All-cause mortality in criminal justice clients with substance use problems—A prospective follow-up study

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ABSTRACT

Background: Mortality in previously incarcerated individuals is known to be elevated, with high proportions of drug-related deaths. However, there is less documentation of whether specific substance use patterns and other clinical characteristics predict increased mortality in the group.
Methods: This is a follow-up study of mortality and causes of death in ex-prisoners with substance use problems prior to incarceration ($N = 4081$), who were followed during an average of 3.6 years from release from prison until death or until data were censored. Baseline predictors of mortality, derived from interviews with Addiction Severity Index (ASI) in prison, were studied in a Cox regression analysis.
Results: During follow-up, 166 subjects (4.1%) died. Standardized mortality ratios were 7.0 (3.6–12.2) for females and 7.7 (5.6–9.0) for males. In 84% of cases, deaths were unnatural or due to substance-related disease. Most common causes of death were accidental poisoning (27%), transport accidents (13%), poisoning/injury with undetermined intent (12%), and suicide (10%). Death was positively predicted by heroin use, overdose, and age, and negatively predicted by a history of depression.
Conclusions: A vast majority of deaths after release from prison in individuals with substance use are due to violent or substance-related causes. Significant predictors identified were mainly related to patterns of drug use, and need to be addressed upon incarceration as risk factors of death. The findings have implications for referral and treatment upon release from prison.

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1. Introduction

Previous research has demonstrated high prevalence of health problems in incarcerated individuals, including substance use disorders, psychiatric conditions, and blood-borne infections related to injection drug use (Fazel and Baillargeon, 2011). Several psychiatric conditions, notably personality disorders and substance use disorders, are over-represented in prison populations (Fazel and Danesh, 2002; Fazel et al., 2006). Also, mortality is known to be high among clients after prison release, with an overrepresentation of fatalities from unnatural causes such as substance-related deaths (Verger et al., 2003; Binswanger et al., 2007; Kariminia et al., 2007a,b; Rosen et al., 2008). During the first few weeks after release, mortality is known to be highly elevated, with drug-related causes in a majority of deaths (Merrall et al., 2010). Although there are few long-term follow-up studies, it appears that roughly, when follow-up time is longer, the percentage of natural causes of death increases (Binswanger et al., 2007; Kariminia et al., 2007a; Rosen et al., 2008).

Despite elevated mortality rates in incarcerated individuals, there are fewer studies assessing baseline predictors of death (Kjelsberg and Laake, 2010). Despite the knowledge that drug-related causes represent a large part of the mortality in previously incarcerated subjects, there is need to identify baseline substance-related predictors of death in these groups (Kinner, 2010; Leach and Oliver, 2011), in order to improve in-prison treatment and referrals to community treatment.

The present study aims to identify predictors of death in incarcerated subjects with substance use, combining national register data of mortality and causes of death with baseline data from structured interviews conducted in prison.

2. Methods

This prospective follow-up study was based on a database of criminal justice clients with substance use problems. Since 2001, the Swedish Prison and Probation Service uses, in an increasing number of correctional facilities, the Addiction Severity Index in order to assess problem load and treatment needs in clients with substance use problems (Tengvald et al., 2004). The Addiction Severity Index (ASI), a semi-structured interview instrument which examines substance-related problems in different aspects of life, is

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a common tool for assessment in clinical work and in addiction research (McLellan et al., 1980, 1992, 2006). Several previous analyses have been published based on the present database of ASI assessments, collected between 2001 and 2006, when data were blinded and delivered to the research group (Hakansson et al., 2008, 2009, 2011). The version used, the ASI-X (Öberg et al., 1999), is a slightly modified ASI version based on the European standard version EuropASI (Kokkevi and Hartgers, 1995).

The present database contains interviews with 7085 clients assessed in prison (72%), on probation (17%), on remand (5%), or, for the remaining clients, in other correctional institutions. Here, clients interviewed in prison (*n* = 5122) were further analysed. In order to include subjects with an actual substance use problem, subjects were excluded if their reported dominating substance use problem (primary drug) was 'none' (*n* = 720) or missing (*n* = 127). Five clients were excluded because instead of the ASI, the related instrument for adolescents had been used (ADAD; Adolescent Drug Abuse Diagnosis, Friedman and Utada, ADAD, 1989). Finally, 16 subjects were excluded because of failure to complete the interview or because the client's answers were judged to be distorted by the client's misrepresentation or inability to understand. Among the remaining 4254 clients, further analyses were based on all clients who were registered to have left prison, i.e. with a confirmed date of release (*N* = 4081).

Consistent with the intention of the Swedish Prison and Probation Service, in an integrated effort to enhance focus on drug problems, the database assessed here is an overrepresentation of illicit drugs compared to alcohol, in comparison to the whole Swedish criminal justice system. It is also an overrepresentation of women (10%), and clients sentenced for acquisitive crimes or drug crimes. In this cohort (*N* = 4081), the primary drugs (dominating problems) reported were the following; amphetamine (32%), polydrug use (more than two illicit substances on the same day, 17%), cannabis (13%), alcohol (12%), heroin (9%), alcohol and drugs combined (7%), sedatives (3%), cocaine (3%), and less than 1% for opioid analgesics and methadone, inhalants and hallucinogenic drugs. Two percent reported other drugs. The attrition rate was low; from a post hoc questionnaire to interviewers, it was concluded that around 6% of clients approached for assessment refused the interview (Hakansson et al., 2011). While the exact time frame until interview is unavailable, the best available data describe the time elapsed from intake to the criminal justice facility where the client was interviewed, to the interview, which was 60 days (median 27 days; 98% were interviewed within the first year after arriving to the prison unit).

Mortality data were collected from the National Causes of Death Register, held by the National Board of Health and Welfare, where deaths until December 31, 2008, were registered. As this registry does not register deaths in individuals not residing in Sweden, a further search in the Swedish criminal justice register identified another three cases. Potential risk factors of death were examined through a Cox regression analysis, including all the following independent variables; age (at baseline), gender, homelessness 30 days prior to incarceration, country of birth (Sweden, Denmark, Norway, Finland or Iceland versus other countries), psychiatric symptoms either during the last 30 days prior to incarceration or previously in life (depression, anxiety, hallucinations, cognitive difficulties, difficulty controlling violent behaviour, or suicide attempts), history of psychiatric hospitalization, previous drug overdose, number of substance types used during the last 30 days prior to incarceration (alcohol, sedatives, opiates/opioids, stimulants, cannabis, hallucinogenic drugs), and history of at least 6 months of substance use (binge drinking, sedatives, opioids other than heroin/methadone, cocaine, cannabis, and hallucinogenic drugs). In order to control for crime characteristics, the model also included the main crime in the index verdict (drug crime, violent crime, or property crime), as

well as the duration of time the client spent in the prison unit (time from arrival to the prison unit until the date of release). Because of the potential bias related to the time lag between incarceration and the interview, sensitivity analyses were run, excluding clients interviewed more than 180 days, 120 days, and 90 days, respectively (including 3805, 3641, and 3443 clients, respectively), after arrival to the prison unit where they were assessed. These sensitivity analyses produced similar hazard ratios in the Cox regression models as in the original analysis.

Frequencies and mean values for categorical and continuous baseline variables are reported in Table 2, as well as binary associations between death status and baseline variables, calculated with chi square analysis for categorical data and independent samples t test for continuous variables. Standardized mortality ratios (SMR) were calculated, comparing mortality in the present study with mortality data from the Causes of Death Register. The numbers of expected deaths were calculated for males and females, respectively, for each 5-year interval (age at death or censorship) from 20 to 64 years. As the median year of release from prison was 2005, and data were censored in December 2008, expected deaths were based on the average death rate per 100,000 inhabitants for the years 2005–2008. The 95% confidence intervals of SMRs were calculated using the exact test (Ulm, 1990). Subjects were followed from the date of release from prison, according to the criminal justice register, until death or until data were censored (December 31, 2008). Time spent outside of prison during leave, which is common in the Swedish prison setting, mainly for clients approaching the end of their sentence, could not be controlled for, as this type of information was unavailable. This survival analysis aimed to study only subjects for whom it was certain that they had left prison. A control analysis was performed with all subjects followed from the date when clients entered the criminal justice unit where they were interviewed, and for whom no date of release could demonstrate that they had actually left prison. Thus, this also includes time spent in incarceration. This control analysis altered the results very little, see below.

Calculations were made using 95% confidence intervals. Statistical analyses were carried out in SPSS software, version 20.0. The study was approved by the Ethics Committee of Lund University.

3. Results

Subjects released from prison (*N* = 4081) were followed for 1329 days (3.64 years). Here, 166 deaths were recorded (4.1%), after an average of 808 days (2.21 years). Standardized mortality ratios (for individuals aged 20–64), were 7.0 (3.6–12.2) for females and 7.7 (5.6–9.0) for males.

Causes of death are seen in Table 1, as well as the average time from release until death for each cause of death. Seventy-three percent of deaths were caused by unnatural causes, including violent or substance-related causes. When adding physical diseases where the death was registered as being alcohol- or drug-related (data not shown), this percentage increases to 84%. The most common causes of death were accidental poisoning (27%), transport accidents (13%), poisoning or injury with undetermined intent (12%), and suicide (10%). Among seven fatalities caused by infectious diseases, three cases were due to viral hepatitis, and one was due to HIV. Other typically substance-related causes of death were four deaths due to alcohol-related hepatic disease. In three cases, the causes of death were missing in the register, and in seven cases, the cause of death could not be determined.

Baseline values and binary associations with death are reported in Table 2. In the survival analysis, death was positively associated with older age, heroin use, and drug overdose, and negatively associated with a history of depressive symptoms (Table 3). Another