

Mikaela Kontu

ADOLESCENCE AND YOUNG
ADULTHOOD RISK FACTORS
FOR DRUG CRIME
OFFENDING

A FOLLOW UP STUDY OF FORMER ADOLESCENT
PSYCHIATRIC INPATIENTS

UNIVERSITY OF OULU GRADUATE SCHOOL;
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FACULTY OF MEDICINE;
OULU UNIVERSITY HOSPITAL



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MIKAELA KONTU

**ADOLESCENCE AND YOUNG
ADULTHOOD RISK FACTORS FOR
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A follow up study of former adolescent psychiatric
inpatients

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Abstract

Drug crime offending is an increasing concern worldwide. However, research on the relationships between adolescent factors, prescription medicine usage, injury/substance-related emergency room visits, and drug crime offending remain scarce.

This study of the former adolescent psychiatric inpatients focused on analyses of drug crime offenders compared to matched non-criminal controls. One aim was to examine the associations of adolescence-related factors (family and school factors, substance use, and psychiatric disorders) to drug crime offending later in life. Other aims were to explore the differences in use of prescribed psychotropic medications and visits to specialized health care due to injuries and poisonings between drug crime offenders and controls.

The original study population consisted of 508 adolescents aged 13–17 years, who were treated in an acute adolescent psychiatric inpatient care unit at Oulu University Hospital between 2001 and 2006. During hospitalization, the adolescents were interviewed using the K-SADS-PL, to assess DSM-IV-based psychiatric diagnoses and to obtain information on family-related factors. Register-based follow-up information on drug criminality was based on criminal records, prescribed psychotropic medication data was acquired from the Drug Register, and treatment events due to injuries and poisonings were gathered from the Care Register for Health Care. For each drug crime offender, two non-criminal controls were matched by gender, age, and family type at admission.

Sixty of the adolescents had committed a drug crime by young adulthood. Conduct and substance use disorders in adolescence were related to drug crime offending. Distant relationship to the father, regular tobacco smoking and weekly use of stimulants in adolescence and lying and thieving at a school-age were all significant risk factors for drug crime offending. Lifetime use of clonazepam and gabapentinoids associated to drug crime offending. Drug crime offenders were more likely to be treated in specialized health care due to injuries and poisonings than the controls.

The study's conclusions highlight the importance of family-centered strategies as an essential component of early interventions. Holistic psychosocial interventions should be preferred when treating patients with substance use disorder or adolescents/young adults with history of drug criminality.

Keywords: adolescence, adolescent psychiatry, drug crime offending, family, injuries, poisonings, psychiatric disorders, psychotropic medications, school, substance use

Kontu, Mikaela, Nuoruuden ja varhaisaikuisuuden riskitekijät huumausainerikollisuudelle. Seurantatutkimus entisistä nuorisopsykiatrisista sairaalapotilaista

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Tiivistelmä

Huumausainerikollisuus on kasvava huolenaihe maailmanlaajuisesti. Siitä huolimatta on niukasti tutkimuksia, jotka tutkivat yhteyksiä nuoruustekijöiden, reseptilääkkeiden käytön tai vammoihin ja myrkytyksiin liittyvien päivystyskäyntien ja huumausainerikollisuuden välillä.

Tämä tutkimus entisistä nuorisopsykiatrisista osastopotilaista keskittyi analyyseihin, joissa verrattiin huumerikollisia ei-rikollisiin kontroleihin. Tavoite oli tutkia nuoruuteen liittyvien tekijöiden (perhe- ja koulutekijät, päihteen käyttö ja psykiatriset häiriöt) yhteyttä huumausainerikollisuuteen. Muina tavoitteina oli tutkia huumerikollisten ja kontrollien välisiä eroja psykotrooppisten reseptilääkkeiden käytön ja vammoihin ja myrkytyksiin liittyneiden erikoissairaanhoidon käyntien osalta.

Alkuperäinen tutkimusväestö koostui 508 nuoresta, jotka olivat 13–17-vuotiaita ja joita oli hoidettu akuutilla nuorisopsykiatrisella osastolla Oulun yliopistollisessa sairaalassa vuosina 2001–2006. Osastohoidon aikana nuoret haastateltiin käyttäen K-SADS-PL-lomaketta, jonka avulla määritettiin DSM-IV-pohjaiset psykiatriset diagnoosit, ja saatiin tietoa perheeseen liittyvistä tekijöistä. Rekisteripohjainen seurantatieto huumausainerikollisuudesta perustui rikosrekisteritietoihin, tieto psykotrooppisista reseptilääkkeistä hankittiin lääkerekisteristä ja vammoihin ja myrkytyksiin liittyvät hoitotapahtumat kerättiin Hoitoilmoitusrekisteristä. Jokaista huumerikollista kohden yhteensovitettiin kaksi ei-rikollista kontrollia sukupuolen, iän ja perhetyypin perusteella.

Kuusikymmentä nuorta oli syylistynyt huumausainerikokseen varhaisaikuisuuteen mennessä. Käytös- ja päihdehäiriöt nuoruudessa liittyivät huumausainerikollisuuteen. Etäinen suhde isään, säännöllinen tupakointi ja viikoittainen stimulanttien käyttö nuoruudessa sekä valehtelu ja varastelu kouluikäisenä olivat riskitekijöitä huumausainerikollisuudelle. Elämänaikainen klonatsepaamin ja gabapentinoidien käyttö liittyivät huumausainerikollisuuteen. Huumerikollisia hoidettiin erikoissairaanhoidossa todennäköisemmin vammojen ja myrkytysten takia kuin kontroleja.

Tutkimuksen tulokset korostavat perhekeskeisten lähestymistapojen tärkeyttä korvaamattomana osana varhaisia interventioita. Kokonaisvaltaisia psykososiaalisia interventioita tulisi suosia hoidettaessa potilaita, joilla on päihdehäiriö tai huumausainerikostausta.

Asiasanat: huumausainerikollisuus, koulu, myrkytykset, nuorisopsykiatria, nuoruus, perhe, psykiatriset häiriöt, psykotrooppiset lääkkeet, päihteen käyttö, vammat

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Mikaela Kontu

Abbreviations

ADHD	Attention-deficit hyperactivity disorder
ASPD	Antisocial personality disorder
ATC	Anatomical-Therapeutic-Chemical
BPD	Borderline personality disorder
CD	Conduct disorder
CI	Confidence interval
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4. edition
DSM-V	Diagnostic and Statistical Manual of Mental Disorders, 5. edition
ED	Emergency department
EMCDDA	The European Monitoring Centre for Drugs and Drug Addiction
etc.	et cetera
EuropASI	European Addiction Severity Index
FCRHC	The Finnish Care Register for Health Care
Fimea	Finnish Medicines Agency
GBD	The Global Burden of Disease
HBSC	Health Behaviour in School-aged Children
HIV	Human immunodeficiency virus
HR	Hazard ratio
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10. revision
i.e.	id est
IQ	Intelligence quotient
IQR	Interquartile range
K-SADS-PL	Kiddie Schedule for Affective Disorder and Schizophrenia for School-Age Children, Present and Lifetime
LSD	Lysergic acid diethylamide
mFTQ	Modified Fagerström's Tolerance Questionnaire
ND	Nicotine dependence
NMUPM	Non-medical use of prescription medication
NSDUH	National Survey of Drug Use and Health
OR	Odds ratio
PCP	Phencyclidine

PD	Personality disorder
SD	Standard deviation
SII	Social Insurance Institution of Finland
SPSS	Statistical Package for the Social Sciences
SUD	Substance use disorder
THL	Finnish Institute of Health and Welfare
vs.	versus
WHO	World Health Organization

List of original publications

This thesis is based on the following publications, which are referred to throughout the text by their Roman numerals I-III:

- I Kontu, M., Hakko, H., Riala, K., & Riipinen, P. (2021). Adolescence predictors for drug crime offending: A follow-up study of former adolescent psychiatric inpatients. *Community Mental Health Journal*, 57(4), 736–745. <https://doi.org/10.1007/s10597-020-00708-2>
- II Kontu, M., Kantojärvi, L., Hakko, H., Riala, K., & Riipinen, P. (2022). Misuse of prescribed psychotropic medication and drug crime offending: A follow-up case-control study of former adolescent psychiatric inpatients. *Criminal Behaviour and Mental Health*, 32(2), 124–137. <https://doi.org/10.1002/cbm.2254>
- III Kontu, M., Hakko, H., Riala, K., & Riipinen, P. (2023). Injuries, poisonings, and other external causes of morbidity among drug crime offenders: A follow-up study of former adolescent psychiatric inpatients. *European Addiction*, 29(3), 194–201. <https://doi.org/10.1159/000530122>

Also, some unpublished data is presented.

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1 Introduction

The prevalence of drug use and drug crime offending is a rapidly growing concern throughout the world. In Finland there has been a constant increase in the number of drug crimes since the year 2014 (Statistic Finland, 2021). More than half of the European convictions for drug crimes are related to personal use or possession (EMCDDA, 2022), which indicates that drug crime offending affect both criminal justice systems and health care systems. The factors related to both drug use and criminality are widely acknowledged in the research literature, but there are not that many studies focusing on drug crime offenders.

Childhood and adolescence are crucial time periods in our development and can be negatively affected by adverse childhood experiences (Oral et al., 2016; Shonkoff et al., 2012). Parental factors, such as parental substance use and psychiatric problems and separation or divorce, are also defined as childhood adversities. These are shown to increase the likelihood for poor health and psychosocial outcomes, such as substance use (i.e., tobacco, alcohol, and illicit drug use), mental health issues (i.e., depression, anxiety, panic, behavioral/conduct problems, ADHD), and criminality in adolescence and adulthood (Graf et al., 2021; Testa et al., 2022).

Mental health problems are common among adolescents (Knaappila et al., 2021). In Finland, 20–25% of all adolescents suffer from at least one psychiatric disorder (Marttunen et al., 2013) and the prevalence remains at 10–20% among children and adolescents worldwide (Kieling et al., 2011). Substance use in adolescence can lead to impairment in mental and physical health, cognition, and behavior (Bava & Tapert, 2010; Spear, 2018; Volkow et al., 2014; White et al., 2020). Moreover, when drug use starts in adolescence, the risk of developing clinical features of drug dependence is higher rather than when drug use begins in adulthood (Chen et al., 2009).

According to the 2019 National Survey of Drug Use and Health (NSDUH), in the United States, the prevalence of substance use disorder of illicit drugs was 3.6% among adolescents and 7.5% among 18–25-year-olds. There was a statistically significant increase in the prevalence of illicit drug substance use disorder among adolescents in comparison to the previous year. Taking alcohol into account, the prevalence of substance use disorder was 4.5% among adolescents in 2019 (SAMHSA, 2023). Among adolescents, substance use and delinquency are related to one another (Mulvey et al., 2010; Walters, 2014; White et al., 2020). Illicit drug use and experimenting are prevalent among Finland's young adult population –

almost half of the 24–35-year-old respondents to the survey had used illicit drugs at some point during their lives (THL, 2023a).

Psychotropic prescription medications such as analgesics, sedatives, and stimulants are known to have the potential for misuse or dependence (Boyd et al., 2015; Compton & Volkow, 2006; EMCDDA, 2021; Holt & McCarthy, 2020; Schepis et al., 2018). Misuse of these medications has been associated with illicit drug use (Carrasco-Garrido et al., 2018; Pätsi et al., 2020) and vice versa (Karjalainen et al., 2017). It seems that misuse of psychotropic medications, illicit drug use and criminal offending often go hand in hand (Cropsey et al., 2015; Sutherland et al., 2015). In the studies related to criminal offenders, high incidences of injury- and substance-related emergency visits are common (Stenbacka et al., 2019; Winkelman et al., 2017).

Mental health disorders, including substance use disorders, are common among young offenders (Fazel et al., 2016). Therefore, studies focusing on offenders are valuable also from a medical point of view. Despite drug crime offending being an increasing concern in Finland (Statistic Finland, 2021), there is a paucity of studies on drug crime offenders. This study aims to identify adolescence and young adulthood related risk factors for drug crime offending and to provide new perspectives and a better understanding of the path from adolescence to young adulthood in relation to drug crime offending.

2 Review of literature

2.1 Drug crime offending

Drug crime is becoming a growing problem all around the world. Since 2014, the number of all narcotic offences in Finland has been increasing (Statistic Finland, 2021). The number of narcotic offences was over 25 000 in 2016, increasing to almost 32 000 by 2019. There has also been an increase in the amount of aggravated narcotic offences, which have increased from 1 184 to 1 545 between the years 2016 and 2019. Not only is the number of narcotic offences increasing, but the prevalence of suspected drug crime offenders has also increased by 7,5–10% every year during the same four-year period (Rönkä & Markkula, 2020). In Europe, the estimated number of narcotic offences in 2020 was 1,5 billion presenting a 15% increase in offences during the preceding ten-year period. More than half of those offences were related to personal use or possession (EMCCDA, 2022). Convictions for personal use suggest that many of the drug crime offenders are also drug users and, therefore, this literature of review also discusses studies based on drug users and substance use. In this study, drug crime offenders include those who committed narcotics offences, aggravated narcotics offences, unlawful use of narcotics offence, and preparation of a narcotic offence. The unlawful use of narcotics offence was introduced into Finnish legislation in 2001 (Niemi & Virtanen, 2017).

2.1.1 Other criminality of drug crime offenders

According to the FinnCrime Study, which is based on a nationwide 1981 birth cohort, there was an overlap between the crime types among drug crime offenders, with 75% also committing a property crime, 59% committing a traffic crime, 54% committing a violent crime, and 50% committing drunk driving. The prevalence of drug crimes was higher among males than females (Elonheimo et al., 2014). The Handbook of Criminological Theory (DeLisi & Vaughn, 2015) contains information from studies based on data from all over the world, including North America, South America, Europe, Asia, Africa, and Australia. It revealed that males express higher levels of problematic behaviors than females. There are meta-analyses showing evidence that males are more impulsive, prone to risk-taking, resistant to punishment and have greater sensation-seeking than females (Byrnes et al., 1999; Cross et al., 2011). In addition to male gender, adolescents and young

adults are more likely to be involved in crime as offenders compared to older adults (DeLisi & Vaughn, 2015).

2.2 Adverse life events in childhood and adolescence and adolescence development

Adverse childhood experiences are stressful and possibly traumatic events that children experience before the age of 18. These include physical, emotional, and sexual abuse; physical and emotional neglect; and household dysfunction, including domestic violence and criminal activities. Adversities in childhood/adolescence include parental divorce, parental mental health, and substance use related problems (Dube et al., 2003).

Aside from childhood, environmental factors are known to influence adolescent development. The adolescent brain undergoes considerable neurobiological changes during the phases of early, middle, and late adolescence, making adolescence a critical time for cognitive and social development. Risky behaviors in adolescents can be explained in terms of limbic system-driven choices to seek immediate pleasure rather than long-term advantages. As a result, poor decisions are frequently made based on emotions, with choices influenced by social context and peer influences. Therefore, risk-taking and sensation seeking during adolescence is associated with increased substance use. Because of the significant brain growth that occurs at this stage of life, teenagers who use substances appear to be prone to changes in brain functioning, cognition, and behavior. There appear to be deficits in attention, memory, and executive functioning among adolescent substance users (Bava & Tapert, 2010). Drug use in adolescence can have other far-reaching effects, because using illicit drugs in adolescence has been shown to increase the likelihood for criminal offending later in life (White et al., 2020).

2.2.1 Family- and school-related factors

Living in an out-of-home placement and separation from a parent can affect negatively on individuals in relation to criminality and psychiatric morbidity. There is evidence, that delinquency was more common among adolescents who did not live with both parents compared to adolescents who lived with both parents (Knaappila et al., 2019) and that separation from a parent in childhood increased the risk for violent offending compared to those who lived with both parents (Mok et al., 2018). In a Finnish Birth Cohort study, individuals who lived in an out-of-

home placement in childhood had a 2-fold increased likelihood of having a criminal conviction in young adulthood than their controls living at home (Côté et al., 2018). Living in out-of-home care during childhood or adolescence has been shown to associate with multiple adverse outcomes in adulthood, including arrests for violent crime and substance misuse (Sariaslan et al., 2022). Psychiatric morbidity was also common among children who lived in out-of-home placements. A Finnish nationwide birth cohort study showed that approximately 20% of children with a diagnosed psychiatric or neurodevelopmental disorder had been placed in out-of-home care, compared with approximately 2.5% of children without such a diagnosis (Kääriälä et al., 2022).

Parent-child-relationship can also affect an individual's risk for criminal offending. Weak parent-child attachment and less parental supervision are associated with greater involvement in delinquency (Fagan et al., 2011). It has been proposed that criminal offending in adulthood can be prevented with a supportive and non-punitive relationship with parents during adolescence (Johnson et al., 2011).

Both maternal and paternal substance misuse are strongly associated with substance misuse (including drug-related crimes) and criminal convictions in the offspring (Latvala et al., 2022). Parental factors are important predictors of an offspring's mental health outcomes. A systematic review written by Jami et al. (2021) has also shown reliable evidence of genetic transmission of depression, criminal behavior, and substance use behaviors from parent-to-child. They also noted that both genetic and environmental processes are important in these associations.

Bullying and offending later in life are strongly associated with each other (Farrington et al., 2012). Bullying has been shown to increase the risk of committing violent, property, and traffic offences (Sourander et al., 2011; Tiiri et al., 2022). Adolescents who have experienced (cyber) bullying, are also more likely to engage with delinquent behavior (Lee et al., 2020). It also seems that school status can affect an individual's risk for criminality. Young adults (aged 18–25 years) with a school dropout status were more likely to be involved in criminal behavior (Maynard et al., 2015).

2.3 Substance use and psychiatric disorders in adolescence

2.3.1 Substance use in adolescence

The 2013 Global Burden of Disease (GBD) study suggests that substance use has significantly increased the health burden within adolescence and young adulthood (Vos et al., 2015). It seems that alcohol causes most of the health burden in eastern Europe, while illicit drug use is more prevalent in the USA, Canada, Australia, New Zealand, and western Europe (Degenhardt et al., 2016). Data from the international Health Behaviour in School-aged Children (HBSC) study showed that among 15-year-old youths in Europe and North America, the percentage of weekly smokers has decreased from 24% to 12%, weekly alcohol use has decreased from 29% to 13%, and lifetime cannabis use has decreased from 22% to 15% from year 2002 to 2014 (Currie et al., 2004; Inchley et al., 2016).

According to data from the Finnish School Health Survey (2019), experimenting with cannabis at least once climbed from 6% to 10% among Finnish 8th and 9th grade boys and from 5% to 7% among same-aged girls between 2006 and 2019 (Warpenius, 2021). From 2019 to 2021, the prevalence of experimenting with cannabis decreased by 1.6% among boys and remained more or less the same among girls. Binge drinking at least once a month dropped from 17.5% to 9% among Finnish 8th and 9th graders between the years 2006–2021. Daily smoking among 8th and 9th grader boys dropped from 16% to 6.5% and among same aged girls the proportion dropped from 14% to 4% between years 2006 and 2021 (THL, 2023b).

2.3.2 Psychiatric morbidity in adolescence

Mental health problems affect 10–20% of children and adolescents worldwide (Kieling et al., 2011). Mental health problems are a major public health concern and the leading cause of disability among children and adolescents worldwide (Erskine et al., 2015). In Finland, roughly 20–25% of all adolescents suffer from at least one psychiatric disorder and psychiatric disorders are the most prevalent health problem among Finnish adolescent population. The most prevalent adolescent psychiatric disorders are affective disorders, anxiety disorders, substance use disorders, and conduct disorders (Marttunen et al., 2013). Overlapping of different psychiatric disorders among adolescents is common, and among substance using adolescents, common psychiatric comorbidities are

depression, anxiety, bipolar disorder, conduct disorder, and ADHD (Deas, 2006). In Finland, there have been some changes in the psychiatric disorder profile among children and adolescents treated in child and adolescent psychiatric inpatient care between the years 2000 and 2018. During this period, there was a decrease in conduct disorders (from 21% to 7%) and psychoses (from 23% to 13%) and an increase in depression (from 25% to 42%) among adolescent psychiatric inpatients. Among both child and adolescent psychiatric inpatients, the prevalence of ADHD has more than tripled (from 5% to 17%) and anxiety disorders doubled (from 8% to 16%) (Kronström et al., 2023).

2.3.3 Behavioral disorders in adolescence

Conduct disorders in children and adolescents are diverse disorders presenting with long lasting, age-inappropriate symptoms of defiant, aggressive, and antisocial behavior (Current Care Guidelines, 2018). Attention-deficit hyperactivity disorder (ADHD) is a developmental disorder, which impairs functioning and has core symptoms of inattention, hyperactivity, and impulsivity. ADHD can be diagnosed in childhood, adolescence, or adulthood (Current Care Guidelines, 2019). Both conduct disorder and ADHD are found to be related to criminal behavior. Conduct disorder is very common among adolescents involved in juvenile delinquency and criminal behavior (Erskine et al., 2016; Fazel et al., 2008). Adolescents with childhood ADHD are 3-times more likely to be involved with juvenile justice system than their non-ADHD peers (Bussing et al., 2010). ADHD has also been identified as an important risk factor for criminal behaviors and later offending, particularly when comorbid with conduct disorders, substance use disorders or antisocial personality disorders (Knecht et al., 2015). However, the association between ADHD and criminal behavior is complicated, by its high comorbidity with conduct, oppositional defiant, antisocial personality, and substance use disorder, each with their own associations with criminality (Young & Cocallis, 2021).

2.3.4 Personality disorders

Antisocial personality disorder (ASPD) is a severe personality disorder with strong associations with crime and violence (Fountoulakis et al., 2008). It involves a pervasive pattern of disregard for and violation of the rights of others exemplified by criminal behavior and a lack of remorse. To meet the diagnostic criteria for ASPD after the age of 18 years, the traits of CD symptoms or the diagnosis of CD

must have been recognized before the age of 15 years. If the behavioral features of the CD continue from adolescence into adulthood, the diagnosis may become ASPD (Black & Grant, 2014). The relationship between CD and ASPD is strong, and up to 50% of children and adolescents with a CD develop ASPD (NICE Clinical Guidelines, 2017).

Borderline personality disorder (BPD) is a complex psychiatric disorder characterized by a persistent instability in emotion regulation, identity and self-image, relationship problems, impulsivity, and repeated self-injurious behavior (Lieb et al., 2004). BPD is also associated with violence and criminal behavior (Fountoulakis et al., 2008). Comorbidities among offenders with BPD are common. The most common comorbid disorders are ASPD, major depressive disorder, ADHD, substance, and alcohol dependence (Wetterborg et al., 2015).

2.3.5 Drug addiction

Drug addiction (or substance addiction) is a neuropsychiatric disorder characterized by a recurring desire to continue taking a drug despite harmful consequences. Development of addiction is caused by drug abuse and requires repeated drug exposure. The process is strongly influenced both by the genetics of the person and by the psychological and social context in which drug use occurs. Addicted person usually loses their control over drug use. DSM-V preferences the word ‘dependence’ as a euphemism for addiction, reportedly in an attempt to help destigmatize addicted patients. Nevertheless, it is important to note that pharmacological dependence means tolerance to a drug and/or withdrawal symptoms that arise from the continued exposure of the drug to the central nervous system. This is distinct from addiction, which means compulsive drug-seeking behavior (Zou et al., 2017). When drug use starts in adolescence, the risk of developing clinical features of drug addiction/dependence is higher rather than when drug use begins in adulthood (Chen et al., 2009).

2.4 Psychotropic prescription medication use

The Finnish Medicines Agency (Fimea) uses an international grouping system of medications, called the Anatomical-Therapeutic-Chemical (ATC) -classification (WHO Collaborating Center for Drug Statistics Methodology, 2021). Medications are divided into groups according to the organ or organ system they affect and their chemical, pharmacological and therapeutic features. The system has fourteen main

anatomical or pharmacological groups (first level). Each main group is divided into either a pharmacological or therapeutic group (second level). The third and fourth levels are chemical, pharmacological, or therapeutic subgroups and the fifth level is the chemical substance. Medications which affect the nervous system are called psychotropic medications.

In the treatment of psychiatric disorders, the use of psychotropic medications has increased from 2000 to 2011 among Finnish child and adolescent inpatients. Among adolescent inpatients aged 13–18 years, there were statistically significant increases in all the medication groups, including antidepressants, antipsychotics, ADHD medications, benzodiazepines, and other psychotropic medications. The most notable increase was in the use of benzodiazepines. It has not been possible to connect this increase in the use of psychotropic medications to any changes in the diagnostic profiles (Kronström et al., 2018). In Finland between 2008 and 2018, the prevalence rates of the use of ADHD medications increased 4.5-fold (from 0.93% to 4.21%) among male adolescents and over 9-fold (from 0.14% to 1.28%) among female adolescents (Vuori et al., 2020). Varimo et al. (2020) found that antipsychotic medication use among Finnish children and adolescents increased from 2.1 to 3.8 per 1000 individuals between the years 2008 and 2017. Between 2008 and 2016, psychotropic polypharmacy also was common among Finnish children and adolescents, with almost a half of all the 14 848 individuals studied requiring psychotropic polypharmacy (Varimo et al., 2023).

2.4.1 Psychotropic medications with potential of misuse and dependence

Psychotropic prescription medications such as analgesics, sedatives, and stimulants are known to have the potential for misuse or dependence (Boyd et al., 2015; Compton & Volkow, 2006; EMCDDA, 2021; Holt & McCarthy, 2020; Schepis et al., 2018). The term “sedative” includes benzodiazepines and sleeping medications (even though, sleeping medications are commonly separated from sedatives as an own medication group), and it means same as “anxiolytics” and “tranquilizers”. The term “analgesics” means the same as “painkillers” and includes opioids. Non-medical use of prescription medications (NMUPM) means non-medical use and medical misuse of certain medication; medication used in ways not intended by the prescriber or use without a prescription. Reasons for NMUPM may include self-medication for either mental or physical health problems or use for relaxation,

euphoria, or intoxication (Boyd et al., 2006; Boyd & McCabe, 2008). Hereafter NMUPM is referred as medication misuse.

In Finland, the prevalence of medication misuse has been steady during the 20th century but has been increasing among adults aged between 25–34 years. This information was gathered from Drug surveys conducted in 1992–2018. The size of the respondents varied between 2 023 (in 2010) and 3 485 (in 2014) individuals. Among 15–24-year-olds, the lifetime prevalence of the misuse of sedatives and analgesics has been relatively stable at 7–9% between 2002 and 2018, while it was 4–8% between the year 1992 and 1998 (Karjalainen et al., 2020). Among school aged children, misuse of sedatives has increased from 2000s to 2010s. Substance use, including alcohol, tobacco, marijuana, and other illicit drug use, has been shown to associate with a greater probability of misuse of psychotropic medications (Carrasco-Garrido et al., 2018). In a study of the Finnish population, sedatives and strong analgesics were the most misused medications. Misuse of medications was most prevalent among 25–34-year-old adults (Pätsi et al., 2020). Use of illicit drugs was more common among medication misusers (Pätsi et al., 2020) and use of illicit drugs has increased among the Finnish medication misusing population from 21% to 70% between 2002 and 2014, based on results from population-based (aged 15–69 years) Drug surveys conducted in the year 2002, 2006, 2010, and 2014 (Karjalainen et al., 2017).

In addition to the misuse of psychotropic medications, off-label use of these medications is becoming more common. One very commonly prescribed medication for off-label use is quetiapine, an antipsychotic which can be used in the treatment of insomnia for its sedative effects. Between 2008 and 2017, the incidence of antipsychotic use, especially quetiapine use, more than doubled among Finnish adolescents aged 13 to 17 years (Varimo et al., 2020). However, there is still limited evidence on the safety and efficacy of quetiapine for the treatment of insomnia, while its side effects are well-known (weight gain and other metabolic effects) (Anderson & Vande Griend, 2014; Modesto-Lowe et al., 2021). Clonazepam is an antiepileptic drug that is also prescribed (off label) to treat anxiety disorders. Long-term use of clonazepam seems to be increasing (Kurko et al., 2018). Furthermore, gabapentinoids, which are originally indicated for treating epilepsy, are now considered first-line agents in clinical guidelines for the treatment of neuropathic pain (Current Care Guidelines, 2017; Lam et al., 2019). Both gabapentinoids and clonazepam have a high risk of abuse and non-medical use (Bockbrader et al., 2010; Dokkedal-Silva et al., 2019; Evoy et al., 2017). Benzodiazepines are effective in the acute treatment of anxiety disorders but have

high potential for addiction. To minimize the risk of addiction with benzodiazepines, clinical and prescribing guidelines recommend avoiding the regular daily use of benzodiazepines, only prescribing when there is no effective alternative and that the lowest possible dose should be given for the shortest duration, which is often less than two weeks (Current Care Guidelines, 2019a).

2.5 Use of health care services in relation to drug use and criminal offending

2.5.1 Somatic morbidity, drug-related mortality and use of health care services

Individuals who inject drugs are at high risk of skin and soft tissue infections, which vary from abscess(es) and uncomplicated cellulitis to life- and limb-threatening infections (Chambers, 2021). These infections are very often caused by *Staphylococcus aureus*, and injection drug use is a significant risk factor for (methicillin-resistant) *Staphylococcus aureus* infections (Huang et al., 2008; Lloyd-Smith et al., 2010). Blood-borne viral infections, such as HIV and hepatitis A, B and C, are also common and are an important health consequence of drug addiction, especially among intravenous drug users (Jager et al., 2004). In Finland, the prevalence of HIV infections has been around 1% among drug users, while the prevalence of hepatitis C is high, at 75% among drug injecting users (Rönkä & Markkula, 2020). Finnish drug users with HIV have a higher total number of hospital admissions, higher crude hospitalization rates, and higher total length of hospital stay in comparison to drug users with hepatitis C or with another type of hepatitis (Onyeka et al., 2015).

In Finland, the number of episodes of inpatient care due to drug-related poisonings have increased substantially in Finland between the years of 2011 and 2020 (from 3 500 to 8 600; one year being over 9 000). During 2020, episodes of inpatient care due to drugs and poisonings were most prevalent among the 25–34-year-old population. The number of patients attending specialized outpatient care for drug-related diseases has also increased in the years from 2016 to 2020 (Jääskeläinen & Virtanen, 2021b).

The number of drug-related deaths in Finland has doubled between the years 2006 and 2021. In 2021 there were most ever drug-related deaths since records began in 2006. Most of the drug-related deaths related to concomitant use of

multiple drugs and most of the deaths were due to accidental poisonings. In 2021, most deaths occurred among 20–34-year-old males and 25–39-year-old females (Statistics Finland, 2022).

2.5.2 Injury- and substance-related emergency visits and hospitalization

In the studies related to criminal offenders, high incidences of injury- and substance-related emergency visits were common. Among Swedish male criminal offenders (follow-up time from the age of 18 to 54 years), hospitalization for alcohol- and drug-related diagnoses were more common than among non-criminals. The study showed, that almost 60% of criminals had been hospitalized for an alcohol- and/or drug-related diagnosis, accidents, and suicide attempts during the study's follow-up period. The incidence of inpatient care stays per living persons and years was higher among criminals than non-criminals (Stenbacka et al., 2019). In the United States, adolescents aged 12 to 17 years with criminal justice involvement in the previous year were more likely to visit emergency departments (ED), require more ED visits, be hospitalized, and have more hospital overnight stays than adolescents without any criminal justice involvement in the previous year. Adolescents with an illicit drug use disorder and who had been involved in the justice system accessed ED services the most (Winkelman et al., 2017). Frank et al. (2014) found very similar findings among an adult population with recent criminal justice involvement, most of whom were aged between 18 to 25 years.

Youths who were assault-injured and were seeking ED care, seemed to have high levels of substance use disorders and a significantly greater number of them had been engaged in the criminal justice system (Bohnert et al., 2015). The majority of offenders visiting ED had substance use problems or disorders, including illicit drug use disorder, abuse or dependence, when compared to controls (Frank et al., 2014; Stenbacka et al., 2019; Winkelman et al., 2017).

2.6 Summary of the reviewed literature: What is known and what should be studied?

There is limited information in the research literature on the associations between drug crime offenders and discussed topics above, but there are many studies of drug users and criminal offenders in general. This study is interested in former adolescent psychiatric inpatients, and those who became drug crime offenders. It

may not be possible for the information presented to be applied directly to all drug crime offenders, but it still provides a valuable understanding of the nature of a certain group of drug crime offenders.

It is known that male gender and younger age can be associated with criminal behavior. Out-of-home placements, living with one parent, weak parent-child attachment, less supervision and parental substance misuse are known to associate to an offspring's risk for criminal behavior. Bullying and dropping out of school are also markers that have been found to associate with criminality. Conduct disorder, attention-deficit and hyperactivity disorder, substance use disorders, antisocial and borderline personality disorders are all found to be common among offenders. According to the research literature, offenders have more hospitalizations due to drug- and alcohol-related diagnoses, longer hospital stays and more emergency department visits, compared to non-offenders.

Drug crime offending includes unlawful use of narcotics, which means personal use of illicit drugs. Illicit drug use is illegal in Finland and, therefore, studies on illicit drug users were also utilized in this study. It is important to note that unlawful use of narcotic offenses may involve non-recurring drug experimentation or it could be a sign of a drug addiction or another psychiatric problem. As described in the earlier research, psychiatric morbidity is common among offenders and, therefore, these two topics can be linked to each other. Early treatment of psychiatric problems in childhood and adolescence could lead to better prevention of later criminal acts, including drug crime offending.

Childhood and adolescence are crucial formative periods in an individuals' development and this study is interested in factors arising in these important stages of early life. This study strives to identify specific factors in family, school, adolescent substance use history and psychiatric morbidity to help explain drug crime offending. Moreover, the associations between psychotropic medication misuse and drug crime offending are yet to be explored widely in the research literature, despite the association with substance misuse and illicit drug use being identified. Furthermore, drug crime offenders' use of specialized health care has not been studied in depth. This study aims to present explicit information on the medical specialties being accessed and the types and reasons for the visits, focusing on injuries, poisonings, and other consequences of external causes.

3 Aims of the current study

The main aim in this study of former adolescent psychiatric inpatients, some of whom became drug crime offenders, is to explore the risk factors for drug crime offending. The more specific aims of this study were:

1. to compare the relationship between family- and school-related factors, adolescent psychiatric disorders, and substance use, and drug crime offending to non-criminal controls (I)
2. to investigate the difference in psychotropic prescription medication use between drug crime offenders and non-criminal controls, as well as the relationship between addictive psychotropic medication use and drug crime offending (II)
3. to study the difference in treatment events in specialized health care settings due to injuries, poisoning, and other external causes of morbidity between drug crime offenders and non-criminals (III).

4 Material and methods

4.1 Study population and data collection (I-III)

This study is part of a follow-up project, investigating the long-term outcomes of former adolescent psychiatric inpatients, and the associations of various psychosocial risk factors, with severe psychiatric and substance use disorders. The study sample consisted of 508 adolescents (208 male, 300 female), who were consecutively admitted for acute psychiatric adolescent inpatient care at Oulu University Hospital, between April 2001 and March 2006 (hereafter referred to as index hospitalization). Adolescents were aged between 13 to 17 years (mean age 15.5 years, SD [standard deviation] 1.3 years). The acute inpatient unit is designed and intended to provide rapid interventions, but allowing enough time for diagnostic methods, and then to seek to direct the adolescents to the relevant outpatient care or other inpatient care units for further treatment. During the data collection period, the median length of stays on this unit were nine days (IQR [interquartile range] 6–16 days). The catchment area of the hospital covers the regions of Oulu and Lapland in Northern Finland, which account for 43 % of the total geographical area of the country. Between the data collection period, approximately 11% of the Finnish population lived in this area.

Of all adolescents admitted to acute inpatient care ($n = 637$) during the five-year period, adolescents aged over 18 ($n = 1$), with intellectual disability ($n = 26$), or with an organic brain disorder ($n = 3$) were excluded from the study. Of the eligible patients ($n = 607$), 77 did not provide informed consent and 22 did not complete their interviews because their stay in the hospital was too short. The participation rate for the study was high, being 83.7% of eligible patients. The inclusion of study participants is described in Figure 1. The description of the study groups will be explained later in section 4.4.3 *Study groups*. After the index hospitalization, study participants were followed up through national registers.

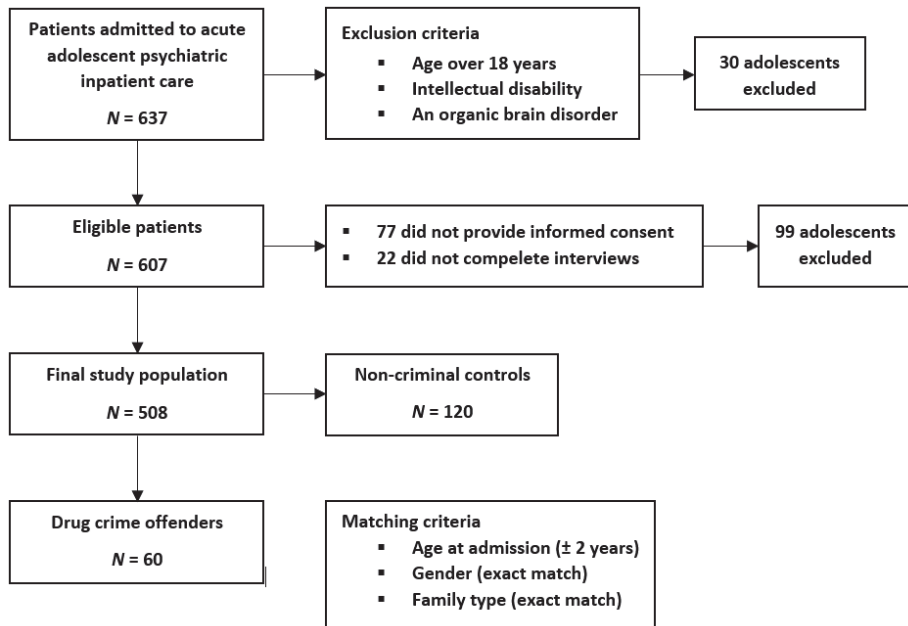


Fig. 1. The description of selection of study participants for this study.

4.2 Research instruments for adolescence-related information and diagnostic tools (I-III)

4.2.1 K-SADS-PL (I-III)

During the index hospitalization, all study participants were interviewed using the Finnish version of Kiddie Schedule for Affective Disorder and Schizophrenia for School-Aged Children, Present and Lifetime (K-SADS-PL). The interviews were performed by the treating physician, or a trained medical student under the surveillance of the treating physician. The K-SADS-PL has been shown to be a valid method for defining DSM-IV based psychiatric disorders of adolescents (Ambrosini, 2000; Kaufman et al., 1997; Kim et al., 2004). If adolescent information remained uncertain or unreliable, the missing information was obtained from interviews with their parents or guardians.

4.2.2 EuropASI (I, II)

During the index hospitalization, patients were interviewed by nurses, using the European Addiction Severity Index (EuropASI) instrument. The EuropASI is an objective, semi-structured interview, designed to gather various information from adolescents, such as socio-economic characteristics, previous somatic and psychiatric symptoms, substance abuse, family and social relationships, education, and criminal behavior (Kokkevi & Hartgers, 2009).

4.2.3 Modified Fagerström's Tolerance Questionnaire (I, II)

The seven-item modified Fagerström Tolerance Questionnaire (mFTQ) for children and adolescents was used to assess adolescents' current smoking habits and their levels of nicotine dependence (ND). The mFTQ evaluates smoking rate, frequency of inhalation, time between waking up and the first cigarette, level of reluctance to give up the first cigarette in the morning, difficulty in refraining from smoking in places where it is prohibited, smoking despite medical illness and smoking more in the first two hours of the day than during the rest of the day. The score sum of mFTQ can vary between 0 and 9, indicating "no ND" (sum score 0–2), "moderate ND" (sum score 3–5) and "high ND" (sum score 6–9) (Prokhorov et al., 1996).

4.3 Register-based follow-up data (I-III)

4.3.1 Criminal records from the Finnish Legal Register Centre (I-III)

In Finland, a citizen can be recorded in the criminal register from the age of 15 onwards, after having been sentenced to either unconditional or conditional imprisonment, community service, dismissal, a juvenile penalty or a fine in lieu of a juvenile penalty, a fine (supplementary fine) or period of community service or probation, in addition to conditional imprisonment, or a sentence has been waived on grounds of lack of criminal responsibility (Finnish Legal Register Center, 2018). The information for crime history and crime types was obtained from the Finnish Legal Register Center. In this study, the official criminal records of the study subjects were available until November 2016. In November 2016, drug crime offenders were aged between 26 and 33 years while non-criminal controls were aged between 22 and 33 years. According to the criminal record, first drug crimes occurred in 2001.

4.3.2 Drug Register of the Social Insurance Institution (SII) of Finland (II)

The information on prescribed psychotropic medications was acquired from the Drug Register of the Social Insurance Institution (SII) of Finland. The Drug Register contains information records of medication names, date of purchases and packaging prices (Social Insurance Institution of Finland, 2021). The information on prescribed psychotropic medications was available up to end of the year 2012. At the end of the year 2012, drug crime offenders were aged between 22 and 30 years while non-criminal controls were aged between 18 and 29 years. According to the Drug Register, first purchases of prescribed psychotropic medications occurred in 1995.

4.3.3 The Finnish Care Register for Health Care (FCRHC) (I-III)

The purpose of the Care Register for Health Care, provided by the Finnish National Institute for Health Welfare (THL), is to collect data on the activities of health centers, hospitals and other institutions providing inpatient care, and on the patients/clients treated in them for the purposes of statistics, research, and planning (Finnish Institute for Health and Welfare, 2021). It covers the information from the 1st of January 1969. This study used the data on treatment received by the patient, including information on reason for seeking care, diagnoses, external causes, type of accident, length of hospital days, and where the patient had been treated. The information on personality disorder diagnoses (CD-10: F21, F60.0–60.9) by young adulthood was collected from the FCRHC. In this study, the data was available up to the end of the year 2016. According to the FCRHC, first treatment events in specialized health care occurred in 1997.

4.4 Main outcome (I-III)

4.4.1 Drug crime offending (I-III)

In Finland, it is illegal to import, export, distribute, purchase, manufacture or possess any of the drug-substances listed in the drug conventions in the Finnish Narcotic Drugs Act (Finlex, 2008). Drug crimes recorded in the criminal records mostly occurred during the follow-up period, after the index hospitalization. Three of the drug crime offenders committed their first drug crimes before their index

hospitalization and another 57 after their index hospitalization. The Finnish criminal code includes nine types of drug offences, including unlawful use of narcotics, narcotics offence, aggravated narcotic offence, preparation of narcotic offence, attempt of preparation of narcotic offence, promoting narcotic offence, preparation of aggravated narcotic offence, attempt of preparation of aggravated narcotic offence, and promoting aggravated narcotic offence. In this study, drug crime offenders committed narcotics offences (n = 123), aggravated narcotics offences (n = 14), unlawful use of narcotics offence (n = 204), and preparation of a narcotic offence (n = 1). The mean age for the first drug offence was 21.0 years (SD 3.3 years). Of drug crime offenders, 73% (n = 44) had committed at least one unlawful use of narcotics offence during the follow-up period. Almost half of them (n = 21) had committed two or more unlawful use of narcotic offences.

4.4.2 Other criminality

Of the 60 drug crime offenders, 38 (63%) had been convicted for violent crime (23 male, 15 female), 37 (62%) for drunk driving (24 male, 13 female), and 31 (52%) for firearms offences (20 male, 11 female) during the follow-up period before the end of the year 2016. Non-violent crime preceded violent crime among thirty drug crime offenders. Three drug crime offenders committed violent crimes before non-violent crimes, and five committed non-violent and violent crimes at the same age. The mean age for the first violent crime was 20.8 years (SD 3.0 years) and for the first non-violent crime was 19.2 years (SD 3.2 years).

4.4.3 Study groups

A total of 60 (40 male, 20 female) of the study population had committed a drug crime by November 2016 and these formed the cases for this study as drug crime offenders. Non-criminal controls were matched with drug crime offenders by age at admission to acute adolescent psychiatric care (± 2 years), gender (exact match), and family type (two parent family and other family types) at admission (exact match). Family type was chosen as one of the matching variables, because separation from a parent or parents has been shown to have a negative effect on individuals, by increasing the likelihood for criminal convictions and substance-related disorders (Côté et al., 2018; Mok et al., 2018). At the end of the follow-up period in November 2016, the age of study subjects ranged between 22 and 34 years (referred to from here on as young adulthood).

4.5 Covariates

4.5.1 Family-related factors (I-II)

Information on family-related factors was obtained from the EuropASI. Family-related factors included family relationships and psychiatric or substance related problems of the family members (mother, father, and siblings). Regarding family relationships, the study subjects were asked whether they felt they had a close relationship to each of their family members. Psychiatric or substance related problems of family members were based on the reports of the study subjects, and the answers were scripted in the analyses as “yes” or “no”.

4.5.2 School-related factors (I-II)

Information on school-related factors was based on the K-SADS-PL. The focus was on behavioral factors, such as telling lies, unauthorized absences, starting fights, bullying, and thieving. School performance was determined by whether the study subject had ever repeated grades, been moved to an observation class, received special needs education, had an adjusted syllabus or any learning difficulties. Using the EuropASI instrument, the study subjects were asked whether they felt they had close friends. All the answers were scripted in the analyses as “yes” or “no”.

4.5.3 Adolescent substance use (I-II)

The K-SADS-PL was used to gather information on substance use in adolescence. The substances enquired about included alcohol, cannabis, stimulants (amphetamine etc.), sedatives (benzodiazepines, barbiturates etc.), opioids (buprenorphine, heroin, morphine, codeine, methadone etc.), hallucinogens (LSD = lysergic acid diethylamide etc.), solvents and inhalants (glue, gasoline, chloroform, ether, paint etc.), and other substances (prescription medications, ecstasy etc.). Cocaine and phencyclidine (PCP) were omitted because none of the study subjects reported having ever used them. In this study, the level of substance use was represented in two ways: use denied or not reported by the study subject and used at least once a week. Information on poly-substance use was also determined. Information on current smoking habits and the levels of ND during adolescence were measured using the seven-item mFTQ for children and

adolescents. In this study, the level of ND of study subjects was separated into two groups: “no ND” and “moderate/high ND”.

4.5.4 Psychiatric disorders in adolescence (I-III)

The adolescent psychiatric disorders were categorized to following diagnostic groups: Psychotic disorders (DSM-IV: 295, 296.0, 296.4–299.0, 297.1–299.0, 301.13, 301.22), anxiety disorders (DSM-IV: 300.00–300.02, 300.21–300.23, 300.29, 300.3, 308.3, 309.81), affective disorders (DSM-IV: 296.2–296.3, 300.4, 311), conduct disorders including ADHD (DSM-IV: 312.8–312.9, 313.81, 314.00–314.01, 314.9, 299.80), and substance-related disorders (DSM-IV: 303.9, 304.0–304.6, 304.8–304.9, 305.0, 305.2–305.7, 305.9). There was also a diagnostic group that included diagnoses other than those listed above, which included eating disorders, enuresis, Asperger’s syndrome, etc., but were ultimately excluded from the analyses due to the groups’ heterogeneity. An adolescent could belong to multiple psychiatric diagnostic groups. In addition, the most severe psychiatric diagnosis of each study participant was defined using the following hierarchy: psychotic, anxiety, affective, conduct and substance use disorder. For survival analyses in the third sub study, these disorders were further dichotomized into internalizing (psychotic, anxiety, and affective disorders) and externalizing (conduct and substance use disorders) disorders. Internalization is the propensity to express distress inwards, and in contrast, externalization describes the propensity to express distress outwards (Krueger, 1999).

4.5.5 Psychiatric disorders in young adulthood (I-II)

After their index hospitalization, some of the study subjects were diagnosed with personality disorder (PD). The information on PD diagnoses (ICD-10: F21, F60.0–60.9) by young adulthood were based on the FCRHC, covering diagnoses up to the end of 2016. Although PDs can be identified in clinical settings during childhood or adolescence, the instruction from the ICD-10 (International Statistical Classification of Diseases and Related Health Problems, 10. revision) guides is that they should not be diagnosed before the age of 16 years. The definition process for PD diagnoses is described in an earlier publication (Kantojärvi et al., 2016). In this study, two study participants were diagnosed with schizotypal disorder (drug crime offenders vs. non-criminal controls; 0 vs. 2), four with antisocial PD (4 vs. 0), seven

with borderline PD (3 vs. 4), one with avoidant PD (0 vs. 1), one with other specific PD (0 vs. 1), and five with unspecified PD (3 vs. 2).

4.5.6 Psychotropic prescription medication use (II)

The Finnish Medicines Agency (Fimea) uses an international grouping system of medications, called Anatomical-Therapeutic-Chemical (ATC) -classification (WHO Collaborating Center for Drug Statistics Methodology, 2021). ATC-classification divides medicines into groups, depending on which organ or organ system they target, and by their chemical, pharmacological and therapeutic features. In this study, psychotropic medications are included in the medication groups N02 (analgesics), N03 (antiepileptic drugs; clonazepam, gabapentin, pregabalin), N05 (antipsychotics, anxiolytics and sleeping medication), N06 (antidepressants and stimulants) and N07B (drugs for treating addictions) (Table 1). The data on psychotropic medications was divided into addictive (meaning high risk of misuse or dependence) and non-addictive (meaning low risk of misuse or dependence) psychotropic medications.

Table 1. Categorization of psychotropic medications (Reprinted, CC BY 4.0 licensed publication from original publication II © 2022 Wiley).

Category	ATC group	ATC code	Names of the medications
Addictive medications	Opioids	N02A	codeine as drug combination, buprenorphine, tramadol
	Antiepileptic drugs	N03A	clonazepam, gabapentin, pregabalin
	Benzodiazepines	N05B	diazepam, chlordiazepoxide, oxazepam, lorazepam, alprazolam
	Sleeping medications	N05C	nitrazepam, temazepam, zopiclone, zolpidem
	Stimulants	N06B	methylphenidate
	Drugs for treating addictions	N07B	buprenorphine as drug combination
Non-addictive medications	Antidepressants	N06A N06C	
	Antipsychotic drugs	N05A	
	Other drugs	N02B	paracetamol, migraine drugs,
		N02C	antiepileptic drugs*

Note: ATC = Anatomical-Therapeutic-Chemical (WHO, 2021).

*Excluding addictive antiepileptic drugs (clonazepam, gabapentin and pregabalin).

4.5.7 Treatment events in specialized health care due to injuries, poisonings, and other external causes of morbidity (III)

The information on treatment events, covering outpatient visits in specialized health care and inpatient hospitalizations, was gathered from the FCRHC. The register information covered up to the end of 2016. The focus was on treatment events that occurred after the age of 13 years and which were due to injuries (ICD-10 codes S00-S99, T00-T35 and T90-T95), poisonings (T36-T65, T96# and T97), other external causes of morbidity (T66-T88 and T98) and other diagnoses (such as M00-M99 and F10-F19) if the cause of the visit was explained by ICD-code V01-Y98, meaning the external cause for injuries, diseases, and deaths. When physician use diagnosis codes S00-T98, the record of an external cause (V01-Y98) is mandatory. Treatment events were further categorized as accidental, intentional, unspecified, and other kind of injury, poisoning, or other external causes of morbidity (complications from medical procedures, anaphylactic reaction etc.). Special attention was focused on the internal medicine and surgery specialties because poisonings and injuries are usually treated in these medical specialties.

4.6 Statistical methods (I-III)

Every Finnish citizen is assigned a personal identity code. This code was used to link the data from the different national registers. In all original studies I-III, the statistical significance of group differences in categorical variables was assessed using Pearson's Chi-square test or Fisher's Exact test and in continuous variables with Student's t-test or Mann-Whitney's U test. The limit of statistical significance was set at $p < 0.05$. The statistical software used in our analyses was the IBM SPSS (Statistical Package for the Social Sciences) Statistics 25, 27, and 29.

Original study I. Adjusted odds ratios (ORs) were calculated using a stepwise binary logistic regression model, and all adolescent characteristics were entered to the model as a potential risk factor for drug crime offending. Adolescent characteristics included family- and school-related factors, substance use in adolescence, and adolescent psychiatric disorders.

Original study II. The association of adolescent- and follow-up related factors to drug offending was assessed with the binary logistic regression analysis, using the forward stepwise selection approach. Adolescence-related factors (psychiatric disorders, level of nicotine dependence, weekly use of alcohol and cannabis, parental psychiatric and substance use problems), the register-based follow-up

information on the use of psychotropic medication (ATC groups for opioids, antiepileptic drugs, benzodiazepines, sleeping medications, stimulants, drugs for treating addictions, antidepressants, antipsychotics, and other psychotropic medications), gender and age at admission to index hospitalization, and age at the end of the follow-up data for psychotropic medications in year 2012 were analysed as potential risk factors for drug crime offending. The choice of variables for the statistical modelling was based on careful consideration of the evidence-based knowledge of factors known to be related to offending in the literature (Fazel et al., 2008; Hensel et al., 2020; Moore et al., 2019) and which were available in our database.

Original study III. Hazard ratios (HRs) with 95% confidence intervals (CI) for drug crime offending were assessed using a Cox regression model and adjusted with internalizing and externalizing disorders from adolescence. Survival analyses explored the treatment events in internal medicine and surgery, and treatment events caused by poisonings and injuries.

4.7 Ethical considerations

This study is part of a project whose research plan was approved by the Ethics Committee of the University of Oulu Faculty of Medicine, approval number 44/2001. Permission to access the Crime register was obtained from the Legal Register Centre, approval number 196/07.01/2016. Permission to use the FCRHC was obtained from the National Institute for Health and Welfare (THL), approval number THL/1619/5.05.00/2013. Permission to access the Drug Register of Reimbursement Medications was obtained from the SII of Finland, approval number 42/522/2013.

The study participants were given a complete description of the proposed study. They were also informed that refusal to participate in the research would not affect their treatment in any way. All study participants and their legal guardian(s) provided written, informed consent before their enrolment in the study. In light of the existing stigma against mental health problems, drug use and drug criminality, all of the study participants were pseudonymized during the data collection. All of the study participants attended hospital and were treated as adolescent psychiatric inpatients. The linkage to different national registers was made after the index hospitalization and, therefore, possible criminal profile did not affect the treatment of the patients. As mentioned earlier, this study includes data that addresses sensitive topics, such as substance use, criminality, and mental health problems. In

order to interpret the findings of this study, it is vital to avoid pre-judgement and moralising. This study follows good ethical research practice, and no individuals can be recognized from the data.

4.8 Personal involvement

I, as the author of this thesis, made a major contribution to all of the original studies and I am named as the first author and the corresponding author in each study. I used previously collected data and together with my supervisors, we selected the variables being examined based on the earlier research literature and our best knowledge. I have built my own variables (treatment events due to injuries, poisonings, and other external causes of morbidity to specialized health care) for the third original study. I performed the statistical analyses with the guidance of my supervisor and statistician Helinä Hakko, PhD, I presented and interpreted the results in consultation with the co-authors. I wrote the first version of each manuscript and was responsible for the final form of each study as it was submitted.

5 Results

5.1 Characteristics of the study groups (I-III)

5.1.1 Psychiatric disorders and substance use in adolescence (I)

Table 2 shows the adolescence-related information on psychiatric disorders and substance use among drug crime offenders and non-criminal controls. During the index hospitalization, drug crime offenders were diagnosed with conduct and substance use disorders more often than their non-criminal controls (CD 82% vs. 43%, $p < .001$; SUD 68% vs. 33%, $p < .001$) and non-criminal controls were more likely to be diagnosed with psychotic disorder compared to drug crime offenders (5% vs. 21%, $p = .006$). In adolescence, drug crime offenders were more likely to have moderate to high levels of ND (85% vs. 51%, $p < .001$) and have weekly use of alcohol (50% vs. 34%, $p = .040$), cannabis (28% vs. 9%, $p = .001$), sedatives (23% vs. 3%, $p < .001$), stimulants (20% vs. 2%, $p < .001$), opioids (15% vs. 2%, $p < .001$) and other drugs (10% vs. 1%, $p = .006$) compared to their non-criminal controls. Weekly poly-substance use was more common among drug crime offenders than non-criminal controls (12% vs. 2.5%, $p = .017$).

Table 2. The adolescence-related information on psychiatric disorders and substance use among drug crime offenders and non-criminal controls (Modified, CC BY 4.0 licensed publication from original publication I © 2021 Springer).

Variables	Drug crime offenders		Non-criminal controls		df	p-value
	n	%	n	%		
Psychiatric disorders						
Psychotic disorder	3	5	25	21	1	.006
Anxiety disorder	9	15	19	16	1	.884
Affective disorder	21	35	56	47	1	.136
Conduct disorder	49	82	51	42.5	1	<.001
Substance use disorder	41	68	40	33	1	<.001
Personality disorder	10	17	10	8	1	.094
Substance use						
Alcohol, weekly use	30	50	41	34	1	.040
Nicotine dependence, moderate/high	51	85	61	51	1	<.001
Drugs, weekly use						
Cannabis	17	28	11	9	1	.001

Variables	Drug crime offenders		Non-criminal controls		df	p-value
	n	%	n	%		
Hallucinogens	2	3	1	1	1	.552
Stimulants	12	20	2	2	1	<.001
Sedatives	14	23	4	3	1	<.001
Opioids	9	15	2	2	1	<.001
Other, weekly use						
Solvents and inhalators	6	10	4	3	1	.086
Others	6	10	1	1	1	.006
Poly-substance use, weekly use	7	12	3	2.5	1	.017

Note: Comorbidity of adolescent psychiatric disorders is likely.

Personality disorders are follow-up diagnoses.

5.1.2 Family- and school-related factors (I)

Table 3 shows the adolescence-related information on family- and school-related factors among drug crime offenders and non-criminal controls. Of family-related factors, drug crime offenders felt more distant with their fathers than non-criminal controls (58% vs. 38%, $p = .011$). Drug crime offenders' mothers were more likely to have had substance use related problems than mothers of non-criminal controls (20% vs. 9%, $p = .040$).

Of school-related factors, drug crime offenders were more likely to tell lies (68% vs. 36%, $p < .001$), start fights (67% vs. 37%, $p < .001$), thief (63% vs. 23%, $p < .001$), and bully (56% vs. 27.5%, $p < .001$). Drug crime offenders were more likely to have had a special needs education (72% vs. 54%, $p = .024$), unauthorized absences (60% vs. 39%, $p = .008$), and been in an observation class (50% vs. 17%, $p < .001$) compared to their non-criminal controls.

Table 3. The adolescence-related information on family- and school-related factors among drug crime offenders and non-criminal controls (Modified, CC BY 4.0 licensed publication from original publication I © 2021 Springer).

Variables	Drug crime offenders		Non-criminal controls		df	p-value
	n	%	n	%		
Family-related factors						
Psychiatric problems						
Maternal	8	13	15	12.5	1	.875
Paternal	4	7	7	6	1	1.000
Sibling(s)	4	7	6	5	1	.733
Substance-related problems						
Maternal	12	20	11	9	1	.040
Paternal	16	27	30	25	1	.809
Sibling(s)	3	5	9	7.5	1	.753
Distant relationship						
Maternal	22	37	36	30	1	.367
Paternal	35	58	46	38	1	.011
Sibling(s)	19	32	34	28	1	.644
School-related factors						
unauthorized absences	36	60	47	39	1	.008
repeated grade	9	15	17	14	1	.881
learning disabilities	23	38	40	33	1	.507
observation class	30	50	20	17	1	<.001
special needs education	43	72	65	54	1	.024
adjusted syllabus	15	25	23	19	1	.366
tells lies	41	68	43	36	1	<.001
starts fights	40	67	44	37	1	<.001
bullies	33	56	33	28	1	<.001
thieves	38	63	27	23	1	<.001
no close friends	12	20	26	22	1	.796

5.1.3 Gender differences in adolescence-related factors (I)

Additional analysis showed that female drug crime offenders were more commonly diagnosed with conduct disorders (75% vs. 35%) ($\chi^2(1) = 8.543, p = .006$) and more often reported moderate to high levels of ND (85% vs. 55%) ($\chi^2(1) = 5.275, p = .043$) in adolescence than their female non-criminal controls. Male drug crime offenders appeared to differ more extensively from their non-criminal controls; They were more commonly diagnosed with conduct disorder (85% vs. 46%) ($\chi^2(1)$

= 16.574, $p < .001$), substance use disorder (72.5% vs. 32.5%) ($\chi^2(1) = 17.186$, $p < .001$), and more often reported moderate to high levels of ND (85% vs. 49%) ($\chi^2(1) = 14.707$, $p < .001$), weekly use of alcohol (60% vs. 29%) ($\chi^2(1) = 10.930$, $p = .001$) and cannabis (32.5% vs. 9%) ($\chi^2(1) = 10.830$, $p = .002$) in adolescence. The male non-criminal controls, compared to male drug crime offenders, were more commonly diagnosed with psychotic disorders (22.5% vs. 2.5%) ($\chi^2(1) = 8.004$, $p = .006$).

5.1.4 Register-based follow-up information (I-III)

Table 4 shows the register-based follow-up information on crimes, psychotropic medication purchases, and treatment events in specialized health care due to injuries, poisonings, and other external causes of morbidity among drug crime offenders and non-criminal controls.

Table 4. The register-based follow-up information among drug crime offenders and non-criminal controls (Modified, CC BY 4.0 licensed publication from original publication II © 2022 Wiley).

Variables	Drug crime offenders		Non-criminal controls		df	p-value
	n	%	n	%		
Number of drug crimes						
One or two	29	48				
Three or more	31	52				
Other criminality						
Only drug crimes	5	8				
One or two	6	10				
Three or more	49	82				
Psychotropic medication use						
Any	56	93	102	85	1	.108
Addictive medication	45	75	56	47	1	<.001
Non-addictive medication	54	90	99	82.5	1	.184
Treatment event in specialized health care						
Yes	53	88	61	51	1	<.001

Note: Treatment event in specialized health care due to injury, poisoning, or external cause of morbidity.

Over 50% of drug crime offenders had committed three or more drug crimes. After taking all crimes into account, 82% of drug crime offenders had committed three or more crimes. In both groups, most of the participants had used prescribed psychotropic medications (drug crime offenders vs. non-criminal controls; 93% vs. 85%; $p = .108$). Drug crime offenders were more likely to be users of addictive medications compared to non-criminal controls (75% vs. 47%; $p < .001$). Drug crime offenders were more likely to have required treatment events in specialized health care due to injury, poisoning, or external cause of morbidity compared to their non-criminal controls (88% vs. 51%; $p < .001$).

5.1.5 Crime types committed by drug crime offenders

Figure 2 shows the crime types committed by gender among drug crime offenders. There were no statistically significant differences between genders. 35% of the male and 45% of the female drug crime offenders had committed all the crime types, including drug crime, violent crime, drunk driving, and firearm offence. 75% of female drug crime offenders and 58% of male drug crime offenders had been convicted for violent crime ($p = .185$).

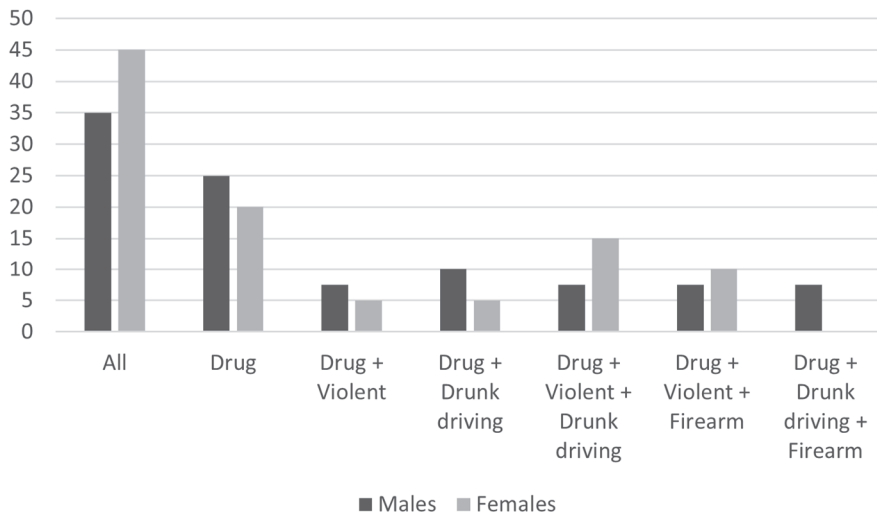


Fig. 2. The number (%) of male and female drug crime offenders who have committed different combinations of drug, violent, firearm and drunk driving offences.

5.1.6 The use of addictive psychotropic medications (II)

Ninety-three percent of the drug crime offenders (36 male, 20 female) and 85% of the non-criminal controls (68 male, 34 female) had used prescribed psychotropic medications according to the information obtained from the Drug register. Table 5 shows the number of users and prescription purchases of addictive psychotropic medications among drug crime offenders and non-criminal controls. A statistically significantly higher proportion of the drug crime offenders, compared to non-criminal controls, had bought addictive prescription psychotropic medications (75% vs. 47%, $p < .001$), particularly (in order from highest to lowest) benzodiazepines (55% vs. 27.5%, $p < .001$), antiepileptic drugs (47% vs. 9%, $p < .001$), opioids (43% vs. 17.5%, $p < .001$), and sleeping medications (40% vs. 17.5%, $p = .001$). Among drug crime offenders, addictive prescription psychotropic medication purchases accounted for 67% ($n = 2\,837$) of all their psychotropic medication purchases during the follow-up period ($n = 4\,231$). Among non-criminal controls, the corresponding proportion was 12% ($n = 461$) of all their psychotropic medication purchases during the follow-up period ($n = 3\,864$).

The number of purchases of prescribed psychotropic medications occurring within the year prior to a drug crime offence being committed was also explored. Addictive psychotropic medications accounted for 74% ($n = 738$) of all psychotropic medication purchases occurring within the year prior to a drug crime offence being committed ($n = 1\,002$). In order from highest to lowest, the most purchased psychotropic medications were benzodiazepines (33%), antidepressants (17%), sleeping medications (14%), opioids (13%), antiepileptic drugs (12.5%), and the remaining 10.5% consisted of antipsychotic drugs, stimulants, drugs for addiction treatment, and other medications.

Table 5. The number of users and prescription purchases of addictive psychotropic medications among drug crime offenders and non-criminal controls (Adapted, CC BY 4.0 licensed publication from original publication II © 2022 Wiley).

ATC group	Drug crime offenders			Non-criminal controls			Difference between study groups*
	% (n) of users	Purchases over lifetime	%	% (n) of users	Purchases over lifetime	%	p-value
All psychotropic medications	93 (56)	4 231	100	85 (102)	3 864	100	
All addictive medications	75 (45)	2 837	67	47 (56)	461	12	<.001
Opioids	43 (26)	348	8	17.5 (21)	57	1.5	<.001

ATC group	Drug crime offenders			Non-criminal controls			Difference
	% (n) of users	Purchases over lifetime		% (n) of users	Purchases over lifetime		between study groups*
	% (n)	n	%	% (n)	n	%	p-value
codeine, drug combination	22 (13)	139		11 (13)	42		
buprenorphine tramadol	7 (4)	12		0 (0)	0		
Antiepileptic drugs**	23 (14)	197	15	8 (10)	15	3	<.001
clonazepam	47 (28)	625		9 (11)	99		
gabapentin	32 (19)	198		6 (7)	30		
pregabalin	15 (9)	140		2 (2)	5		
Benzodiazepines	28 (17)	287		5 (6)	64		
diazepam	55 (33)	1 345	32	27.5 (33)	179	5	<.001
chlordiazepoxide	38 (23)	339		12.5 (15)	59		
oxazepam	15 (9)	14		2.5 (3)	16		
lorazepam	25 (15)	321		8 (10)	17		
alprazolam	2 (1)	2		3 (4)	36		
Sleeping medications	42 (25)	669		8 (10)	51		
nitrazepam	40 (24)	415	10	17.5 (21)	109	3	<.001
temazepam	2 (1)	5		0 (0)	0		
zopiclone	25 (15)	163		2.5 (3)	3		
zolpidem	18 (11)	72		10 (12)	81		
Stimulants	17 (10)	175		7 (8)	25		
methylphenidate***	7 (4)	76	2	3 (4)	17	0.5	.001
Drugs for treating addiction	7 (4)	76		3 (4)	17		
buprenorphine, drug combination	2 (1)	28	1	0 (0)	0	0	.444
	2 (1)	28		0 (0)	0		

Note: *Statistical significance of difference in the number of users between drug crime offenders and non-criminal controls.

**Six drug crime offenders had the diagnosis of epilepsy, two of them had bought addictive antiepileptics, and these accounted for 2.7% of all drug crime offenders' addictive antiepileptic purchases.

***Twelve drug crime offenders had a diagnosis of ADHD and three of them had bought stimulants.

5.1.7 Poly-substance use among drug crime offenders (II)

Poly-substance use of the addictive psychotropic medications among drug crime offenders was also explored. During the study lifetime, thirteen (22%) of the drug crime offenders had used opioids, benzodiazepines, sleeping medications and addictive antiepileptics. Eleven (18%) had poly-substance use of benzodiazepines

and sleeping medication together with addictive antiepileptics. Eight (13%) had poly-substance use of benzodiazepines and sleeping medications together with opioids. Six (10%) had used only benzodiazepines and sleeping medications, two had only used opioids, and one had only used addictive antiepileptics. Sixteen (27%) drug crime offenders had never used any of these medication groups. The temporal connections in the use of different medication groups were not explored.

5.2 The association of adolescence-related factors and psychotropic medication use to drug crime offending (I)

Table 6 shows the results of stepwise logistic regression analysis using all adolescent characteristics, including family- and school-related factors, substance use in adolescence and adolescent psychiatric disorders, as potential predictors for drug crime offending. Of family- and school related factors, distant relationship with the father (OR = 2.60; $p = .020$), lying (OR = 2.46; $p = .029$) and thieving (OR = 2.73; $p = .014$) were risk factors for drug crime offending. Moderate to high levels of ND increased the likelihood for drug crime offending by over 3-fold ($p = .010$) and the use of stimulants by over 8-fold ($p = .014$). Drug crime offenders were less likely to have suffered from affective disorders (OR = 0.35; $p = .012$) or psychotic disorders (OR = 0.08; $p = .009$) during adolescence, compared to non-criminal controls.

Table 6. Adolescence-related risk factors for drug crime offending (Reprinted, CC BY 4.0 licensed publication from original publication I © 2021 Springer).

Variables	Likelihood for drug crime offending		
	Adjusted OR	95% CI	p-value
Family-related factors			
Distant relationship with father	2.60	1.16–5.84	.020
School-related factors			
Tells lies	2.46	1.10–5.53	.029
Thieves	2.73	1.23–6.06	.014
Substance use in adolescence			
Nicotine dependence, moderate/high	3.36	1.33–8.48	.010
Stimulants, weekly use	8.38	1.54–45.45	.014
Adolescent psychiatric disorders			
Affective disorder	0.35	0.15–0.80	.012
Psychotic disorder	0.08	0.01–0.53	.009

Table 7 shows the results of stepwise logistic regression analysis. Adolescence-related factors (psychiatric disorders, level of nicotine dependence, weekly use of alcohol and cannabis, parental psychiatric and substance use problems), age at index hospitalization, the register-based follow-up information on the use of psychotropic medication (ATC groups for opioids, antiepileptic drugs, benzodiazepines, sleeping medications, stimulants, drugs for treating addictions, antidepressants, antipsychotics, and other psychotropic medication), age at the end of the follow-up data for psychotropic medications in year 2012, and gender were entered into the model as potential risk factors for drug crime offending. The analysis showed that the strongest risk factors was the use of antiepileptic drugs (AOR 7.77; $p < .001$). Adolescent substance use disorder (AOR 2.34; $p = .050$) and conduct disorder (AOR 3.49; $p = .010$) were also risk factors for drug crime offending. Another risk factor was age at the end of the follow-up (AOR 1.52; $p < .001$). Drug crime offenders were less likely to suffer from psychotic disorders in adolescence (AOR 0.10; $p = .018$).

Table 7. Adolescent and follow-up related risk factors for drug crime offending (Modified, CC BY 4.0 licensed publication from original publication I © 2022 Wiley).

Variables	Likelihood for drug crime offending		
	Adjusted OR	95% CI	p-value
Use of addictive antiepileptic drugs*	7.77	2.99–20.24	<.001
Age at the end of the follow-up**	1.52	1.23–1.88	<.001
Conduct disorder	3.49	1.35–8.99	.010
Substance use disorder	2.34	1.00–5.48	.050
Psychotic disorder	0.10	0.02–0.68	.018

Note: *Antiepileptic drug use included purchases of clonazepam, gabapentin or pregabalin.

**Drug register was available up to the end of the year 2012.

5.3 Treatment events in specialized health care due to injuries, poisonings, or other external causes of morbidity (III)

Of all drug crime offenders, 88% had a history of treatments in out- and/or inpatient settings due to injury, poisoning, or other external cause of morbidity, and the corresponding percent among non-criminal controls was 51% ($p < .001$). At a medical specialty level, statistically significant differences between the study groups (drug crime offenders vs. non-criminal controls) were found in the specialties of internal medicine (48% vs. 17.5%; $p < .001$), surgery (70% vs. 32%; $p < .001$), general medicine (22% vs. 7%; $p = .003$), acute medicine (25% vs. 5%;

$p < .001$), anaesthesiology (7% vs. 1%; $p = .043$), and otorhinolaryngology (15% vs. 2%; $p = .001$). Figure 3 shows the amount (%) of drug crime offenders and non-criminal controls visiting the most visited medical specialties. No statistically significant differences were found in the specialties of psychiatry, child psychiatry, neurology, oral and maxillofacial surgery, ophthalmology, gynaecology, lung diseases, physiatrics, or paediatrics and paediatric surgery.

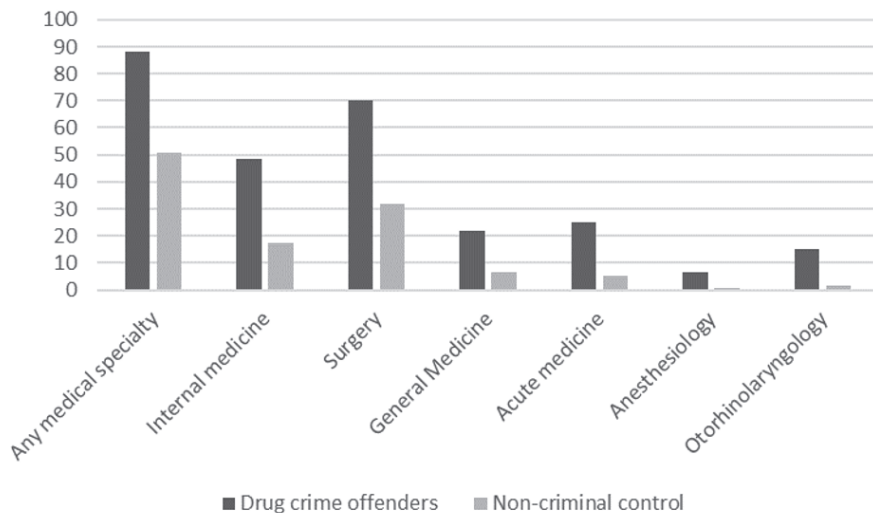


Fig. 3. The amount (%) of drug crime offenders and non-criminal controls, who received treatment in out- and/or inpatient settings due to injuries, poisonings, or other external cause of morbidity, by medical specialties.

Table 8 shows the types and reasons for treatment events received in out- or inpatient settings, by drug crime offenders and non-criminal controls. When compared to non-criminal controls, drug crime offenders had more commonly received treatments due to any reason being explored.

Table 8. The types and reasons for treatment visits in specialized health care and inpatient hospitalization among drug crime offenders and non-criminal controls (Reprinted, with permission, from original publication III © 2023 Karger Publishers).

Types and reasons	Drug crime offenders		Non-criminal controls		df	p-value
	n	%	n	%		
Injury						
For any reason	51	85	45	37.5	1	<.001
Accidental	39	65	35	29	1	<.001
Intentional	10	17	2	2	1	<.001
Assault	14	23	5	4	1	<.001
Unknown reason	23	38	20	17	1	.001
Poisoning*						
For any reason	33	55	24	20	1	<.001
Accidental	11	18	9	7.5	1	.029
Intentional	25	42	13	11	1	<.001
Unknown reason	15	25	9	7.5	1	.001
Other external cause of morbidity**	8	13	4	3	1	.022

Note: *Poisoning from different medications, drugs, alcohol etc.

**Anaphylactic allergic reactions, complications from medical procedures etc.

Among drug crime offenders, 66% of treatment events were inpatient visits, while the corresponding percent among non-criminal controls was 75%. Among the study participants requiring inpatient treatment, the median duration for inpatient hospitalization was 6 days (IQR 13) for drug crime offenders (n = 42, range from 1 to 118 days) and 3 days (IQR 4) for non-criminal controls (n = 42, range from 1 to 228 days).

Figures 4 and 5 show the survival estimates and adjusted HRs by age at first treatment event due to poisoning and injury among drug crime offenders and their non-criminal controls, after adjusting with adolescent psychiatric disorders. Of drug crime offenders, 43% (n = 26) had internalizing disorder and 57% (n = 34) had externalizing disorder as their index diagnosis, while for non-criminal controls the corresponding percentages were 72% (n = 81) and 28% (n = 34). The survival estimates by age at first treatment event, due to a poisoning, differed statistically significantly between drug crime offenders and non-criminal controls (HR 1.89, 95% CI 1.26–2.84; p = .002) with drug crime offenders being younger than their non-criminal controls. The survival estimates by age at first treatment event, due to an injury, differed statistically significantly between drug crime offenders and non-

criminal controls (HR 2.54, 95% CI 1.69–3.82; $p < .001$) with drug crime offenders being younger than non-criminal controls.

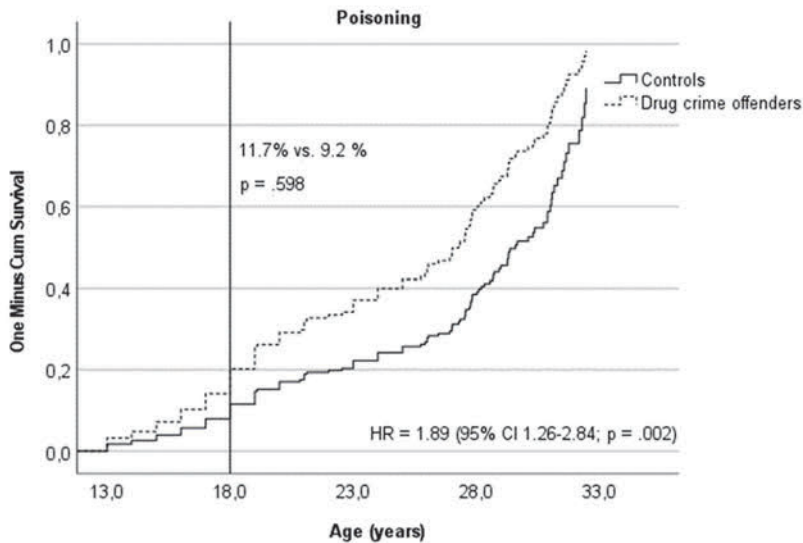


Fig. 4. The survival estimates and adjusted hazard ratio by age at first treatment event in out- or inpatient settings due to a poisoning, by drug crime offenders and non-criminal controls (Reprinted, with permission, from original publication III © 2023 Karger Publishers).

Note: Hazard ratios (HRs) are adjusted with internalizing (psychotic, affective and anxiety disorders) and externalizing (conduct and substance use disorders) disorders diagnosed during index hospitalization.

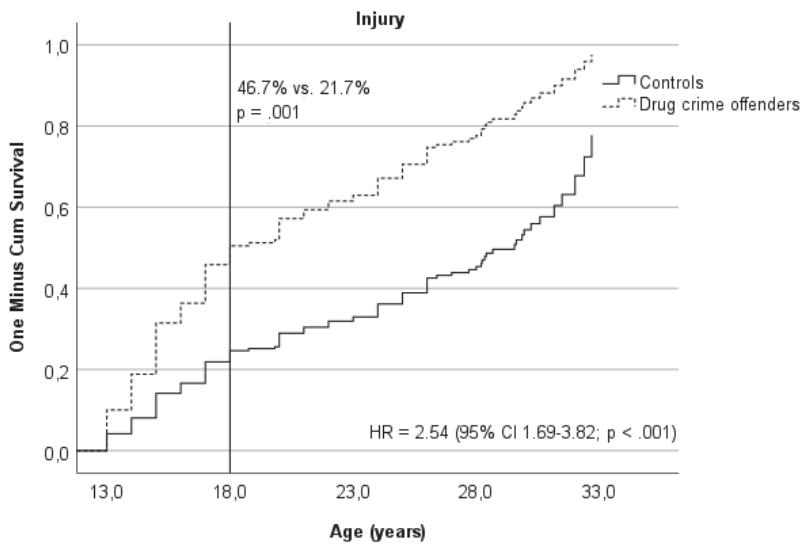


Fig. 5. The survival estimates and adjusted hazard ratio by age at first treatment event in out- or inpatient settings due to an injury, by drug crime offenders and non-criminal controls (Reprinted, with permission, from original publication III © 2023 Karger Publishers).

Note: Hazard ratios (HRs) are adjusted with internalizing (psychotic, affective and anxiety disorders) and externalizing (conduct and substance use disorders) disorders diagnosed during index hospitalization.

6 Discussion

6.1 Overview of the main findings

In this population of former adolescent psychiatric inpatients, 12% had committed at least one drug crime by the time of young adulthood. The majority (67%) of the convicted drug crime offenders were male and 33% were female. Almost 75% of drug crime offenders had committed unlawful use of narcotics offences, which could mean that most of them were also users of illicit drugs. Only a small proportion (8%) of the drug crime offenders had committed solely drug crimes, but more than half (63%) of them were also guilty of violent crimes.

Drug crime offenders were characterized by conduct and substance-related disorders in adolescence, whereas affective and psychotic disorders in adolescence were shown to be less common among drug crime offenders, compared to controls. Weekly use of stimulants and moderate to high levels of nicotine dependence during adolescence were more likely among drug crime offenders than among non-criminal controls (I).

Examination of the family- and school-related factors revealed that the role of a close father relationship was crucial; meaning that feeling distant to a father was a risk factor for later drug crime offending. Of school-related factors, the main behavioral characters that associated with later drug crime offending were thieving and telling lies already at school-age (I).

Exploration of the use of prescribed psychotropic medications showed that drug crime offenders were more likely to be users of addictive psychotropic medications than their non-criminal controls. Benzodiazepines were the most purchased medication group among drug crime offenders, accounting for approximately one third of all purchases both during the lifetime and in the year preceding drug crimes being committed. Of all addictive medications, the use of gabapentinoids and clonazepam had the strongest association with drug crime offending. Moreover, older age at the end of the follow-up time predicted drug crime offending, but this may only have reflected longer age period of prescription medication use (II).

The results of study III suggested that drug crime offenders had, accessed specialized health care services for injuries, poisoning, and other external causes of morbidity at a younger age than their non-criminal controls. The most common reasons for treatment events in health care services among drug crime offenders

were accidental injuries or intentional poisonings. Most of the visits were to the internal medicine and surgery medical specialties (III).

6.2 Discussion of the results

6.2.1 Adolescence-related risk factors for drug crime offending (I)

Distant relationship to father and maternal substance use problems

The findings of original study I revealed that former adolescent psychiatric inpatients were more likely to become drug crime offenders when they reported to having had a distant relationship with their father. This association existed regardless of whether they have lived with one or two biological parents or were raised in out-of-home placements during adolescence. This adds new information to existing knowledge, that out-of-home placement and separation from a parent increase the risk for subsequent offending (Côté et al., 2018; Mok et al., 2018). Earlier research has shown that a good quality father-child relationship and the presence of the father in childhood reduce an adolescents' risk of delinquent behavior, above and beyond the effects of their mother's involvement (Bronte-Tinkew et al., 2006; Vanchugova et al., 2022). However, according to a study of juvenile delinquency by Simmons et al. (2018), having an uncaring or cruel father had more of an impact in increasing the risk for adolescent offending than having an absent father. Considering the findings of the original study I, it can be surmised that, regardless of the family structure during adolescence, an adolescent can feel emotional distance to their father despite the father's physical presence.

Another minor finding of study I was, that mothers of drug crime offenders had more often experienced substance use problems than mothers of non-criminal controls. It is known that maternal alcohol abuse can predict mental distress in the offspring (Rognmo et al., 2012) and maternal cannabis use is associated with an increased risk of substance use, including tobacco, alcohol, cannabis, and opioid misuse, among adolescent offspring (Madras et al., 2019). The association between maternal substance use problems and the offspring's drug crime offending was not found, but this finding highlights the complexity often found in households of adolescents who subsequently become drug crime offenders.

Lying and thieving

In the original study I, a history of telling lies and thieving at school-age was associated to later drug crime offending. Lying and thieving are behavioral features that are included in the diagnosis of conduct disorder (CD) (Black & Grant, 2014). The current study showed that the prevalence of adolescent CD among drug crime offenders was twice as high as among non-criminal controls. In the original study II, a diagnosis of conduct disorder during adolescence predicted later drug crime offending. As noted in the research literature, the relationship between CD and antisocial personality disorder (ASPD) is known to be strong (NICE Clinical Guidelines, 2017). Earlier research has shown that CD is associated with criminality (Erskine et al., 2016; Fazel et al., 2008) and that ASPD is relatively common among prisoners (Black et al., 2010). Therefore, the findings of the original study I emphasize the importance of recognizing those youths for whom ASPD might develop and, consequently, who are at potential risk for involvement in drug criminality. The novel finding in the original study I was that telling lies or thieving, per se, was associated to drug crime offending. Moreover, this association appeared regardless of the presence or absence of conduct disorder.

Smoking and stimulant use

Moderate to high levels of nicotine dependence (ND) and weekly use of stimulants in adolescence were strong risk factors for drug crime offending in the original study I. Other studies have demonstrated that smoking tobacco in adolescence is associated with delinquency and vice versa (Hale & Viner, 2016), and also to drug use (Aston, 2015). In adulthood, smoking tobacco increases the possibility of drug crime offending (Elonheimo et al., 2011). Higher levels of ND in adolescence have been reported to predict greater levels of drug crime offences committed up to young adulthood (Jurmu et al., 2020). Despite tobacco smoking being illegal for people aged under 18 years in Finland (Finlex, 1976), the original study I showed the presence of a significant levels of ND already during adolescence. Smoking has decreased in the Finnish population during the last ten years, with the decrease being notable among 14–20-year-olds girls and boys. The number of daily smokers was 21% among boys and 18% among girls in 2011, while the corresponding amounts fell to 7% and 5% in 2021 (Jääskeläinen & Virtanen, 2021a). Given that adolescents are often sensitive to social influences, the decrease in rates of smoking may reflect reduction in social pressure to smoke cigarettes. In light of this,

smoking in adolescence may now be a more significant risk factor when considering possible criminal outcomes.

The original study I also showed that weekly use of stimulants in adolescence was a substantial predictor for drug crime offending. It has been shown, that in a criminal justice population, amphetamine use predicted criminal recidivism (Håkansson & Berglund, 2012). Beside stimulants as illicit drugs, earlier studies have reported that stimulants are also one of the most misused prescription drugs among adolescents and adults (Compton & Volkow, 2006; Holt & McCarthy, 2020), and non-medical use of stimulants often co-occurs with illicit drug use (Novak et al., 2016). The findings of the original study I highlights that stimulant use in adolescence is a significant factor that may predict later drug crime offending.

Nonetheless, the original study II also showed that the amount of methylphenidate purchases remained low among drug crime offenders, even while twelve of them had a diagnosis of ADHD. In Finland during the 21st century, it may have been harder to obtain a diagnosis of ADHD and even harder access stimulant treatment, because sobriety was necessary to receive the treatment. It could therefore be hypothesised that these youths with ADHD self-medicated with illegal stimulant drugs and/or stimulants obtained on the dark market.

Substance use disorder in adolescence

The association of substance use to criminal offending is reported in several earlier studies (Moore et al., 2019; Whiting et al., 2021). In the original study II, the results indicated that a diagnosis of substance use disorder during adolescence was a risk factor for subsequent drug crime offending. That is a worrying finding considering the various cognitive deficits and other potentially damaging consequences of exposure to different substances in adolescence (Spear, 2018; Volkow et al., 2014). Spear's Review (2018) showed that alcohol use in adolescence caused alterations in attention, verbal learning, memory, and visuospatial processing, along with altered development of grey and white matter volumes and disrupted white matter integrity. The functional consequences included behavioral inefficiencies, decreased cognitive flexibility and elevations in risk-taking, impulsivity, disinhibition, and anxiety. Short-term use of cannabis in adolescence caused impaired short-term memory and motor coordination and in high doses, paranoia and psychosis. Long-term or excessive use of cannabis in adolescence has been shown to cause altered brain development, addiction, increased likelihood of dropping out of school, and lower IQ (intelligence quotient) (Volkow et al., 2014).

6.2.2 Psychotropic medication use related to drug crime offending (II)

The association of drug crime offending and antiepileptic medication use

In this study, clonazepam, gabapentin, and pregabalin formed the group of addictive antiepileptics. Gabapentinoids accounted for 68% (n = 427) of all addictive antiepileptic drug purchases (n = 625) among drug crime offenders. In clinical settings, gabapentin and pregabalin are used to treat epilepsy and neuropathic pain, and pregabalin is also used to treat generalized anxiety disorder (Current Care Guidelines, 2017, 2019 & 2020a). Clonazepam is used as an add-on therapy to treat epilepsy (Kälviäinen, 2015; Song et al., 2020). Clonazepam does not have any clinical indications for psychiatric treatment in Finland (Riala & Ruokoniemi, 2018). All of these drugs are known to have a high risk of misuse, which is potentially due to their associated relaxing and euphoric effects (Bockbrader et al., 2010), tolerance development, physical dependence, and withdrawal symptoms (Dokkedal-Silva et al., 2019; Evoy et al., 2017). In this study, only six of the drug crime offenders had a diagnosis of epilepsy, and two of them had bought clonazepam and/or gabapentinoids. Those purchases accounted for only 2.7% of all drug crime offenders' addictive antiepileptic drug purchases (17 out of 625 purchases), which show a high prevalence of use for purposes other than epilepsy treatment among drug crime offenders.

The findings of the original study II showed that use of addictive antiepileptic drugs (gabapentinoids and clonazepam) related to drug crime offending more than opioids, benzodiazepines, and sleeping medications, which were also commonly used among drug crime offenders. Peltokorpi et al. (2021) found, that tobacco smoking and alcohol use, the first prescriptions of benzodiazepines and opioids, and a diagnosis of substance dependence predated the first prescriptions of gabapentinoids. The present finding indicates that gabapentinoids may pose new challenges at a time when “opioid crisis” (Volkow & Blanco, 2021) and misuse of benzodiazepines (Votaw et al., 2019) have been one of the major worldwide public health concerns over the past decades. Taken all this information into account, gabapentinoids may be more addictive than generally recognized.

The use of addictive psychotropic medications

In the original study II, drug crime offenders' purchases of addictive psychotropic medications formed a substantial proportion of all psychotropic medication purchases, both during the lifetime (accounting for 67% of all purchases) and one year before drug crimes were committed (accounting for 74% of all purchases). Benzodiazepines were the most purchased medication group, accounting for approximately one third of all purchases both during the lifetime and in the year preceding drug crimes. Opioids and sleeping medications were also commonly used by drug crime offenders. In the criminal justice population, both separate and concurrent opioid and benzodiazepine use has been associated with drug-related crimes (Cropsey et al., 2015). The findings of the use of benzodiazepines, opioids, and sleeping medications in the original study II strengthen the evidence for a relationship with drug crime offending.

When prescribing medications with the potential for both addiction and abuse, safe prescribing emphasizes the importance of being familiar with the differences between appropriate and inappropriate prescribing. Inappropriate prescribing means inadequate prescribing, excessive prescribing, or continued prescribing despite the lack of evidence of efficacy, while appropriate prescribing involves achieving disease control while minimizing toxicity, substance use disorder, or the risk of substance use disorder and implementing safeguards to reduce medication diversion. An awareness of the existence of "prescriber shopping" may help in implementing safeguards to help recognizing and identify the medication-seekers. Prescriber shoppers often seek out medications from multiple sources by seeing different health care providers, they typically present with a list of complaints that are often fictitious and commonly differ for each provider. In summary, safe prescribing of controlled medications helps avoid medication diversion (Dydyk et al., 2022; Preuss et al., 2022).

6.2.3 Drug crime offenders' use of specialized health care services (III)

In the original study III, almost 90% of drug crime offenders had a treatment episode in specialized health care due to injury, poisoning, and/or other external cause of morbidity during the follow-up period, while the corresponding percentage for non-criminal controls was around 50%. In comparison to non-criminal controls, drug crime offenders' lifetime likelihood for a treatment event

due to poisoning was almost doubled and, for a treatment due to injury, there was a 2.5-fold increase. The higher use of hospital services among drug crime offenders supports other studies examining offenders in general, with findings that offenders are frequent users of emergency departments (ED) and hospital services (Stenbacka et al., 2019; Winkelman et al., 2017). In the original study III, the proportion of drug crime offenders using several different medical specialties was notably higher compared to non-criminals, but the most common specialties involved were internal medicine and surgery.

A recent study of adolescent delinquency found that violent adolescent delinquency predicted higher number of ED visits in early adulthood, but not non-violent adolescent delinquency (Portnoy & Schwartz, 2023). In this study, of those 88% of drug crime offenders who required a treatment episode due to injury, poisoning, or other external cause of morbidity in specialized health care, 60% had committed a violent crime and 28% had not. This finding provides support to earlier literature but also shows that non-violent drug crime offenders are also frequent attendees for acute care, such as for injuries and poisonings.

Earlier studies have shown that offenders have a higher risk of premature death (Skinner & Farrington, 2020) and substance-related mortality (Stenbacka et al., 2012). Moreover, higher mortality has been associated with drug-related crimes (Skardhamar & Skirbekk, 2013). In the original study III, injuries and poisonings, both accidental and intentional, were more common among drug crime offenders compared to controls. Moreover, drug crime offenders had a higher prevalence of treatment events due to assaults and injuries and poisonings due to unknown reason, compared to their controls. Almost half of the drug crime offenders had their first treatment event due to injury before the age of 18 years, which was a significantly higher proportion compared to the one-fifth of non-criminals. Of all drug crime offenders, over forty percent were treated in specialized health care for an intentional poisoning. In addition, almost half of the drug crime offenders who had been sentenced for unlawful use of narcotic offences, were treated for an intentional poisoning. The findings of the original study III suggest that drug crime offenders are at risk for serious health outcomes due to intentional self-harm and risk-taking behavior at a young age.

6.3 Methodological considerations

6.3.1 Strengths of the study

This study has several strengths that need to be acknowledged. Firstly, this study used reliable and valid research instruments, such as the K-SADS-PL (Ambrosini, 2000; Kaufman et al., 1997), the EuropASI (Kokkevi & Hartgers, 2009), and the mFTQ (Prokhorov et al., 1996) for assessing substance use in adolescence, school- and family-related factors and for defining adolescent psychiatric disorders. Using a semi-structured diagnostic interview, like K-SADS-PL, helps to minimize the risk of subjective bias. Due to its reliability in evaluating DSM-IV-based diagnoses, using K-SADS-PL made it possible to adjust the statistical analyses with adolescent psychiatric disorders.

Secondly, the diverse use of register data, obtained from national registers, made it possible to follow all of the participants up to end of the year 2016. The information on treatment events in specialized health care was gathered from the FCRHC, held by the National Institute for Health and Welfare. The information on committed crimes was obtained from the official records of the national Legal Register Center. Criminal records included crimes which were committed after an offender turned 15 years of age and their crime had led to an official sentence passed by a court (Finnish Legal Register Centre, 2021). The information on medication purchases was acquired from the Drug Register of the Social Insurance Institution (SII) of Finland. The nationwide registers have been shown to be reliable sources for data in scientific research (Miettunen et al., 2011), while self-report scales and questionnaires can have potential limitations, such as recall bias and missing outcomes for individuals who are unable to participate due to a direct consequence of the outcome. The national registers made it possible to have a long follow-up time from 10 to 15 years in total.

Thirdly, the catchment area in this study for adolescents in need of psychiatric inpatient care is a geographically large area of Northern Finland, and approximately 11% of the Finnish population lived in that area. Of the study participants, almost 13% came from areas of Finland other than Northern Finland. This may be because 26% of the study participants lived in child welfare institutions, and of those adolescents, 40% were from areas other than Northern Finland. Therefore, the study findings do not merely reflect features of adolescents from Northern Finland. All the adolescents in this area were treated in the same acute adolescent psychiatric inpatient care unit, meaning that the study population represents the most serious

cases of psychiatric disorders among the general adolescent population in this area. The participation rate of the study project was also high at 84% of all eligible participants, so the study population can be considered as a relatively unselected sample of all adolescents admitted to the acute unit during the 5-year period. Overall, the current study utilized a combination of data acquired from clinical semi-structured examinations together with follow-up information from the national registers.

6.3.2 Limitations of the study

When viewing the results of this study, the following limitations should be acknowledged. Firstly, the findings of this study cannot be directly generalized to the general adolescent population because adolescents participating in this study had severe psychiatric disorders requiring acute inpatient care. Although the participation rate of the study project was also high (84%), some selection bias may still exist. For example, due to non-participation where parents or legal guardians did not provide informed consent or where adolescents did not complete their interviews.

Unfortunately, this register-based follow-up data did not include laboratory tests verifying the blood concentrations of the medications studied or illicit drugs and, moreover, we do not have the information on illegally purchased prescription medications obtained from black markets or the dark net. It is also likely that our study underestimates the true prevalence of PD and ADHD, because PD patients often do not seek psychiatric treatment and, at the time of the data collection, the diagnostics for ADHD was not as advanced as it is today.

I was not able to evaluate treatment effectiveness because of the limited information in the existing data. The information on adolescent substance use, family- (including familial substance use and psychiatric problems) and school-related factors were based on the adolescents' self-reporting. It should be noted, however, that for family-related factors, adolescents' self-reports of parental characteristics have been reported as providing valid data for research purposes (Pisinger et al., 2016).

It is possible that many of the injuries, poisonings, and other external causes for treatment events were of low severity and not requiring or appropriate for specialized level treatment. Therefore, the treatment events available for this study may underestimate the true prevalence of all incidents of injuries, poisonings, and other external causes for treatment events among the study population. Moreover,

the number of “unknown” reasons may have been emphasized due to the lack information or limited time for physicians to be able to specify the reason (intentional or accidental) for the visit. Similarly, it must be noted that only a minority of all crimes are reported to the police and lead to sentences passed by a court. This means that many crimes are committed which are not recorded in the criminal records. It is also possible that certain crimes are more frequently reported to the police, leading to overrepresentation in the criminal records.

The crime register data was available until November 2016, while the medication purchase data ceased at the end of 2012. This may lead to an underestimation of the true prevalence of prescription medication purchases in relation to drug crimes because, in five cases, the first drug offences were committed after the year 2012. Moreover, the small number of cases in some subgroup analyses may have caused type II error, meaning a lack of statistical power. Further type I errors may also exist, meaning a risk of spurious findings due to the numerous statistical comparisons performed in this study. Finally, it is important to knowledge that there is always a chance for information bias when the review of the existing literature was done by one person.

7 Conclusions

7.1 Main conclusions

The current study of a former adolescent psychiatric inpatient population, with a comprehensive follow-up data through national registers, provides a novel perspective to earlier studies. Only a limited number of studies on drug crime offenders are published in the research literature, and this is one of the few studies focusing exclusively on drug crime offenders. In this unselected study population, more than one in ten of former adolescent psychiatric inpatients had committed a drug crime by young adulthood. Most of them were recidivists and had committed other crimes, including violent crimes.

Some of the main findings of the current study suggest that single traits of behavioral disorders in childhood and/or adolescence, especially lying and thieving, together with smoking and illegal substance use, might be proxy markers of a later propensity for drug crime offending. While substance use and conduct disorders are known to associate with criminality, these findings propose that ‘the symptoms’ do not need to form a disorder to elevate someone’s risk for drug crime offending. When evaluating the need for early interventions for the families and children, more support could be given to families in which offspring tend to lie and thieve.

The findings of this study highlight the importance of a good-quality father-child-relationship as a protective factor regarding adolescent’s involvement in drug criminality. Having a close relationship to father seems to be valuable regardless of the physical presence or absence of the father. This emphasises the need for family-centered approaches. Despite much being known about the links between father engagement and favourable child development outcomes (Allen & Daly, 2007), the protective factors underlying close father-child-relationships remain unknown.

Another key finding of this study was that clonazepam and the gabapentinoids associated with drug crime offending. For a prescriber, difficult challenges arise where potentially addictive psychotropic medications are clinically the most appropriate but there is potential for the patient receiving that medication to use it for illegal purposes. It is an ethical dilemma where physicians must weigh the pros and cons as to whether or not to prescribe certain medications when they know that there is a possibility that the patient purchases similar substances from the dark markets, leading to even worse outcomes, including death. Issuing the first prescription of a medication with potential risks is significant responsibility for

physicians and not one to be taken lightly. Even though gabapentinoids have potential for misuse and can be addictive, they can be very effective in the treatment of neuropathic pain (Current Care Guidelines, 2017). A confidential patient-physician relationship and careful monitoring of the medication use during the treatment should help minimize the risk of misuse of these medications.

The findings of this study suggest that clinicians may unintentionally contribute to the problem of overuse of addictive psychotropic medications. The proportion buying prescriptions for addictive medications was much higher among those who committed drug crimes compared to those without criminal records. Even though there were more drug crime offenders using benzodiazepines, opioids, sleeping medications, and gabapentinoids than there were non-criminal controls using those medications, users of stimulants, such as methylphenidate, remained low among drug crime offenders. This was despite the fact that the use of stimulants in adolescence associated with drug crime offending. The fact that, in the past, it was harder to get a diagnosis of ADHD and be treated with ADHD medications, which may have led to self-medication with stimulants obtained from dark markets.

The current study is one of the very few studies providing information on the specific specialized health care specialties accessed by drug crime offenders following injuries, poisonings, and other external causes of morbidity. The main finding was that, in comparison to non-criminals, drug crime offenders were more likely to access specialized health care due to injuries and poisonings (both accidental and intentional) at a younger age. The current findings may indicate that drug crime offenders endanger their health by exhibiting higher levels of intentional self-harm and risk-taking behavior, already in adolescence and young adulthood. It may be the self-harming and risk-taking behavior is a sign of worse health and/or social status. Further investigating of these factors could help the patients to receive more appropriate care and support from psychiatrists and/or social workers, and prevent future crimes from being committed.

7.2 Research implications

Further research into drug criminality could be conducted based on the current findings. In this study, we focused on the relationship between adolescent psychiatric diagnoses and drug crime offending, however adult psychiatric diagnoses were not examined. It would be interesting to study, how drug crime offending affect recovery from adolescent psychiatric morbidity or how it affects psychiatric morbidity in young adulthood and/or later adulthood. It would also be

revealing to examine how many of the drug crime offenders experience psychotic episodes or disorders later in adulthood and, how many of these are cannabis related psychoses. A larger sample group could help researchers to investigate which mental health disorders associate with severe and minor drug criminality. A qualitative study could be conducted to determine what types of medications and illicit drugs drug crime offenders obtain from black markets and the streets, providing a clearer understanding of the real use of the drugs. This study focused only on injuries and poisonings and, therefore, other morbidity (i.e., infection diseases) of the drug crime offenders could also be explored. Drug crime offenders' use of other social and health services, including primary health care and social services, could also be studied. With new data, further examination of the associations of lying and thieving in adolescence to later offending would be possible. The effect of other family-related factors, such as parental education level on offspring's risk for drug crime offending also warrants further study.

7.3 Clinical implications

I believe that child- and family-centered approaches (Niemelä et al., 2019) are an invaluable part of early interventions, in the prevention of involvement in drug crime offending in adolescence and young adulthood. Family-centered approaches should seek to improve the relationships between distant or absent fathers and their children and families. Behavioral features and certain substance use in adolescence may be early signs of a possible path to drug crime offending and, therefore, more attention should be directed towards these both at school and home. Among youths, tendency strategy to improve collaboration between child protection, police, and health care authorities would be desirable. Intergenerational social exclusion and other problems in families, including parental substance use and mental health problems, should be considered more closely in social and health services.

The findings of the current study emphasize the importance of physicians first considering all clinical indications when prescribing addictive psychotropic medications, and the need for caution when using certain medications, particularly gabapentinoids, in treating patients with a history of substance or drug use. To minimize the risk of inappropriate use of these medications, the main goal should be to understand and know your patients well enough and have developed a confidential patient-physician relationship with them. When designing one's treatment plan individually, drug screening could help to monitor a patients' treatment compliance. In emergency departments, drug screening could be

considered as one of the examination tools among patients being treated for injuries, besides poisonings. To avoid negative feelings in patients towards drug screening, the testing should be informed and done in collaboration with the patient, in order to foster a good patient-physician relationship. This could lead to earlier intervention and the possible harm arising from drug use and drug criminality being prevented.

If concern about a potential drug use problem arises, physicians should also consider consulting psychiatrist colleagues, who may better understand the characteristics of the addiction. People with illicit drug use often have comorbid mental and other health problems, and any psychosocial interventions could be instigated at the same time as drug treatments. The goal of holistic psychosocial and psychotherapeutic interventions is not only a reduction of drug use and intoxications, but also an increase in life control, improvement in mental health and functioning, and reduction of health-related harm associated with drug use (COHERE Finland, 2021).

In Finland, a drug crime charge may be dropped if the suspect has applied for treatment approved by the Ministry of Social Affairs and Health. The Finnish law obliges the police to always give care guidance for drug users and to support them when seeking treatment. Seeking treatment is enough, and no further treatment adherence is required for the charges to be dropped (Saarinen, 2021; National Prosecution Authority, 2018). If no treatment adherence is required, more attention should be paid towards contacts with care services. Using motivational interviewing (Current Care Guidelines, 2020b) to improve an individual's motivation to change their way of living would be baseline for preventing drug addiction and criminal recidivism.

Clinicians should also be aware of the health-related stigma related to mental health problems (Stangl et al., 2019) and illicit drug use (Crawford et al., 2012). Stigmatization can appear as strong preconceptions, blaming patients for their illness and as negative speech expressions (Rovamo & Toikko, 2019). Fear of stigmatization and discrimination can already affect an individuals' willingness to engage with healthcare services (Millum et al., 2019) and, unfortunately, negative attitudes of health professionals towards patients with substance use disorders seem to be common (Rovamo & Toikko, 2019; Van Boekel et al., 2013). Therefore understanding, empathy and openness can play a vital role in the treatment of individuals with health-related stigma conditions and should be valued and encouraged. I believe that this also applies in the treatment of drug crime offenders.

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Original publications

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