackburn, & Harrison, 2008), and intoxication and attentional deficits together lead to the greatest impairments in driving (Harrison & Fillmore, 2011). Finally, research has shown specifically that certain driving behaviors of individuals with ADHD look similar to that of intoxicated controls, and these problematic behaviors (e.g., swerving) are further exacerbated by alcohol consumption (Weafer, Camarillo, Fillmore, Milich, & Marczinski, 2008). Indeed, the American Psychiatric Association's Diagnostic and Statistical Manual (*DSM-IV–TR*) notes that traffic accidents and violations are more frequent in drivers with ADHD (American Psychiatric Association, 2000). It might be that, for individuals with ADHD, the combination of alcohol and attentional inhibition deficits leads to a particular vulnerability for being detected and rearrested for DUI and other risky driving behaviors (Weafer, Milich, & Fillmore, 2008).

For the subtype of DUI offender for whom DUI is one expression of a range of risky behaviors, risky driving can be a marker for other externalizing behaviors. Research indicates that traffic violations, both alcohol-related and non-alcohol-related, are common across DUI offenders' criminal histories, and predict later arrest for DUI (Donovan, Umlauf, & Salzberg, 1990). Similarly, road rage behavior is associated with heavy alcohol consumption and DUI (Fierro, Morales, & Alvarez, 2011). In our sample, conduct disorder was one of the most commonly reported lifetime disorders. Repeat offenders with a past-year or lifetime history of conduct disorder were significantly more likely to commit future criminal offenses than other offenders.

This is consistent with the findings by Cavaiola and colleagues (2007, 2003) suggesting that traits associated with conduct disorder, including hostility and psychopathic deviance predicted recidivism among both first-time and repeat offenders. DUI offenders for whom DUI is part of a pattern of engaging in impulsive and risky behaviors appear to be at high risk for continued criminal offending of any sort. It remains to be seen whether this carries over to DUI behavior specifically.

There were several limitations to this study. First, we relied on DUI and other criminal arraignments within Massachusetts as our outcome variables. DUI, in particular, is a low detection event (Beitel, Sharp, & Glauz, 2000; Centers for Disease Control, 2006), so it is most accurate to think of the outcome we were trying to predict as being caught and charged for DUI, not necessarily engaging in DUI behavior. In addition, because our data were confined to Massachusetts criminal records, it is possible that DUI offenders in our sample left the state, died, or had undetected DUIs in other states during the study period. Thus, DUI recidivism was a relatively rare event in our sample, which likely accounts for the failure of many of the trends we observed to reach statistical significance when examining DUI recidivism specifically. If offenders died or moved, it is possible that those undetected events added statistical noise to our study, allowing participants who might have recidivated or reoffended—had they not died or moved out of state—to be counted in the no offense group. Second, the repeat offenders in our sample all completed an inpatient treatment program. In Massachusetts, most repeat DUI offenders are mandated to such treatment, so they are representative of the MA population of repeat DUI offenders. However, the rates of DUI recidivism in our sample might be lower than in other populations of repeat DUI offenders due to this treatment. Third, though we controlled our survival analyses for age and gender, there might have been other factors for which we did not control that were associated with both psychiatric comorbidity and reoffense.

In conclusion, we found that certain patterns of psychiatric disorders predicted criminal reoffense in a sample of repeat DUI offenders. Lifetime severity of comorbidity appeared to be a particularly important predictor as did a history of ADHD. These findings indicate that not only do repeat DUI offenders often present with a variety of psychiatric disorders but also that psychiatric comorbidity likely hampers treatment and contributes to reoffense. If this is the case, then treatment programs focused exclusively on changing alcohol consumption behavior and treating alcohol use disorders with little attention to treating underlying mental health issues are not likely to reduce reoffense risk for these offenders.

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