

Title: Substance use pattern, self-control and social network are associated with crime in a substance using population

Running title: Crime and substance use

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ABSTRACT

Introduction and aims: Rates of crime are high in substance using populations; therefore investigation of factors associated with crime in these populations is highly relevant. We describe crime prevalence and associations between crime, pattern of substance use and psychosocial factors, such as self-control and social network. **Design and methods:** A cross-sectional study including substance users (n=549; mean age 34 years; 27% women) entering treatment at 21 treatment-centres across Norway (December 2012 - April 2015). Data on demographics, substance use, psychosocial variables and crime in the 6 months prior to treatment were obtained through interviews. Adjusted odds ratios (aOR) with 95% confidence intervals (CI) were estimated through logistic regression. **Results:** 64% of participants committed crime in the 6 months prior to treatment. Of these, 93% committed income-generating crime. Several factors were associated with increased likelihood of having committed crime: Use of stimulants aOR=1.82 (CI: 1.04-3.17), use of a higher number of different substances aOR=1.16 (CI: 1.04-1.31) and spending most of their time with family or friends using addictive substances aOR=2.38 (CI: 1.10-5.16) and aOR=2.22 (CI: 1.32-3.73). Protective factors associated with decreased likelihood of committing crime were being older aOR=0.95 (CI: 0.92-0.97) and higher self-control aOR=0.94 (CI: 0.91-0.97). **Discussion and conclusions:** Stimulant use, higher number of different substances used, lower self-control, primarily a substance-using social network and being younger were associated with crime in this substance using population. Treatment clinics should consider these risk factors for crime, and suitable interventions should be implemented and evaluated.

Keywords: Substance-related disorders, crime, behaviour, social network, substance use treatment

INTRODUCTION

Crime causes economic and social damages for victims and for society as a whole (1, 2). Additionally, offenders experience negative consequences, such as arrests and feelings of guilt and remorse (3). Similarly, substance use and dependence have adverse consequences for individuals, families and society (4, 5). In substance using populations, elevated crime-rates have been reported among stimulant users (6, 7), heroin users (6, 8, 9), alcohol users (7), illicit benzodiazepine users (6, 9) and cannabis users (9). Other substance use related factors have also been associated with crime: higher number of different substances used (9, 10), intravenous route of administration (10) and increased dependence (6, 9, 11). Further, lower self-control has been associated with crime among jail inmates (12), and having a substance using social network is associated with higher crime rates among substance users (11). Overall, the literature indicates that the crime-substance use relationship is influenced by a range of substance use- and psychosocial factors.

There are several theoretical explanations of the relationship between crime and substance use. Substance use could lead to crime, e.g. through economic necessity (6, 13). Conversely, crime could lead to substance use, e.g. profits are used to buy substances (14). There is also evidence that substance use and crime have a reciprocal relationship (15, 16), that the causal direction can change over time (17) or differ between individuals (18, 19). Finally, there could be a common factor that influences both crime and substance use, causing an increased risk for both behaviours, e.g. lower self-control (20). In summary, the relationship between substance use and crime may in part be mediated through or interconnected with other factors, such as substance use pattern, self-control and social network.

The high crime rates and the various factors associated with crime in substance users, give cause to believe that addressing criminal behaviour during substance use treatment could improve long-term treatment outcomes. However, the wide range of factors associated with crime make it difficult to decide where to focus efforts. We have not found studies that broadly investigate psychosocial

factors together, including substance use pattern, self-control and social network, and their association to crime in substance users. The overall aim of this paper is to explore the relationship between substance use, psychosocial factors and crime, and thereby guide treatment focus to further improve patients' recovery process. The specific aims of the study are to 1) describe type and frequency of crime in both genders, and 2) investigate associations between the likelihood of committing crime, substance use pattern and psychosocial factors, including self-control and social network.

METHODS

Design

In this multicentre, cross-sectional study we collected data from 14 Opioid Maintenance Treatment (OMT) centres and 7 in-patient treatment centres across Norway, between December 2012 and April 2015.

Setting

In Norway, applications for publicly funded substance use treatment in specialist health care go through medical practitioners or social services. A regional team evaluates applications according to specific criteria: Severity and type of substance use, the patient's situation, and expected benefit and cost of treatment (21). The treatment centres that contributed to this study treat patients with problematic use of mainly illicit substances, although use of alcohol and prescribed addictive substances co-occur for some. Patients are selected towards appropriate and available treatments such as OMT and in-patient treatment. OMT is typically given on an out-patient basis, and can be life-long. In-patient treatment is usually provided for 3-12 months, often with aftercare offered for 1-3 years after treatment-completion. The only firm criterion for OMT is a diagnosis of opioid dependence according to ICD-10 or DSM-IV diagnostic criteria (22), although expected benefits, patient age and length of substance use are taken into consideration. All 14 OMT centres were part of the same national program. For in-patient treatment, there were no specific diagnostic criteria for intake. One in-patient treatment centre exclusively treated women, 2 had a lower age limit of 23 years and 2 had upper age limits (28 and 35 years).

Participants

This study included a total of 549 participants from 21 treatment centres. We have calculated a formal inclusion rate based on logistic patient data from the centres. Of 1416 patients entering treatment at these 21 centres during the observation period, 670 (47%) were not considered or were unavailable for various reasons (logistics, early discharge, considered physically or psychologically

unfit by facility staff, unknown/other reason). Of the 746 that were considered for inclusion, 129 (17%) declined, 45 (6%) did not meet for appointments, 23 (3%) were not interviewed for other reasons and 549 (74%) went on to complete participation.

Of the full sample, 283 participants entered OMT (27% women), while 266 participants entered in-patient treatment (28% women). Mean age was 34 years (33 for men and 35 for women). Ninety-one percent were born in Norway, 3% in another Nordic country and 6% in other parts of the world. Forty-six percent had children (44% of men and 50% of women), but only 6% of these were currently living with their children (5% of men and 8% of women).

Measures

Participants self-reported crime committed in the 6 months prior to entering treatment or a controlled environment (some were transferred to treatment from a controlled environment, such as a prison or a health care facility). As all participants entered substance use treatment, use and possession of illicit substances were not included as offences. Participants' reported the number of criminal acts distributed across 5 subgroups: acquisitive crime (theft, burglary, embezzlement, soliciting), substance-related crime (selling, smuggling, manufacturing and similar), violent crime (caused physical harm or pain to others intentionally), traffic violations (driving under the influence, speeding, driving without a license and similar) and finally a non-specified category of other crime. There were no questions on prostitution, which is not illegal in Norway. For life-time history of incarceration, a question from EuroASI (23) was used: "Have you ever served a prison sentence?"

The structured interview included questions used in the national patient registry (24): Living conditions ("stable living conditions last 4 weeks?"), education and employment, as well as substance use. Participants were asked how many different substances they had used in the last 6 months and asked to list their 1st, 2nd, 3rd and 4th most used substances or addictive medications, as well as intake-method for each. In addition, they were asked whether they had used syringes in the 4 weeks prior to treatment and whether they had ever overdosed.

As a measure of level of dependence, the Severity of Dependence Scale (SDS), a validated five-item scale, was used (25). The scale ranges from 0 to 15 (low to high), and is devised to measure dependence of specific substances, primarily for research purposes (e.g. "Did you think your use of amphetamines was out of control?"). We have rephrased the items to reflect general dependence on substances, (e.g. "Did you think your use of substances was out of control?"). Responses were given on a 4-point Likert scale. In our sample, internal consistency of the scale was $\alpha=0.68$.

The Brief Self Control Scale (BSCS) is a 13-item scale previously validated in student and jail inmate populations (12, 26) and its single construct validity has been supported (27). The scale ranges from 13 to 65 (low to high), and consists of statements, e.g. "I refuse things that are bad for me". Responses were given on a 5-point Likert scale. Internal consistency of the scale in our sample was $\alpha=0.83$, similar to the consistency seen previously (12, 26).

In regard to social network, we used a question from EuropASI (23): "Who do you usually spend most of your leisure time with?" The response options were family or friends, either with or without "current problems with alcohol/ substances/medications", and a fifth option was "I am mostly alone". Participants with family or friends without problems with substance use as their primary social network, and participants that were mostly alone, were combined to form a reference group which did not have a substance using primary social network.

Procedure

Participants received information from facility staff about the voluntary participation and the study's purpose, and gave written consent. Facility staff were trained in the use of the interview form through attendance of seminars arranged by the research group. The goal was for interviews to be completed within 6 weeks of treatment start; however interviews completed within 12 weeks were accepted. The median time between treatment start and interview was 18 days (OMT: 19 days, in-patient treatment: 17 days).

Ethics

The study was approved by the Norwegian regional ethics committee (ref: 2012/1131/REK).

Participation in the study was voluntary and it was made clear that non-participation would not affect the treatment provided. The structured interview itself was developed in collaboration with clinicians to make the interview clinically useful as part of standard assessment of new patients.

Analysis strategy

If participants had committed at least one crime of any type in the past 6 months, they were included in the “crime” group. Otherwise they were included in the “no crime” group. We did not distinguish between different types of crime in analysis, as most participants (70%) had committed several types of crime. Participants were also asked how many times they had committed each type of crime.

Blank responses (19%) or uninterpretable responses (4%) (e.g. “all the time” or “almost every time shopping”) were considered missing (in total 23%). Non-numeric responses with some numerical information (6%) were interpreted conservatively (e.g. “several hundred” as “200” and “every day during the past 6 months” as “180”). We calculated the median number of crimes for each participant and the interquartile range for all participants who had reported number of crimes.

Participants were categorized as users of a substance if they listed it among their four most used in the past 6 months. We combined pharmacologically related substances into three categories: *stimulants* (stimulants reported were: amphetamines: 89%, cocaine: 21%, other stimulants: 5%, crack: none), *illicit opioids* (illicit opioids reported were: heroin: 71%, buprenorphine, methadone and other opioids: 37%) and *prescribed addictive medications* (Prescribed addictive medications reported were: opioids in OMT: 16%, opioids prescribed outside the official OMT program: 42%, benzodiazepines: 56% and other: 7%). The other categories were *cannabis*, *alcohol* and *illicit benzodiazepines*. Participants could be included in up to four different substance-categories, which allowed statistical adjustment for polysubstance use.

We used IBM SPSS 22 for statistical analysis. We investigated different types and frequencies of crime among men and women. For all statistical tests, a significance level of 5% was used. We did bivariate analyses (X^2 or t-tests) between crime and no crime groups within each gender, for each variable. Finally, we estimated odds ratios (OR) and adjusted odd ratios (aOR) using dichotomous logistic regression models with committed crime (crime/no crime) as the dependent variable. We present 4 models to demonstrate how the aORs change as variables are added to the models. The independent variables were selected based on previous research, clinical relevance, and on the bivariate analyses. In preliminary analysis, we ran the regression models divided by gender, and divided by type of treatment entered. As similar association between the independent variables and crime were found in these analyses, we decided to keep the entire sample in one model for the logistic regression, while adjusting for gender and type of treatment.

RESULTS

Sixty-four per cent (66% of men and 56% of women) had committed at least one crime in the 6 months prior to entering substance use treatment (Table 1). Of these, 93% had income-generating crime (i.e. acquisitive or substance-related crime, excluding use and possession of illicit substances) among the types of committed crime. Traffic violations were reported by 40% of those who had committed crime, while 30% reported violent crime. Detailed information on number of criminal acts was given by 77% of the crime group, who reported 27 124 criminal acts in total. The median number of acts was 20 in the last 6 months; the interquartile range was 4-152. The 10% with the highest number of acts reported 13 518 acts, which was 50% of all criminal acts reported.

<Insert Table 1>

Of those who had committed crime, 81% of men and 76% of women reported stimulants among their 4 most used substances. To compare, among those who had not committed crime, stimulant use was reported by 47% of both genders (Table 2). Additionally, for both genders, those who had committed crime were younger, reported more use of cannabis and illicit benzodiazepines, higher number of different substances used, scored higher on the SDS, scored lower on the BSCS, more often had a substance using main social network, reported more unstable living conditions in the last 4 weeks, and more often entered in-patient treatment compared to those who had not committed crime. Men who had committed crime reported non-fatal overdoses more often than men who had not committed crime, and a smaller proportion had completed more than the 10 mandatory years of education. Women who had not committed crime most frequently reported illicit opiates (72%), which was higher than among women who had committed crime (44%).

<Insert Table 2>

In Table 3, the outcome of unadjusted logistic regression analyses and 4 different adjusted logistic regression models are shown. In the final model (model 4) several variables significantly increase the

likelihood of having committed crime: Stimulant use (aOR: 1.82, CI: 1.04-3.17), higher number of different substances used (aOR: 1.16, CI: 1.04-1.31), having a primary substance using social network consisting of family (aOR: 2.38, CI: 1.10-5.16) or friends (aOR: 2.22, CI: 1.32-3.73), and entering in-patient treatment as opposed to OMT (AOR: 2.47, CI: 1.31-4.68). Older age (aOR: 0.95, CI: 0.92-0.97) and higher BSCS score (aOR: 0.94, CI: 0.91-0.97) significantly decreased the likelihood of committing crime.

<Insert Table 3>

DISCUSSION

More than half of both men and women had committed crime in the 6 months prior to treatment. The most frequent crime reported was income-generating crime, followed by traffic violations, violent crime and other crime. A small proportion of participants (10%) were responsible for over half of the reported crimes. A range of substance use patterns and psychosocial factors were associated with the likelihood of criminal behaviour. Stimulant use, higher number of different substances used and a primarily substance using social network were associated with increased likelihood of committing crime, while older age and higher self-control were associated with decreased likelihood of committing crime.

The crime rate found in our study (64%) fall in line with previous self-report studies of substance using populations (40-70%), although the assessed time-periods in the studies vary from 1 to 6 months (6, 7, 11). Our results support previous findings of an increase in likelihood of crime for substance users who use stimulants (6, 7). One study, with a population similar to ours, found no association between stimulant use and crime (9). However, the time-period assessed was 1 month, compared to 6 months in our study. Consistent with a number of previous studies, we found an association between a higher number of different substances used and crime (9, 10), which may reflect a more uncontrolled pattern of substance use or a need for a greater income to finance the substance use.

The association between higher self-control and decreased likelihood of crime in this substance using population supports similar associations found in prison populations (12). Although there are many studies on self-control and crime, it can be difficult to compare findings, as the measures used vary from single construct scales, like the BSCS, to scales constructed of several subscales (e.g. impulsivity and sensation seeking), or even behavioural measures of self-control (e.g. delay discounting). It appears the BSCS has internal consistency in our sample and scores were normally distributed. We found the same mean BSCS score as in undergraduate students and jail inmates (12, 26), but a lower

mean score compared to a general adult community sample (28). We were not able to determine the causal direction between crime and low self-control, however there are theories and findings that the level of self-control is established early in life and remains stable over time (20, 29). On the other hand, there are studies that suggest self-control is malleable and can be improved over time (30) or through interventions (31).

We found an increase in likelihood of crime for participants who had a primarily substance using social network. This association was found both when the substance using network consisted of friends and when it consisted of family, suggesting that the primary association with crime was the substance using aspect of the network. Although there are few investigations of the association between crime and social network in substance using populations, a similar association has previously been found in a smaller sample (11). Further, social network, self-control and substance use has been investigated in male offenders (32) and jail inmates (33). The investigators concluded that the effect of self-control on substance use is partly mediated through social bonds, such as having a substance using social network (32, 33). These studies differ from the present study; substance use was the outcome under investigation, while our outcome of interest was crime in a substance using population. In our study, both having a primarily substance using social network and lower self-control had independent associations to crime.

In line with previous findings, being younger was associated with an increased likelihood of crime (6, 9, 10). This is commonly found across all populations that commit crime, and may reflect a general desistance of crime around the middle ages (34). Some previous studies have found male gender to be associated with crime (8, 9), while others have not (7). In our results, an elevated unadjusted OR was associated with male gender; however it was not statistically significant in the adjusted model. Additionally, participants included in the study when entering in-patient treatment, as opposed to OMT, were more likely to have committed crime in the last 6 months before entering treatment. This could be accounted for by factors not identified or measured in this study, or may reflect a

concentration of the already reported risk-factors in one group, for instance, in-patients were on average 10 years younger, had higher rates of stimulant use and used a higher number of different substances compared to OMT patients. Although we are unable to explain this increased odds ratio for crime among in-patients, it does indicate that focus on criminal aspects in substance use treatment is of particular importance for in-patient treatment.

There are several differences in methodology in research on substance use and crime, and our study has some limitations and some strengths. We were unable to investigate the causal relationship between crime and associated factors in this cross-sectional study. Over half of patients entering treatment in the inclusion-period did not participate in the study. This was mostly due to logistical reasons related to the centres and facility staff. We therefore consider the non-participants to be primarily a random selection. Although we cannot be certain that there were no selection bias present in our sample, we consider the sample representative of persons entering treatment for mainly illicit substance use in Norway, and in countries with similar contexts and conditions. When estimating criminal involvement, some studies use registries of arrests and convictions. Our results are based on self-reported interview data for the past 6 months, and can be subject to both recall bias and other errors in reporting. However, self-reported crime and substance use has been shown to be reliable (35), and may give a more accurate numerical estimate of criminal involvement than official crime records based on e.g. convictions (15). Similarly, to objectively assess substance use, biological measures, such as saliva or urine samples can be used. Arguably, biological measures of substance use are limited both by lack of specificity and its invasive nature (36). Other strengths of our study are the large nationwide sample size and low rates of missing data due to data collection by trained interviewers. The interview included a rich array of variables, enabling us to adjust for a range of substance use and psychosocial variables in our analysis.

Clinical implications and conclusion

The finding that use of stimulants, use of a higher number of different substances, lower self-control and a primarily substance using social network were associated with an increased likelihood of crime, underlines the complexity of the topic investigated and underscores the relevance of a psychosocial clinical approach. Previous research and theories have emphasized the role of self-control and social network in both criminal and addictive behaviour. In light of this, our finding that substance use, self-control and social network are associated with crime in a substance using population indicates that treatment programs for substance use could improve patient recovery by addressing these factors in addition to substance use behaviours. Treatment centres should implement self-control and social network interventions, and assess these interventions to ensure their effectiveness in improving substance use and criminal outcomes.

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