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Externalizing and self-medicating: Heterogeneity among repeat DUI offenders

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ABSTRACT

Aim: Despite significant reductions in Driving Under the Influence (DUI) in the United States during recent decades, DUI continues to be a major public health threat. The current study investigated the intersection of two domains known to influence DUI: criminal history and psychiatric comorbidity.
Methods: DUI recidivists (N = 743) attending a court-mandated two-week inpatient DUI program completed a computerized mental health assessment as part of their intake to that program. Participants' criminal records were obtained 4–5 years after program attendance.
Findings: This study identified three primary repeat DUI offender subtypes with distinct patterns of criminal behavior and psychiatric comorbidity: (Type I) those whose DUI emerges from a pattern of drinking to cope with mood and anxiety problems, (Type II) those whose DUI emerges as part of a larger pattern of externalizing and criminal behavior, and (Type III) those whose DUI offenses reflect more acute triggers and isolated episodes of excessive drinking.
Conclusion: These findings suggest that current treatment models used in DUI programs are inadequate to address the heterogeneity in the population of DUI recidivists and that earlier and more comprehensive screening would allow for better targeting of resources to DUI offender subtypes.

1. Introduction

Driving under the influence of intoxicants (DUI) is a major public health problem facing the United States. According to 2016 data from the U.S. National Highway Traffic Safety Administration (NHTSA), 10,497 people were injured or killed in alcohol-related crashes, and 28% of all motor vehicle fatalities involved alcohol-impaired drivers that year (NHTSA, 2017). Furthermore, the estimated annual economic cost of alcohol-related accidents is roughly $49.8 billion (Blincoe et al., 2015). DUI has been dubbed one of the most publicly hazardous consequences of addiction (Nelson and Tao, 2012).

During the 1980s and 1990s, the percent of motor vehicle fatalities that were alcohol-involved has decreased steadily. This decrease coincided with national prevention and awareness campaigns. However, more recently, these declines have leveled off– from 2007 to 2015, this percent has held steady near 30% (National Highway Traffic Safety Administration, 2008, 2009, 2010, 2012, 2013a, 2013b, 2015a, b, 2016; Nelson and Tao, 2012). The lack of a continued decline in DUI fatalities suggests that past prevention and awareness strategies, which target individuals who are most likely to respond to harsh legal consequences as well as those simply not aware of the dangers of DUI, are not sufficient to reach today's DUI offenders (Shaffer et al., 2007; Yu et al., 2006). Arguably, it is these offenders who do not respond to legal sanctions and information campaigns which represent the greatest public health threats. The National Transportation Safety Board (NTSB) notes that repeat DUI offenders are "disproportionately represented" among individuals involved in fatal crashes and recommends specific targeting of repeat DUI offenders for tailored interventions (NTSB, 2013). Information from two reports based on Fatality Analysis Reporting System data supports this conclusion. In 2011, 7% percent of drivers in motor vehicle fatalities whose BAC was $>=$ .08 had a prior DUI conviction compared to 1% of drivers in motor vehicle fatalities whose BAC was 0 (NHTSA, 2013a). Similarly, an article using 2011 data reported that drivers with at least one prior DUI offense were "62% more likely to be in a fatal crash" than drivers without a prior DUI offense (Fell, 2014).

Despite the knowledge available about DUI offenders, our predictive models for DUI recidivism perform poorly (see Nelson and Tao, 2012; Nochajski and Stasiewicz, 2006, for a review). For example, C'de Baca et al. (2001) attempted to predict DUI recidivism across four years in a large sample of DUI offenders using a range of demographic, criminal

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history, drinking, and personality variables. However, despite the amount of data at the model's disposal, its sensitivity, specificity, and percent correct classification (62%, 65%, and 64%, respectively) were low. Similarly, Peck et al. (1994) found that, though many of their predictors of DUI recidivism were significant, the accuracy of their predictions was low (i.e., multiple R < .30). Bishop's study of the predictive accuracy of a comprehensive risk measure, the Driver Risk Inventory for predicting DUI recidivism, reported generally low AUCs (i.e., .47–.62).[1] There are at least two potential reasons for this. First, DUI recidivism is most commonly defined as a repeated DUI arrest or conviction. However, studies estimate that between 1 in 100 and 1 in 200 DUI events result in arrest (Beerman et al., 1988; Beitel et al., 2000). Therefore, "first-time" DUI offenders have likely engaged in the behavior multiple times, and those who do not "recidivate" might engage in repeated DUI without being caught. Therefore, DUI recidivism is not only a low base rate target but a moving and sweeping target reflecting police practices, detection, and offender evasion skills as much as actual DUI behavior. That said, DUI arrest, and even more so re-arrest, is likely a good severity indicator of DUI behavior because arrests often occur due to accidents or visibly reckless driving.

Another potential source of inaccuracy in actuarial models for DUI recidivism is offender heterogeneity; DUI offenders are not a homogenous group. Though the majority of repeat offenders are White and male, age and socioeconomic status varies widely as do mental health and criminal background (Nelson and Tao, 2012; Nochajski and Stasiewicz, 2006; Shaffer et al., 2007). Therefore, a single model used to predict recidivism might fall short because it fails to consider moderators that affect the relationship between certain variables and DUI offense. For example, theoretically, a history of reckless driving might be an important predictor of DUI but only among those who are young. Theoretically, depression might be an important predictor but only among women. One study of alcohol-related accidents reported that, among young drivers, these types of accidents were more prevalent among White drivers than non-White drivers but observed the opposite relationship among older drivers (Abdel-Aty and Abdelwahab, 2000). In addition, Wieczorek and Nochajski (2005) have identified certain risk factors that predict second DUI offense, but not three or more offenses, suggesting that there might be subtypes of DUI recidivists.

Some work has been done on DUI subtypes. Most of these studies used cluster analysis and found two to five clusters that differed from each other on mental health, personality, and/or substance use variables (Cavaiola et al., 2007; Donovan and Marlatt, 1982; Hubicka et al., 2010; Nolan et al., 1994; Palmer et al., 2007; Wells-Parker et al., 1986; Wieczorek and Miller, 1992). Based on this previous work, Nelson and Tao (2012) proposed that there are at least two types of DUI offenders: those whose DUI behavior reflects a wider pattern of impulsive and reckless behavior and those whose DUI behavior occurs within the context of mental health issues that extend beyond substance abuse. The former, best conceptualized as the "externalizing DUI offender," might engage in DUI behavior as part of a larger profile of criminal and risky behavior. Research on sensation-seeking and DUI supports our conceptualization of this type offender, and mixed findings about the role of impulsivity in DUI offense (see Schell et al., 2006, in particular) support the idea that these risk factors might only apply for a subtype of DUI offenders. We propose that this subtype is younger, more likely to be antisocial, and more likely to engage in additional risky and aggressive driving behavior but less likely to report comorbidity beyond additional drug use disorders. Indeed, Cavaiola et al. (2007), while not examining specific types of DUI offender, found that repeat DUI offenders in their sample could be distinguished from first-time offenders by their driving records– more than a third of repeat offenders in their sample had their licenses revoked *prior* to any DUI offense. The latter type of DUI offender we propose, best conceptualized as the "self-medicating DUI offender," might suffer from symptoms of alcohol dependence and experiences significant psychiatric comorbidity. We propose that these offenders tend to be older and drink less for social reasons but more to cope with negative affect and adverse situations. As previously noted by Hubicka et al. (2010), these two types of offenders map onto the two types of alcoholics described and confirmed in the literature: Type I alcoholics whose drinking begins later in life and is characterized by drinking to avoid or cope with negative stimuli and Type II alcoholics who begin drinking earlier in life as part of a wider pattern of substance use and externalizing behaviors (Cloninger et al., 1996).

The type of comorbidity they exhibit also can distinguish these two proposed types of offenders. As best described by Krueger et al. (1998), most psychiatric disorders can be classified as either externalizing disorders (e.g., substance use disorders, conduct disorder) that involve some form of acting out or internalizing disorders (e.g., mood and anxiety disorders) that involve acting or reflecting inward.

In previous work, we identified and detailed two domains that contribute to DUI recidivism that might help differentiate offender subtypes: psychiatric comorbidity and criminality (LaBrie et al., 2007; Nelson et al., 2015; Shaffer et al., 2007). As mentioned previously, DUI offenders, even first-time offenders, exhibit higher rates of mental health disorders, both substance-related and otherwise, compared to the general population (Lapham et al., 2006, 2001; Nelson et al., 2015; Shaffer et al., 2007). Shaffer and colleagues discovered multimorbidity among almost half of the repeat DUI offenders they assessed. Mental health disorders, however, not limited to substance and alcohol use, are not confined to only repeat DUI offenders. Hubicka et al. (2010) found that DUI offenders in general scored significantly higher than the general population on multiple mental health domains (i.e., depression, anxiety, somatization, psychoticism, interpersonal sensitivity, paranoia). Other work has linked depression to DUI behavior within the general population (Stoduto et al., 2008), though this link is likely mediated by symptoms of alcohol use disorder (Zhang and Sloan, 2014).

In the realm of criminality, research shows that a significant percentage of DUI offenders have criminal records other than substance-related offenses (e.g., 40% in LaBrie et al., 2007), both for other forms of risky driving behavior and for non-driving related delinquency such as property crimes (LaBrie et al., 2007; Webster et al., 2009). LaBrie and colleagues reported that among DUI offenders, those with property crime charges were 1.4 times more likely to recidivate, and those with person crime charges were twice as likely to recidivate compared to their DUI-only participants.

1.1. The present study

Despite the information available about the topics of criminality and comorbidity among the DUI population, these domains have not been integrated in a single study. Given the heterogeneity of the offender population, there is a serious need for innovative policies and practices regarding DUI offender programs. This study aims to identify, for the first time, the interplay between (1) criminality and (2) mental health comorbidity among different types of DUI offenders as it relates to recidivism. Using a well-validated comprehensive diagnostic interview (i.e., the Composite International Diagnostic Interview [CIDI]: Kessler and Ustun, 2004), we screened repeat offenders at a 2-week inpatient DUI program in Massachusetts for DSM-IV Axis I disorders (American Psychiatric Association, 2000). We also obtained criminal record information for these offenders covering their past history and four to five years of information after their entry into a DUI program. We hypothesized that (1) we would be able to identify subtypes of offenders with distinct patterns of criminal behavior and psychiatric comorbidity, (2) at least two subtypes would emerge, one characterized by externalizing behavior and disorders and the other by internalizing disorders such as depression and anxiety, and (3) those subtypes would exhibit different levels of recidivism.

[1] More recent research on DUI recidivism in the peer review literature reports on significant predictors of recidivism but does not provide information about model performance.

2. Methods

2.1. Participants

Seven hundred seventy-nine repeat DUI offenders attending a court-mandated inpatient DUI program between February 2005 and April 2006, representing 80% of recruited admissions[2], agreed to participate in a study about psychiatric comorbidity and DUI recidivism. As part of this study, participants agreed to share their program intake data with investigators. Seven hundred sixty-seven (98%) of the 779 participants who participated in the study also agreed to allow us access to their criminal record. We were not able to locate criminal record data for 24 of those 767, possibly due to the provision of false information by participants. This resulted in our final sample of 743 (i.e., 95% of original study participants; 76% of recruited admissions). Eighty-two percent of the sample were male, 87% were non-Hispanic white, 18% were married, 27% were separated or divorced, and 73% did not have a college degree. Participant age ranged from 19 to 77 with an average age of 39.6.

2.2. Procedures

At the time of this study, *The Middlesex Driving Under the Influence of Liquor Program* was one of two Massachusetts-based inpatient programs for repeat DUI offenders. This 2-week program, as an alternative to 30 days of additional jail time, served all repeat DUI offenders in the eastern portion of the state who chose this alternative to incarceration. Interested readers can find more information about this program in Shaffer et al. (2007). The Middlesex Driving Under the Influence of Liquor program incorporated a standardized mental health interview into their usual program intake procedures. Throughout the 15 month study period, all admissions who were able to speak and understand English and engage in a comprehensive assessment completed a standardized, computerized, clinical interview (i.e., the CIDI) with a staff member as part of their intake.[3] At the end of each offender's two-week program, researchers introduced the project and individually obtained consent from potential participants. Participants received a $25 gift card for their participation in the study at baseline and a $50 gift card if they completed a later follow-up study not reported on in this manuscript. All procedures were approved by the Cambridge Health Alliance Institutional Review Board.

2.3. Measures

2.3.1. Composite International Diagnostic Interview (CIDI)

The standardized mental health assessment implemented at the Middlesex Driving Under the Influence of Liquor program was the CIDI (Kessler and Ustun, 2004), a well-validated, reliable computerized instrument used in national and international epidemiological studies of mental health. The CIDI consists of a screener module that screens for DSM-IV Axis I disorders followed by a series of modules for each disorder. Respondents only enter those modules for which they screen positive. Automatic algorithms combine respondents' answers from the screener and modules to determine whether respondents qualify for each disorder in the past year and/or their lifetime. The intake data for this study included information about symptoms of and qualification for 11 different DSM-IV Axis I disorders. For this article, we examine any lifetime history of these disorders. In addition to this diagnostic data, the interview collected demographic data that we used in our analyses. These demographic variables included gender, age, race and ethnicity, marital status, education, and income.

2.3.2. Criminal record information

To obtain criminal record information, we provided the Massachusetts Criminal Offender Record Information unit with a list of participants who had provided consent and their identifying information (i.e., birthdate and, for those who provided it, social security number). We received full records for these participants via computer file 65 months after the study began. Because we recruited consecutive admissions to the program during the course of a year, the available post-program criminal record information ranged from 51 months post-program to 65 months post-program.

The Criminal Offender Record Information data file was organized by arraignment, providing information about the date, crime type, and outcome of each arraignment. After confirming that the identifying information for each offender matched the information on our consent forms, we de-identified the file and organized it by a participant identification number. We noted the date of each offense, whether it occurred before or after attendance at the DUI program, and, for those that occurred after, whether they occurred within the first, second, third, fourth, or fifth year after involvement with the DUI program. As Table 1 summarizes, based on prior work examining criminal offense among DUI offenders (Argeriou et al., 1985; LaBrie et al., 2007), we grouped offenses into the following eight exclusive categories: person (e.g., assault and battery; armed robbery), sex (e.g., rape; indecent exposure), property (e.g., burglary; shoplifting), DUI (e.g., operating under the influence of liquor; operating under the influence of drug), non-substance-related motor vehicle (e.g., operating after license suspension; operating negligently), alcohol-related (e.g., possession of alcoholic beverage; drinking in public), drug-related (e.g., possession of illicit substance; distribution of substance), and other (e.g., disorderly conduct; trespassing).

2.4. Data reduction

We reduced both our psychiatric and criminal history data to create a manageable number of variables for analysis. From the eleven DSM-IV diagnoses, we created eight lifetime disorder categories. We combined drug abuse and dependence into a single category capturing drug use disorders and also combined major depression and dysthymia into a single category capturing depressive disorders. We excluded alcohol abuse because it was present in almost our entire sample (i.e., 98% qualified for a lifetime diagnosis of alcohol abuse). The eight remaining mental health categories included variables for lifetime presence of alcohol dependence, drug use disorder, gambling disorder, conduct disorder (i.e., externalizing disorders), as well as depressive disorder, bipolar disorder, generalized anxiety disorder, and post-traumatic stress disorder (PTSD) (i.e., internalizing disorders).

We created two sets of variables from the criminal record information data: one set to measure outcomes and one set to create criminal profiles. To measure recidivism, we focused on substance-related motor vehicle offenses as an outcome. We also assessed offenses occurring after the DUI program as a secondary outcome. To create criminal profiles, we retained the eight crime categories described earlier and created counts of offenses prior to the DUI program within each crime category.

2.5. Analytic strategy

We used SPSS version 25 for all analyses. We first examined the distribution of crime types within our sample and the association between psychiatric comorbidity and crime types. To examine whether there were distinct subtypes of DUI offenders within our sample, as characterized by criminal history and psychiatric comorbidity, we

[2] There were 1,224 admissions during the study period. However, 244 did not complete the intake assessment analyzed as part of this study: 99 because of counselor workload or absence, 33 because they were discharged prior to assessment, 86 because of counselor-identified language barriers, and 26 because of counselor-identified cognitive difficulties. The remaining 977 completed the assessment and were recruited for the study.

[3] 99 DUI offenders did not complete the intake assessment because their counselors were either absent or had issues with their workload.

Table 1
Pre-Program Criminal Offenses.

Crime Type	Offenders w/ Type of Offense Pre-Program (N [%])
DUI (alcohol or drug)	741 (99.7%)
Non-substance-related MV	586 (78.9%)
Property	398 (53.6%)
Person (non-sex)	304 (40.9%)
Non-MV drug	258 (34.7%)
Non-MV alcohol	209 (28.1%)
Sex	35 (4.7%)
Other	388 (52.2%)

Note. DUI = Driving under the influence of intoxicants; MV = motor vehicle. Percentages total more than 100% because offenders can have multiple pre-program crime types. Percentage with a pre-program DUI offense is less than 100% because two offenders did not have pre-program DUI offenses on their Massachusetts criminal record. Both individuals self-reported two prior DUIs, so it is likely that they received their DUIs in other states but were sentenced to the program in Massachusetts.

conducted a cluster analysis using a two-step clustering procedure to create clusters of offenders based upon both the eight criminal category count variables and eight psychiatric disorder categories. We examined the sociodemographic characteristics of these clusters. Finally, we examined associations between these clusters and re-offense and recidivism outcomes using chi square tests of independence and Cox regression survival analyses.

3. Results

3.1. Pre-DUI program criminal offending

We first examined the distribution of pre-DUI program criminal offenses across crime-type category. Tables 1 and 2 display these results. After DUI offenses, the most common pre-program offenses were non-substance related motor vehicle offenses (79% of the sample) followed by property offenses (54% of the sample). Eight percent of the sample had only DUI offenses prior to the DUI program. The sample also evidenced two other common combinations of pre-DUI program offenses: (1) pre-program DUI and other motor vehicle offenses (11% of the sample and (2) a pattern that included six different types of offenses– DUI, other motor vehicle (MV), person, property, drug, and other (7% of the sample). Beyond those specific combinations, DUI offenders in our sample tended to have pre-program records that included DUI, other motor vehicle offense(s), and one other offense type (14% of the sample), or DUI, other motor vehicle offense(s), and two other offense types (also 14% of the sample).

3.2. Pre-DUI program criminal offense and psychiatric comorbidity

Next, we examined the association between crime type and psychiatric comorbidity. To begin this examination, we first analyzed whether offenders with different psychiatric disorders evidenced different numbers of pre-DUI program criminal offenses on their record. As Table 3 shows, DUI offenders who qualified for lifetime diagnoses of conduct disorder [$F(1,741) = 68.1$, $p < .001$; $\eta^2 = .08$], PTSD [$F(1,741) = 5.5$, $p < .05$; $\eta^2 = .01$], drug use disorder [$F(1,741) = 5.8$, $p < .05$; $\eta^2 = .01$], alcohol dependence [$F(1,741) = 4.3$, $p < .05$; $\eta^2 = .01$], or gambling disorder [$F(1,741) = 10.7$, $p < .01$; $\eta^2 = .01$] had more criminal offenses pre-program than those who did not qualify for those disorders. One-way ANOVA with a linear contrast revealed that the more disorders an offender qualified for, the more pre-program criminal offenses he/she had [$F(1,739) = 24.8$, $p < .001$; $\eta^2 = .03$].

Then, using their pre-DUI program criminal background, we divided our sample into four exclusive groups: (1) those with only DUI offenses, (2) those with only DUI and other motor vehicle or substance-related offenses, (3) those with property offenses but no person offenses, and (4) those with person offenses (both sex and non-sex).[4] As Table 4 shows, disorders were not evenly distributed across these groups. Alcohol dependence [$\chi^2(3,N = 671) = 10.4$, $p < .05$, $\varphi = .13$], drug use

Table 2
Pre-Program Criminal Profiles.

Profile	Offenders w/ Type of Profile Pre-Program (N [%])
One offense type	
DUI only	59 (7.9%)
Other single offense type	1 (0.1%)
Two offense types	
DUI + MV	80 (10.8%)
DUI + 1 other non-MV offense	42 (5.7%)
Three offense types	
DUI + MV + 1 other non-MV offense	105 (14.1%)
DUI + 2 other offense combinations	32 (4.3%)
Four offense types	
DUI + MV + 2 other offense combinations	104 (14.0%)
DUI + 3 other offense combinations	33 (4.4%)
Five offense types	
DUI + MV + person + property + other	39 (5.2%)
DUI + MV + 3 other offense combinations	47 (6.3%)
DUI + 4 other offense combinations	31 (4.2%)
Six offense types	
DUI + MV + person + property + drug + other	52 (7.0%)
DUI + MV + 4 other offense combinations	53 (7.1%)
DUI + 5 other offense combinations	19 (2.6%)
Seven offense types	
DUI + 6 other offense combinations	41 (5.5%)
Eight offense types	
DUI + 7 other offense combinations	5 (0.7%)

Note. DUI = Driving under the influence of intoxicants; MV = motor vehicle. Specific offense combinations found in less than 5% of the sample combined into larger categories.

Table 3
Pre-Program Criminal Offenses and Psychiatric Comorbidity.

	# of Pre-DUI Program Offenses for Individuals w/ and w/out Each Disorder (M[SD])	
Psychiatric Disorder	No Lifetime Diagnosis	Lifetime Diagnosis
Addiction-Related Disorders (Non-Exclusive Groups)		
Alcohol Dependence*	12.2[12.8]	14.2[14.0]
Drug Use Disorder*	12.0[12.9]	14.4[13.9]
Gambling Disorder**	12.8[13.0]	24.1[21.5]
Other Psychiatric Disorders (Non-Exclusive Groups)		
Depressive Disorder	12.9[13.3]	14.1[13.9]
Bipolar Disorder	13.1[13.5]	12.4[10.6]
Generalized Anxiety Disorder	13.2[13.7]	11.3[9.0]
Post-Traumatic Stress Disorder*	12.6[13.0]	15.9[15.2]
Conduct Disorder***	11.2[11.1]	21.1[18.4]

***$p < .001$; **$p < .01$; *$p < .05$.
Note. DUI = Driving under the influence of intoxicants. All diagnoses are lifetime estimates. Offense counts are of individual charges, not separate arrests or arraignments.

[4] We selected these four crime type groups for this descriptive analysis based on the counts of offenders with these crime types, as well as their conceptual difference. We wanted to examine whether DUI offenders with no other type of criminality differed from others but also recognized that for many of these offenders DUI offenses were often inter-twined with other motor vehicle and substance-related offenses, sometimes as part of the same arrest. Therefore, we included both DUI-only and DUI plus motor vehicle and substance-related offense categories. We separated property and person crimes because of the known differences between these crime types in terms of recidivism and interpersonal components.

Table 4
Pre-DUI-Program Criminal Offense Type and Psychiatric Comorbidity.

	% w/in Each Crime Category w/ Given Disorder			
Psychiatric Disorder	Only DUI (N = 59)	Only DUI & MV or Substance (N = 131)	Property but no Person (N = 168)	Person (N = 313)
Addiction-Related Disorders (Non-Exclusive Groups)				
Alcohol Dependence*	27.1%	38.9%	40.5%	47.9%
Drug Use Disorder***	16.9%	36.6%	47.0%	44.7%
Gambling Disorder	0.0%	0.8%	1.8%	3.5%
Other Psychiatric Disorders (Non-Exclusive Groups)				
Depressive Disorder	6.8%	10.7%	15.5%	11.2%
Bipolar Disorder	3.4%	7.6%	8.3%	7.7%
Generalized Anxiety Disorder	8.5%	8.4%	7.1%	9.6%
Post-Traumatic Stress Disorder	8.5%	9.2%	13.7%	16.6%
Conduct Disorder***	3.4%	8.4%	21.4%	25.6%
# of Psychiatric Disorders (Exclusive Groups)***				
0	52.5%	38.9%	28.6%	23.6%
1	28.8%	22.1%	26.8%	24.3%
2	10.2%	25.2%	21.4%	27.5%
3+	8.5%	13.7%	23.2%	24.6%

***p < .001; **p < .01; *p < .05.
Note. 72 cases excluded because pre-program criminal profile included other crime types. DUI = Driving under the influence of intoxicants. All diagnoses are lifetime estimates.

disorder [$\chi^2(3,N = 671) = 19.4$, $p < .001$, $\varphi = .17$], and conduct disorder [$\chi^2(3,N = 671) = 28.0$, $p < .001$, $\varphi = .20$] rates differed among the groups as did the overall comorbidity (i.e., # of disorders) [$\chi^2(9,N = 671) = 35.5$, $p < .001$, $\varphi = .23$]. In each of these instances, offenders who had committed past property or person crimes had higher rates of the disorder in question and were more likely to qualify for 3+ psychiatric disorders than offenders with only past DUIs or MV or substance-related offenses.[5]

3.3. Pre-DUI program criminal and psychiatric clusters

Next, we conducted a cluster analysis using SPSS's two-step clustering methodology (IBM Knowledge Center, 2017). This exploratory method allows for the inclusion of both categorical and count variables. We included the eight variables measuring the number of offenses within each crime category that each DUI offender had committed pre-program as well as the eight disorder categories. A three-cluster solution fit the data best as determined by the Bayesian Information Criterion. As summarized in Table 5, we can best describe these clusters as (1) significant mental health issues (Cluster 1; n = 419), (2) externalizing behaviors (Cluster 2; n = 112), and (3) few externalizing (e.g., drug use, conduct disorder, criminal behavior) or mental health issues (Cluster 3; n = 212). Participant age [$F(2,740) = 3.1$, $p < .05$; $\eta^2 = .01$], gender [$\chi^2(2,N = 743) = 17.7$, $p < .001$, $\varphi = .15$], and race [$\chi^2(2,N = 691) = 25.4$, $p < .001$, $\varphi = .19$] varied across these clusters. As Table 5 shows, offenders in the mental health cluster were younger, more likely to be white, and more likely to be female than offenders in the other clusters.

[5] To test this, we conducted follow-up chi squares for the disorders that had shown statistically significant deviations from expected distributions across groups. In the follow-up chi squares, we compared DUI offenders who had person and/or property pre-program offenses to those who only had DUI or other motor vehicle or substance-related offenses. For level of comorbidity, we compared qualification for 3+ disorders to qualification for fewer than 3 disorders. DUI offenders who had person and/or property pre-program offenses had higher rates of pre-program drug offenses (45.5% compared to 30.5%, $\chi^2(1,N=671)=12.6$, $p < .001$), alcohol dependence (45.3% compared to 35.3%, $\chi^2(1,N=671)=5.6$, $p < .05$), and conduct disorder (24.1% compared to 6.8%, $\chi^2(1,N=671)=26.2$, $p < .001$) than other DUI offenders in the sample. DUI offenders who had person and/or property pre-program offenses also were more likely to qualify for three or more lifetime disorders than other DUI offenders in the sample (24.1% compared to 12.1%, $\chi^2(1,N=671)=12.0$, $p < .01$).

3.4. Pre-DUI program criminal and psychiatric clusters and re-offense

Finally, we examined recidivism rates for the different clusters. As part of a separate project (Nelson et al., 2015), we have already investigated whether DUI recidivism and other re-offense differed by psychiatric comorbidity in this sample: we observed that the presence of a non-substance-related psychiatric disorder significantly increased the chances of recidivism during the 4–5 year follow-up.

Table 6 summarizes DUI recidivism and other re-offense rates for the different clusters. Due to the low base rate of DUI re-offense and the consequent low power of the study to detect such differences, we did not observe statistically significant differences between clusters for post-DUI program rates of DUI. However, clusters did evidence significantly different rates of re-offense of *any* kind post-DUI program [$\chi^2(2,N = 743) = 39.6$, $p < .001$, $\varphi = .23$]. Offenders in Cluster 2 (i.e., externalizing behavior) were more likely to re-offend post-DUI program than offenders in Cluster 1 (i.e., mental health issues), who were more likely to re-offend than offenders in Cluster 3 (i.e., few externalizing behaviors/mental health issues).

3.5. Cox regression analyses

Cox regression analyses controlling for gender and using criminality/psychiatric clusters to predict time to re-offense revealed statistically significant differences between clusters for post-DUI program re-offense of any kind. Members of the externalizing behaviors cluster were more likely to re-offend within the time period assessed and had shorter times to re-offense than those in the other clusters (HR = 1.9, 95% CI = 1.5, 2.3), and those in the cluster with few externalizing behaviors/ mental health issues were less likely to re-offend within the time period assessed and had longer times to re-offense than those in the mental health issues cluster (HR = 0.7, 95% CI = 0.6, 0.9). The analyses of post-DUI program DUI re-offense (as opposed to re-offense of any kind) suggested that members of the few externalizing behaviors/ mental health issues cluster were less likely to re-offend within the time period assessed and had longer times to re-offense than those in the mental health issues clusters, though the findings did not reach the a priori study threshold for statistical significance (i.e., $p < .05$) (HR = 0.8, 95% CI = 0.6, 1.1; p = .15). Table 6 demonstrates that the externalizing and mental health clusters had similar post-DUI program DUI rates compared to Cluster 3. Fig. 1, displays survival curves for time to any re-offense and time to DUI re-offense.

Table 5
Criminal / Psychiatric Clusters (mean # of offenses of each type; % qualifying for each disorder).

	Cr/Ps Cluster 1 Few Ext / MH Issues (N = 212)	Cr/Ps Cluster 2 Externalizing (N = 112)	Cr/Ps Cluster 3 Mental Health Issues (N = 419)
Crime Type		(Mean # of offenses of each type)	
Person (non-sex)***	0.7	6.3	0.9
Sex***	0.0	0.5	0.0
Property***	1.0	7.6	1.2
DUI (alcohol or drug)***	2.6	3.7	2.8
Non-substance-related MV***	2.0	7.9	2.2
Non-MV alcohol***	0.3	1.0	0.4
Non-MV drug***	0.3	2.6	0.6
Other***	0.9	7.1	1.2
Psychiatric Disorder		(% qualifying for each disorder)	
Alcohol Dependence***	0.0%	39.3%	63.5%
Drug Use Disorder***	0.0%	48.2%	60.6%
Gambling Disorder**	0.5%	6.3%	1.7%
Conduct Disorder***	0.0%	47.3%	20.3%
Depressive Disorder***	0.0%	9.8%	17.7%
Bipolar Disorder***	0.0%	6.3%	11.5%
Generalized Anxiety Disorder***	0.0%	4.5%	14.3%
Post-Traumatic Stress Disorder***	0.0%	14.3%	20.8%
Sociodemographic Characteristics		(% / M[SD])	
Gender (% Female)***	12.7%	8.9%	23.2%
Age*	40.7	40.3	38.4
Race/Ethnicity (% non-White)***	13.1%	9.4%	2.6%

Note. ***p < .001; **p < .01; *p < .05. Cr/Ps = Criminal / Psychiatric; DUI = Driving under the influence of intoxicants; MV = motor vehicle; Ext = externalizing; MH = mental health.

Table 6
Criminal/Psychiatric Clusters and Recidivism Risk.

Cluster	N	% w/ DUI offense post-program	% w/ DUI or MV offense post-program	% w/ any arraignment post-program***
Cluster 1 (Few Ext/MH Issues)	212	5.2%	12.3%	20.8%
Cluster 2 (Externalizing)	112	9.8%	22.3%	55.4%
Cluster 3 (MH Issues)	419	8.1%	14.8%	33.9%
Overall	743	7.5%	15.2%	33.4%

***p < .001.
Note. DUI = Driving under the influence of intoxicants; MV = motor vehicle; Ext = Externalizing; MH = mental health.

4. Discussion

This study suggests that distinct clusters of offenders exist within the repeat DUI population. The type and extent of offender criminal background and psychiatric comorbidity distinguish these clusters; further, these groups of offenders have different levels of risk for future criminal and DUI offense. These findings suggest that clinical programs better tailored to the risks and needs of subgroups of DUI offenders might have better potential to reduce DUI recidivism than the current one-size-fits-all-approach. Strikingly, 8% of the sample evidenced only DUI offenses prior to baseline; less than 20% evidenced only motor vehicle-related offenses (including DUI). This indicates that, for a vast majority of repeat DUI offenders, DUI offense is just one piece of a more complex pattern of criminal behavior. Analysis by amount of criminal offending and type of criminal offending revealed that DUI offenders with greater numbers of pre-program offenses and with pre-program property or person offenses exhibited the highest levels of psychiatric comorbidity. Those for whom DUI was one offense within a larger and habitual pattern of offending also qualified for more psychiatric disorders. Property offenders and person offenders had elevated levels of alcohol and drug dependence, as well as conduct disorder, compared to other offenders. Similarly, offenders who qualified for these disorders had high overall numbers of pre-program offenses.

These findings suggest that DUI offenders with an extensive criminal background are most likely to suffer from externalizing psychiatric comorbidity (e.g., substance use disorders, conduct disorder). Though they experienced elevated rates of externalizing disorders, the more severe person and property criminality groups did not have significantly elevated rates of mood or anxiety disorders compared to the rest of the sample. Anxiety and mood disorders (i.e., internalizing disorders) can limit willingness to act upon urges to violate social mores and folkways. For example, among individuals whose mental health issues influence their ability to control certain behaviors (e.g., DUI), internalizing disorders might reduce the likelihood of engaging in highly impulsive behaviors. Consequently, it is not surprising that anxiety and mood disorder rates are not elevated in our high criminality groups.

This distinction between externalizing comorbidity and internalizing comorbidity helps explain the clusters that emerged when we used both psychiatric comorbidity and criminal history to define clusters. In this study, three clearly differentiated clusters emerged: one characterized by low levels of offending and high rates of psychiatric comorbidity, particularly mood and anxiety disorders, representing about 55% of the sample; one characterized by high levels of offending and externalizing disorders (i.e., substance use, conduct disorder, gambling), representing about 15% of the sample; and one characterized by low levels of criminal offense and psychiatric disorder, representing about 30% of the sample. This suggests that there are distinct profiles of repeat DUI offenders identifiable by their combination of psychiatric and criminal history.

This type of clustering closely mirrors the heterogeneity among people with substance use disorders. For example, as mentioned in the introduction, different “types” of alcoholics (Type I vs. Type II) display opposing characteristic personality traits (e.g., high harm avoidance vs. high novelty seeking) and different motivations for alcohol consumption (e.g., coping with anxiety vs. getting high) (Cloninger et al., 1996).

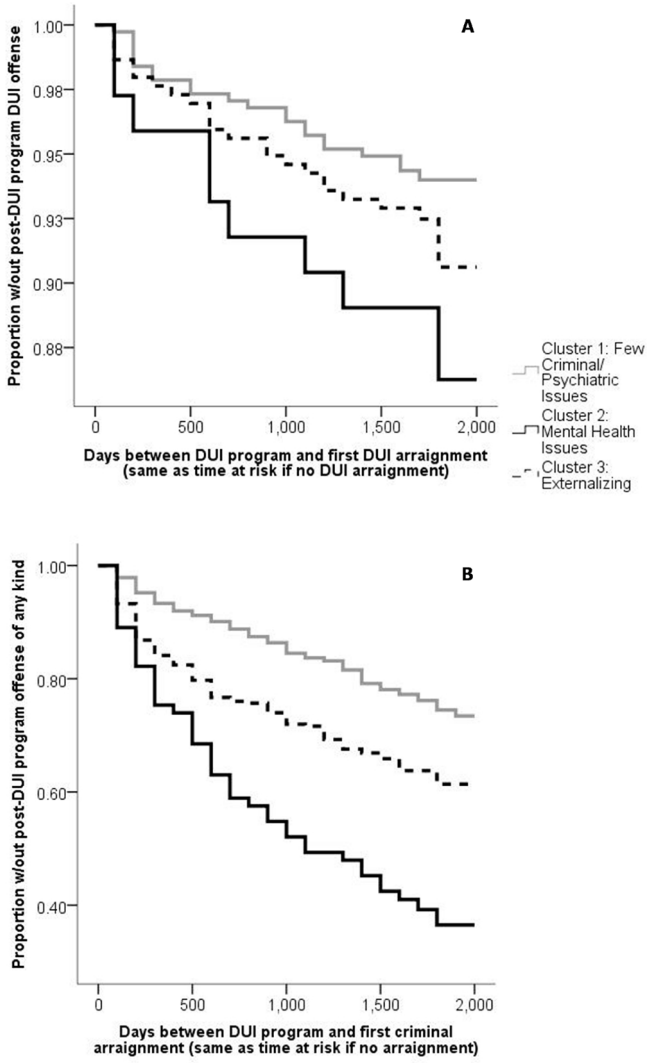

Fig. 1. (A) Survival Curves for Criminality/Psychiatric Clusters: DUI Recidivism; (B) Survival Curves for Criminality/Psychiatric Clusters: Any Re-Offense.

Our externalizing cluster parallels Type II alcoholism, and our cluster with higher psychiatric comorbidity parallels Type I alcoholism. Specific to DUI, some previous research suggests that two subtypes might exist: problem drinkers who drive and problem drivers who drink (Donovan et al., 1985, 1990; Harrison and Fillmore, 2011; Peck et al., 1994). The current findings support these subtypes. Problem drivers fit our externalizing cluster, and problem drinkers fit our comorbidity cluster. To parallel Cloninger's nomenclature, we can identify our clusters as: (a) Type I DUI offenders, whose DUI emerges from a pattern of drinking to cope with mood and anxiety problems, (b) Type II DUI offenders, whose DUI emerges as part of a larger pattern of externalizing and criminal behavior, and (c) Type III DUI offenders, whose DUI offenses reflect more acute triggers and isolated episodes of excessive drinking. These subtypes also confirm previous DUI subtyping work that identifies specific clusters differentiated by psychiatric comorbidity (Donovan and Marlatt, 1982; Hubicka et al., 2010; Nolan et al., 1994; Wieczorek and Miller, 1992).

Notably, in our sample, Type I DUI offenders were more likely to be white females and slightly younger than other DUI offenders. This gender distribution mirrors that identified for Types I and II alcoholism; Type II alcoholism is more prevalent among men than women (Cloninger et al., 1996; Del Boca and Hesslebrock, 1996). This distribution also supports prior work in this area (Reilly et al., 2018) as well as prior work with this sample (LaPlante et al., 2008) that finds that female repeat DUI offenders tend to have a more severe profile of mental health issues than male repeat DUI offenders.

Our three repeat DUI offender profiles differed significantly in their outcomes. Not surprisingly, Type II DUI offenders, who exhibit externalizing behavior and disorders, had the highest rates of criminal re-offense post-DUI program than other offenders. However, Type I DUI offenders, those with high rates of psychiatric comorbidity and particularly mood and anxiety disorders, were also more likely to re-offend than Type III DUI offenders, suggesting that these mental health disorders increased risk for re-offense. It is also notable that the rates of DUI re-offense displayed in Table 6 and Fig. 1b are similar for Type I and Type II DUI offenders. For individuals with mental health problems, the combination of an alcohol use disorder (i.e., alcohol dependence as classified by DSM-IV) and anxiety or mood disorder (i.e., generalized anxiety disorder, PTSD, bipolar, or depression) creates a context within which they likely experience impaired control over many aspects of their lives including DUI. Alcohol dependence also likely influences the level of intoxication at which these individuals drive and their likelihood of being arrested for their DUI. Palmer and colleagues' work (2007) classifying first-time offenders a priori according to drug use disorders and other psychiatric disorders supports this interpretation. In their study, though offenders with anxiety and mood disorders expressed greater readiness to change, they had poorer outcomes than others and failed to reduce their drinking or DUI behavior. Future research could specifically investigate impaired control and other cognitive and emotion regulation factors as mediators of the relationship between psychiatric comorbidity and DUI offense. The current results highlight the importance of psychiatric comorbidity as well as externalizing behaviors as influences on DUI recidivism and other re-offense.

Given these findings, it is important for treatment programs that engage with DUI offenders, particularly repeat DUI offenders, to recognize the potential for unmet mental health treatment need. More than half of our sample fell into the mental health cluster (i.e., Type I DUI offenders), and these offenders had elevated rates of re-offense compared to the 30% categorized as Type III DUI offenders. These individuals reported histories of PTSD, depression, biploar disorder, and generalized anxiety disorder in addition to substance use disorders. Though there are DUI treatment models that address mental health issues beyond substance use (e.g., Wells-Parker et al., 2006; Wells-Parker and Williams, 2002), there are few DUI programs that assess for these mental health issues much less treat them (McMillan et al., 2008; Strashny, 2014). At the very least, DUI programs need to screen for these disorders; ideally, these programs could integrate existing treatment approaches or curricula into these programs to address the role of these disorders in relapse. For example, Wells-Parker et al. (2006) have shown that DUI offenders who suffer from depression are more receptive to brief counseling interventions than others, particularly if those interventions occur as part of DUI treatment. Past work reviewing treatment approaches for DUI revealed that multi-component approaches, those that integrate multiple types of treatment, tend to be more successful in preventing DUI relapse (Miller et al., 2015). The more DUI programs engage in comprehensively assessing their clients for externalizing and internalizing disorders, as well as criminal history, the better prepared they can be to target treatment to the needs of the offender.

In addition to the mental health needs discussed above, there is some work that suggests that certain brief interventions might be particularly effective for offenders with extensive criminal backgrounds or externalizing problems (Brown et al., 2010; Woodall et al., 2007). As Nochajski and Stasiewicz (2006) note in their review of DUI relapse, a single model of DUI relapse is unlikely to capture the full heterogeneity of DUI offenders; to be effective, treatments and interventions need to address both behavioral and psychological components of DUI. Recognizing the specific risks, needs, and heterogeneity of the repeat DUI

offender population is crucial for providing adequate and effective treatment.

4.1. Limitations

Readers should interpret the results of this study within the context of certain limitations. Our participants were a sample of DUI recidivists who were admitted to one particular DUI facility in Massachusetts during a specific period of time. This sample might not be representative of the national DUI recidivist population. As discussed previously, many DUI offenders are not caught, so DUI re-offense, as operationalized in this study, is specific to a re-offense that leads to an arraignment and not simply the continuation or discontinuation of DUI behavior. Additionally, the mental health piece of our data did not include any validity scales (e.g., the lie scale from the MMPI) and relies on retrospective self-reports of past behaviors and experiences, which are not always accurate or reliable due to recall biases or socially desirable response patterns (see Schell et al., 2006). Though we informed participants that their mental health data would not be shared with the courts, some might have minimized their mental health symptoms because of concerns that this information would affect their sentence or after-care requirements.

5. Conclusions

Limitations notwithstanding, this study advances the DUI and mental health literatures by providing a comprehensive examination of the psychiatric and criminal heterogeneity evidenced by this population of DUI recidivists. Current findings suggest that the penal/education system in place for DUI recidivists is inadequate to curb continued re-offense. DUI programs need to begin screening and treating mental disorders. These treatment efforts might yield improved efficacy and impact if matched to the different DUI typologies (e.g., self-medicating or externalizing) that are evident among DUI treatment seekers. Though more research is needed to better understand the mechanisms through which psychiatric comorbidity, criminality, and DUI behavior interact, the current study suggests that the relationship between DUI recidivism, other criminality, and psychiatric comorbidity is significant and must be adequately addressed. To energize and extend the decrease of DUI re-offenses, these different “types” of DUI offenders require uniquely tailored screening, treatment, and continuing care.

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Contributors

Prior to the completion of this manuscript, Richard A. LaBrie passed away. For many years and at the time of his death, he was affiliated with the Division on Addiction and Harvard Medical School. Dr. LaBrie contributed to the concept and analyses for this paper. Dr. Sarah Nelson contributed to the concept, design, analysis, and writing of this manuscript. Ms. Emily Shoov contributed to the writing of this manuscript. Dr. Howard Shaffer contributed to the concept and writing of this manuscript. Dr. Nelson had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors contributed to the manuscript, and all authors except Dr. LaBrie have approved the final article.

Conflict of interest

The authors also receive current funding from the Foundation for Advancing Alcohol Responsibility, The Healing Lodge of the Seven Nations via NIH and Indian Health Services (IHS), the Integrated Centre on Addiction Prevention and Treatment of the Tung Wah Group of Hospitals (which receives funding from The Hong Kong Jockey Club Charities Trust), the Massachusetts Gaming Commission, the Massachusetts Department of Public Health, and DraftKings.

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