

Alcohol Problems among Prisoners: Subgroup Variations, Concurrent Drug Problems, and Treatment Needs

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Keywords

Prisoners · Alcohol problems · Drug problems · Alcohol Use Disorders Identification Test · Drug Use Disorders Identification Test · Dual dependence · Treatment needs

Abstract

Background/Aims: Alcohol problems in the prison population are understudied, underdetected, and undertreated. Our aims were to identify subgroups of inmates whose pre-prison drinking behavior indicated a high need for alcohol-related interventions, to assess the prevalence of concurrent alcohol and drug problems, and to compare dual-dependent inmates and those who were alcohol-dependent alone with respect to the severity of their drinking problems. **Methods:** Data stemmed from the nationwide Norwegian Offender Mental Health and Addiction (NorMA) study. Both male ($n = 1,356$) and female ($n = 90$) inmates took part in the study, representing about 40% of the prison population in Norway at the time of the data collection (2013–2014). Pre-prison substance use problems were assessed using the Alcohol Use Disorders Identification Test (AUDIT) and the Drug Use Disorders Identification Test (DUDIT). **Results:** A majority (55%) had an AUDIT positive screen (score ≥ 8), which is indicative of alcohol problems of some severity, and 18% were possible alcohol-dependent (score ≥ 20). A positive screen

was associated with younger age, lower education, violent offending, driving while intoxicated (DWI), and previous criminal convictions. Two-thirds (68%) of those who screened positive on the AUDIT had also a DUDIT positive screen (score ≥ 6), and a similar overlap between possible alcohol dependence and possible drug dependence (score ≥ 25) was observed. Inmates with possible dual dependence (12% of all) had higher mean scores on the AUDIT than those with possible alcohol dependence only (7% of all). **Conclusions:** More than half of the prisoners in Norway had AUDIT scores that indicated they could benefit from alcohol-related interventions, and the prevalence was elevated in younger, less educated groups of previously convicted DWI, and violent offenders. Alcohol problems were most often combined with drug problems, and possible dual dependence was associated with particularly severe drinking problems.

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Introduction

Alcohol use disorder (AUD) is associated with high mortality and burden of disease, and the prevalence is elevated among males, in lower social strata, and among individuals with conduct disorders and poor self-control [1]. Such risk factors are prevalent in prison populations

[2, 3], and a growing body of research provides evidence that AUD is widespread among inmates [4].

In general, few of those who have severe alcohol problems enter treatment [5, 6]. The prison setting may potentially offer an opportunity to detect and treat individuals who are particularly hard to reach. However, according to a report from the WHO Regional Office in Europe [7], drinking problems among inmates have been overshadowed by drug problems, and alcohol treatment services in prison have systematically been underprioritized. The report also pointed out that “a needs assessment of alcohol problems in prisons is a first step to identify the nature and scale of the problems, and the resources needed to meet them.” Our study of inmates in Norway is a contribution to such an assessment.

Many European countries screen for harmful drinking among newly incarcerated prisoners [8], but validated tools are rarely used [9]. In Scotland, the assessment may be restricted to a simple yes/no question [10], which is likely to entail a substantial underidentification of positive cases [11, 12]. For instance, Kissell et al. [12] found that only one-third of those who scored in the dependent range on the Alcohol Use Disorders Identification Test (AUDIT) reported that they had a drinking problem. Moreover, inmates with an AUDIT positive screen were far less likely than those who screened positive on the Drug Abuse Screening Test to recognize their substance use problems and ask for help. Hence, it may be even more important to use validated instruments to screen inmates for alcohol problems than for drug problems.

Jones and Hoffmann [13] assessed male prisoners in the UK and the USA in the early 2000s and concluded that “despite the emphasis on drugs in correctional populations, alcohol dependence appears to be the most prominent substance use disorder.” However, a recent meta-analysis found that diagnosed AUD and drug use disorder (DUD) were about equally prevalent among male inmates in high-income countries; the pooled prevalence was 26 and 30%, respectively [4]. The studies were published between 1988 and 2015, and DUD was more prevalent in more recent research. Trends in the relative prevalence of AUD and DUD were not scrutinized, but representative studies of inmates in Finland showed that the AUD-to-DUD ratio among males decreased from 6.8:1 (41 vs. 6%) in 1985 to 0.9:1 in 2006 (52 vs. 58%) [14]. Even more dramatic changes were observed among females.

Studies on diagnosed AUD do not capture the full range of alcohol problems that may require interventions. The AUDIT is highly suitable for this purpose [15], and it has been used in some studies of inmates, mainly in the

UK [16] and Australia [17, 18]. The results generally indicate that a majority should be offered some kind of alcohol-related intervention, which is not necessarily the case among prisoners in other high-income countries.

The bulk of the research on both AUD and less severe alcohol problems has assessed inmates in one or only a few prisons (see e.g., [4, 16, 19]). The samples have typically been quite small and restricted to either remanded or sentenced prisoners. Moreover, relatively few studies have included both genders. Our study was based on a large national sample of male and female inmates (remanded as well as sentenced), allowing us to explore whether the prevalence of alcohol problems varied by demographics and imprisonment-related factors. Previous research on such variations is limited, but there is some evidence that alcohol problems among prisoners are inversely related to age [10, 20] and educational level [21] and positively related to recurrent convictions [20], violent offending [22, 23], and driving while intoxicated (DWI) [24].

Concurrent Drug Problems and Dual Dependence

Concurrent alcohol and drug problems have rarely been assessed in studies of inmates. Diagnostic assessments of general population samples or patients in substance use treatment constitute the main body of literature on the issue [25–27]. According to Arnaout and Petraki’s [28] brief review of this research and a more recent study by Saha and coworkers [25], there is evidence to suggest that comorbid AUD and DUD (i.e., dual dependence) is associated with more severe alcohol dependence and an excess of poor outcomes in various life domains.

A study of the general population in the USA showed that one-eighth of those with AUD also had DUD, whereas a majority of those with DUD also had AUD [27]. This asymmetry reflects that severe alcohol problems are far more prevalent than severe drug problems, which may not be the case among prisoners. Indeed, a study of US female inmates found that a majority (64%) of those who were alcohol-dependent were drug-dependent as well, while a minority (30%) in the drug-dependent group suffered from dual dependence [29]. A Norwegian study of male inmates may also be noted. It found that two-thirds of those who reported high-frequency drunkenness prior to incarceration had used illegal drugs in the month before they entered prison [30].

The Norwegian Context

The penal policy in Norway is based on humanistic values, and rehabilitation of offenders is highly priori-

tized [31, 32]. All prisons are publicly funded, and services such as health care and education are delivered by the public welfare system. The incarceration rate in 2018 was 63 per 100,000 inhabitants, which is very low in a European context [33]. Currently, about half of all convicts serve their sentence in prison [34]. The other half includes penal sanctions such as community sentence, participation in programs targeted at driving under the influence, drug court, and home detention with electronic monitoring.

The Directorate of Norwegian Correctional Service has developed a tool for mapping the prisoners' needs and resources, but validated instruments to capture substance use problems are not included. Only one-fifth of those who entered prison in 2018 were assessed with this tool [35].

Aims

The present study aimed to expand the sparse literature on alcohol problems of varying severity in the general prison population. Specifically, we (i) identified subgroups of inmates whose drinking behavior indicated a high need for alcohol-related interventions, (ii) assessed the prevalence of co-occurring drug problems, and (iii) examined whether concurrent alcohol and drug problems were associated with more severe drinking problems than alcohol problems alone.

Materials and Methods

Sample and Data Collection

Data stemmed from the Norwegian Offender Mental Health and Addiction (NorMA) study, which was conducted in 2013–2014 [36]. Participation was voluntary and based on written informed consent, which included information that the answers to the self-report questionnaire were strictly confidential. As prison life implies complying with many rules, restrictions, and injunctions, the inmates were also informed that refraining from participation was not associated with any sanctions.

Almost all (57 of 63) prison units in Norway took part in the study, and prison nonparticipation was due to limited staff capacity and geographical inconvenience. Altogether, 1,499 inmates responded, corresponding to approximately 40% of the total prison population at the time of the data collection [36]. The questionnaire was translated into four languages, but some inmates did not read any of these and were thus precluded from participation. Other reasons for nonparticipation were absence from prison on the day of data collection (e.g., due to appointment with lawyer or health services) and preclusion of study eligibility by prison authorities for security reasons [37]. The sample was, however, representative with respect to several demographic variables. Details about data collection and ethics are reported elsewhere [36, 37].

Measures

Alcohol problems in the year before incarceration were assessed using the AUDIT [15], which has exhibited excellent reliability and validity across nations and population subgroups [38]. It has also shown to be effective for screening alcohol problems among individuals in various stages of the criminal justice system [22]. The AUDIT consists of 10 items that capture drinking patterns, alcohol-related harm, and dependence symptoms. The total score ranges from 0 to 40, and scores of ≥ 8 are indicative of alcohol problems [39]. The standard categorization of AUDIT positive screens and the suggested implications for intervention are as follows:

- Scores 8–15: Simple advice
- Scores 16–19: Simple advice, brief counseling, and continued monitoring
- Scores ≥ 20 : Referral to specialist for diagnostic evaluation and treatment.

As in previous research [40], we used the terms “hazardous drinking” when referring to scores of 8–15, “harmful drinking” when referring to scores of 16–19, and “possible alcohol dependence” when referring to scores ≥ 20 . When describing our results, we used the terms “alcohol problems” and AUDIT positive screens (scores ≥ 8 , including possible dependence) interchangeably. Moreover, we occasionally refer to AUDIT scores ≥ 20 as “alcohol dependence” (skipping the term “possible”). One should thus keep in mind that a diagnosis of alcohol dependence was not assessed.

Drug problems in the year before incarceration were measured using the Drug Use Disorders Identification Test (DUDIT) [41], which is a validated screening tool that parallels the AUDIT. It has been found to screen effectively for drug problems in various population groups, including individuals in criminal justice settings [42, 43]. The DUDIT includes 11 items, and the total score ranges from 0 to 44. When assessing low-risk groups, the recommended cutoff score is ≥ 6 for males and ≥ 2 for females [44]. Scores of ≥ 25 are indicative of drug dependence for both genders. Because the proportion of drug users was likely high in our sample, a positive screen was defined as scores ≥ 6 for both genders. In contrast to the AUDIT, there are no DUDIT guidelines with suggested interventions that vary according to the scores on the scale.

The *demographic measures* included gender, age, and educational level. The latter was categorized as low (10 years of compulsory schooling or less), medium (2–4 years of post-compulsory education), or high (college or university degree).

Imprisonment-related measures. The prisoners were asked which of the following kinds of crimes they were charged with or sentenced for in relation to their current incarceration: drug-related crimes, violence, acquisitive crimes, DWI, sexual offenses, and financial crimes. Because they could report more than 1 crime type, the categories were not mutually exclusive. We also applied measures on imprisonment status (sentenced or remanded), current imprisonment length, type of prison (high or low security), and previous criminal convictions (yes/no).

Nonresponse and Missing Data Substitution

Respondents whose missing value on the total AUDIT scale reflected no alcohol use in the year before incarceration were given the value 0. For the remaining group with missing values, we applied person mean substitution for inmates who responded to at least half of the AUDIT items. This reduced the occurrence of missing values from 10% to 3%. Respondents who did not respond to six or more items ($n = 46$) were excluded. The study sample thus

comprised 1,453 inmates. When using the same strategy for the DUDIT, the percentage of missing values dropped from 11 to 4%. The prevalence of nonresponse to other questions ranged from <1% (gender) to 9% (age). Hence, the number of respondents in the analyses showed some variation.

Analyses

Bivariate analyses included cross-tabulations with χ^2 -test, ANOVAs with *F*-test, and correlation analyses. To assess whether statistically significant correlates of alcohol problems remained significant when adjusting for demographic covariates, we conducted multivariate linear and logistic regression analyses. The dependent variables in the latter analyses were restricted to being AUDIT positive (scores ≥ 8 vs. ≤ 7) and having scores in the dependent range (scores ≥ 20 vs. ≤ 19).

Results

Sample Description

Males represented 94% of the sample, and 60% were aged 35 years or younger (Table 1). Four in ten (38%) had low education, while 13% had an academic degree. The most frequently reported reasons for incarceration were drug-related offenses (41%), violence (33%), and acquisitive crime (26%). The vast majority (83%) had been sentenced, and 75% had been incarcerated less than a year. Almost six in ten (57%) were in a high security prison, and 60% had been convicted of crime previously. Moreover, 55% screened positive on the AUDIT and 18% were possible alcohol-dependent. The prevalence of DUDIT positive screens and possible drug dependence was 57 and 37%, respectively.

Subgroup Variations in Alcohol Problems

Alcohol problems were not significantly related to gender (Table 2), but the prevalence was elevated in younger inmates and in groups with low or medium education (these educational groups were merged because their results barely differed). Alcohol problems were also positively related to violent offending and DWI, and inversely related to sexual offending. Moreover, previously convicted inmates were twice as likely as those without former convictions to have AUDIT scores in the dependent range. No other imprisonment-related variables were significantly associated with alcohol problems (results not displayed). Thus, the percentage of hazardous, harmful, and possible dependent drinkers showed negligible variation between inmates who reported drug-related offenses and those who did not.

One-fifth ($n = 274$) had all the characteristics that were positively related to alcohol problems (i.e., ≤ 35 years old,

Table 1. Descriptive statistics of the study sample

	%	N
Gender		
Males	93.8	1,356
Females	6.2	90
Age, yr		
17–25	23.8	316
26–35	36.2	482
36–45	22.6	301
≥ 46	17.4	231
Educational level		
Low	37.5	537
Medium	49.3	708
High	13.2	190
Type of offense ¹		
Drug-related	41.0	596
Violence	33.0	480
Acquisitive	25.9	376
DWI	16.5	240
Sexual	9.5	138
Financial	7.7	112
Imprisonment status		
Sentenced	82.6	1,181
On remand	17.4	249
Imprisonment length		
<3 months	35.7	480
3–12 months	39.0	524
>1 year	25.2	339
Type of prison		
Low security	43.2	623
High security	55.8	820
Previously convicted	59.5	826
AUDIT positive screen (scores ≥ 8)	55.1	801
Possible alcohol dependence (≥ 20)	18.4	267
DUDIT positive screen (scores ≥ 6)	56.9	792
Possible drug dependence (≥ 25)	36.8	513

DWI, driving while intoxicated; AUDIT, Alcohol Use Disorders Identification Test; DUDIT, Drug Use Disorders Identification Test. ¹ Not mutually exclusive categories.

low/medium education, incarceration due to violence or DWI, and previous convictions), of whom 79% screened positive on the AUDIT and 31% were possible alcohol-dependent. This high-risk group accounted for 27% of the AUDIT positive cases in the sample, and 35% of all cases of possible alcohol dependence.

Precisely because of their age, the youngest prisoners could not possibly be highly educated. However, the inverse association between educational level and alcohol problems persisted when controlling for age (continuous): the age-adjusted odds ratio of low/medium educa-

Table 2. Prevalence of AUDIT positive screens and percentage distribution of prisoners across AUDIT categories by demographic and imprisonment-related factors

	AUDIT positive	AUDIT score categories		
		hazardous drinking ¹	harmful drinking ²	possible alcohol dependence ³
Males	55.8	29.0	8.3	18.6
Females	46.7	23.3	6.7	16.7
<i>p</i> value	0.091	0.251	0.593	0.650
17- to 25-year-olds	71.8	36.1	14.9	20.9
26- to 35-year-olds	61.2	31.1	8.1	21.8
36- to 45-year-olds	43.5	25.2	5.3	13.0
≥46-year-olds	35.1	16.5	1.7	16.9
<i>p</i> value	<0.001	<0.001	<0.001	0.012
Low/medium education	59.0	30.3	9.2	19.5
High education	31.1	17.9	1.6	11.6
<i>p</i> value	<0.001	<0.001	<0.001	0.009
Violent crimes				
No	46.4	26.5	6.6	13.3
Yes	72.9	32.7	11.5	28.7
<i>p</i> value	<0.001	0.014	<0.001	<0.001
Driving while intoxicated				
No	53.1	27.4	8.4	17.3
Yes	65.4	34.6	7.1	23.8
<i>p</i> value	<0.001	0.024	0.494	0.019
Sexual offenses				
No	56.7	29.5	8.7	18.5
Yes	39.9	19.6	2.9	17.4
<i>p</i> value	<0.001	0.014	0.017	0.754
Previously convicted				
No	45.1	26.4	7.0	11.7
Yes	61.7	29.8	8.6	23.4
<i>p</i> value	<0.001	0.177	0.287	<0.001

AUDIT, Alcohol Use Disorders Identification Test. ¹ Scores 8–15. ² Scores 16–19. ³ Scores ≥20.

Table 3. Logistic regression analyses showing changes in the associations between alcohol problems and crime types when adjusting for age and educational level

	Violent crimes		Driving while intoxicated		Sexual offenses	
	crude OR [95% CI]	AOR ¹ [95% CI]	crude OR [95% CI]	AOR ² [95% CI]	crude OR [95% CI]	AOR ¹ [95% CI]
AUDIT positive screen	3.17*** [2.47–4.01]	2.48*** [1.91–3.21]	1.70*** [1.27–2.72]	1.57** [1.17–2.11]	0.50*** [0.34–0.72]	0.69 [0.46–1.03]
Possible alcohol dependence	2.73*** [2.01–3.62]	2.60*** [1.94–3.48]	1.51* [1.08–2.10]	1.45* [1.04–2.02]	ns	ns
<i>N</i>	1,318		1,435		1,318	

AOR, adjusted odds ratio; AUDIT, Alcohol Use Disorders Identification Test. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. ¹ Adjusted for age and educational level. ² Adjusted for educational level only.

Table 4. The prevalence of drug problems across AUDIT score categories (percentages)

	Hazardous drinking	Harmful drinking	Possible alcohol dependence	<i>p</i> value
DUDIT positive screen (scores ≥8)	57.3	72.4	83.2	<0.001
Possible drug dependence (scores ≥25)	32.3	43.1	62.9	<0.001
<i>N</i>	403	116	256	–

AUDIT, Alcohol Use Disorders Identification Test; DUDIT, Drug Use Disorders Identification Test.

tion on being AUDIT positive was 2.3 (95% CI = 1.6–3.3), and the adjusted odds ratio for possible alcohol dependence was 1.9 (95% CI = 1.2–3.2).

Educational level was also inversely related to violent offending ($\phi = -0.15, p < 0.001$) and DWI ($\phi = -0.09, p = 0.001$), and positively related to sexual offending ($\phi = 0.14, p < 0.001$). Moreover, violent offenders were younger ($M = 31.1, SD = 11.4$) than other inmates ($M = 36.4, SD = 11.4; p > 0.001$), sexual offenders were older ($M = 40.3, SD = 14.7$ vs. $M = 34.0, SD = 10.6; p > 0.001$), and age was not significantly related to DWI. However, all but the inverse association between an AUDIT positive screen and sexual offending remained statistically significant when adjusting for these covariates (Table 3).

Concurrent Alcohol and Drug Problems

A majority (68%) of the AUDIT positive inmates had also a DUDIT positive screen, and 44% of these inmates were possible drug-dependent. The more severe the alcohol problem, the higher was the prevalence of drug problems and possible drug dependence (Table 4).

Analyses of the full sample showed that 75% had a positive screen on the AUDIT and/or the DUDIT (Fig. 1); 38% screened positive on both, 18% screened positive on the AUDIT only, and 19% screened positive on the DUDIT only. Moreover, 44% scored in the dependent range on one or both screening instruments: 12% were dual-dependent, 7% were dependent on alcohol only, and 25% were drug-dependent only.

Inmates with possible dual dependence had higher AUDIT scores than those who were alcohol-dependent only ($M = 27.4, SD = 5.70$ vs. $M = 25.8, SD = 5.38; p = 0.023$). The proportion with a high-risk profile (≤ 35 years old, low/medium education, violent offending or DWI, and previous convictions) was also elevated in the dual-dependent group (39.8 vs. 22.1%, $p = 0.004$). However, a linear regression analysis showed that the association between dual dependence (vs. alcohol dependence alone)

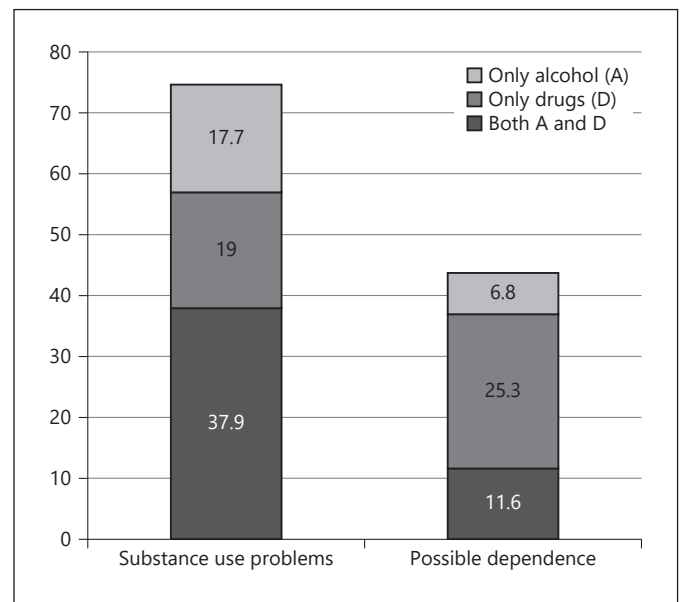


Fig. 1. Percentages of all prisoners whose AUDIT and DUDIT scores were indicative of substance use problems (positive screens) and possible dependence due to alcohol use only, drug use only, and concurrent alcohol and drug use ($N = 1,393$). AUDIT, Alcohol Use Disorders Identification Test; DUDIT, Drug Use Disorders Identification Test.

and the continuous AUDIT score remained statistically significant when all the variables connected to the high-risk profile were accounted for ($B = 1.67, SE = 0.77; p = 0.032$). Finally, it may be noted that dual dependence was almost twice as prevalent among inmates who reported drug-related offenses (16.2%) as compared to those who did not (8.3%; $p < 0.001$).

Sensitivity Analyses

The validity of self-report data on pre-prison substance use may be questioned, particularly for respondents who had been incarcerated for a long time. How-

ever, the pattern of findings was replicated when long-term prisoners (>1 year) were excluded from the analyses.

Discussion

Our study added to the body of evidence that alcohol problems are widespread among inmates in high-income countries [4, 16–18]. A majority (55%) screened positive on the AUDIT, indicating that they had alcohol problems of some severity in the year prior to imprisonment. Moreover, 18% had AUDIT scores that were indicative of pre-prison alcohol dependence. By way of comparison, a recent general population study in Norway found that 17% had an AUDIT positive screen and that 1% was possible alcohol-dependent [44].

Drug problems in terms of a DUDIT positive screen were approximately as widespread as alcohol problems, but possible drug dependence was twice as prevalent as possible alcohol dependence. Few, if any, previous studies have applied the AUDIT and/or the DUDIT to assess substance use problems in a national sample of prisoners, restricting our possibility to compare the prevalence rates with those in other countries.

Subgroup Variations in the Prevalence of Alcohol Problems

Alcohol problems were not significantly related to gender. Negligible male/female differences have also been found in other studies of alcohol problems in prisoners [10, 14], while the prevalence in the general population is much higher among males [45, 46]. Female inmates thus seem to be a more selected group with respect to unhealthy drinking behavior than their male counterparts.

As in previous studies of inmates [10, 20], the prevalence of alcohol problems, including possible dependence, tended to decrease by age. We did not pursue the issue, but MacAskill and co-workers [40] found some interesting age differences in the responses to single AUDIT items. Among possible alcohol-dependent inmates, daily or almost daily drinking and equally frequent symptoms of severe dependence were reported less often in younger age groups. The researchers thus noted that young heavy drinking inmates may be less likely to identify themselves as “a person with alcohol problems,” and another study found that this was indeed the case [11].

Alcohol problems were more widespread among inmates with low/medium education, who reported violent offending or DWI, and who had been convicted of crime previously. These results also agree with previous re-

search [20–24]. The association between alcohol problems and violent offending does not merely concur with other studies of inmates [22, 23], but also with research based on other samples and methodological approaches [47, 48].

Concurrent Alcohol and Drug Problems

A majority (68%) of the AUDIT positive inmates had also a DUDIT positive screen. A similar proportion (63%) of those with possible alcohol dependence were possible drug-dependent as well. Correspondingly, two-thirds of the alcohol-dependent inmates in the study of Proctor [29] were dual-dependent. The drug that was the main source of the drug problems was not assessed in our study, but previous analyses of the sample showed that high-frequency cannabis use was far more prevalent than high-frequency use of any other illegal substance prior to incarceration [37].

The prevalence of drug problems increased along with the severity of the alcohol problems, and possible dual-dependent inmates had graver drinking problems than those who were possible alcohol-dependent alone. These results echo those of general population studies on comorbid AUD and DUD [6, 30]. Altogether, substance use problems were widespread in our sample; three-quarters screened positive on the AUDIT and/or the DUDIT, and more than four in ten were possible alcohol- and/or drug-dependent.

Strengths and Limitations

Nationwide studies of alcohol problems among prisoners are scarce, and our study included inmates in almost all prison units in Norway. The sample was large and resembled the national prison population with regard to several demographic characteristics [36]. Moreover, we relied on the AUDIT and the DUDIT, and no previous study of the general prison population – to our knowledge – has applied validated tools to assess *both* alcohol and drug problems of varying severity. Our study also added to the meagre body of research on concurrent alcohol and drug problems among prisoners.

However, the study participation rate suggests that the generalizability of the results may be hampered by selection bias with regard to participation barriers, as for instance foreign language or health problems. Moreover, because the NorMA study provided a snapshot of those incarcerated at a specific point in time, the sample inherently included a relatively large proportion of long-term prisoners at the expense of short-term prisoners. This would not have been the case if newly incarcerated in-

mates were recruited consecutively. The sentence for DWI is typically short, and we found that DWI was positively related to alcohol problems. Hence, due to our sampling method, the prevalence of alcohol problems was probably underestimated.

The time frame for the AUDIT and the DUDIT was the year before incarceration, and the responses may have been hampered by recall bias. According to Greenfield and Kerr [49], who focused on alcohol measurement methodology, this kind of response error generally implies that drinking in the past is systematically underreported. They also proposed that the further in the past the drinking behavior in question, the stronger is the effect of recall bias. However, there seems to be a paucity of studies that have tested these assumptions empirically.

Implications

According to the AUDIT guidelines [39], a bare majority of the prisoners in Norway should be offered some type of alcohol-related intervention, and almost one-fifth should be referred to a specialist for diagnostic evaluation and treatment. Moreover, our study indicated that the interventions should take into account that concurrent alcohol and drug problems are prevalent, and that dual dependence is associated with particularly severe drinking problems.

We also identified a high-risk profile with respect to alcohol problems. However, the specificity of this profile was low, suggesting that identification of such problems cannot be done by proxy but requires routine screening of all inmates. A test-retest reliability study of the AUDIT indicated that the *timing* of the screening may be important [50]. Compared to the results at entry into prison, a new assessment a couple of weeks later showed a three-fold increase in the proportion, whose AUDIT scores were indicative of pre-prison alcohol problems. According to the researchers, the latter results were more reliable.

Considering the range and severity of the health and social harms connected to excessive drinking [51], it is enigmatic that alcohol problems among prisoners seem to be a neglected issue by the correctional services in many European countries [7]. A history of heavy drinking is also a major risk factor for suicide *during* incarceration [52], and there is abundant evidence to suggest that alcohol is causally linked to violence [47, 48]. Implementation of alcohol treatment services may not merely reduce the risk of relapse into criminal behavior such as violence and DWI [24, 53] but also increase the likelihood of successful post-release reintegration into society – which is a main goal of the penal policy in Norway [31].

Our study highlighted the importance of screening for *both* alcohol and drug problems among prisoners. Research based on other samples has found that comorbid AUD and DUD is associated with psychiatric disorders, suicidal behavior, social problems, and poor physical health [25, 28]. Moreover, simultaneous intake of alcohol and other intoxicants may be particularly harmful, as for instance with regard to the increased risk of overdose when alcohol and opioids are used at the same time [54, 55]. Hence, it is imperative to identify inmates with concurrent alcohol and drug problems, and to offer adequate help and treatment.

A substantial majority of the prisoners in our study had alcohol and/or drug problems of some severity, suggesting that interventions targeted at substance use problems should be a default option rather than an option for a select few. There are special units for inmates with substance use problems in some Norwegian prisons, accounting for 3–4% of the total prison capacity [56]. The discrepancy between the potential needs and the targeted facilities is thus substantial, which also seems to be the case in many other European countries [7]. For instance, a study of Finnish inmates showed that only 22% of those who were assessed as having a need for substance use interventions received one [57].

Conclusions

A majority of the prisoners in Norway had AUDIT scores that were suggestive of alcohol-related interventions. The prevalence was elevated in younger, less educated groups of previously convicted DWI and violent offenders. Alcohol problems were most often combined with drug problems, and inmates with dual dependence had particularly severe drinking problems.

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Statement of Ethics

Participation in the NorMA study was voluntary and based on written informed consent. The study was approved by the Norwegian Committee of Research Ethics (REK 2012/297), the Ministry of Justice and Public Security, and the Directorate of Norwegian Correctional Service.

Conflict of Interest Statement

All authors declare that they have no conflicts of interest to disclose.

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