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Mental Disorders and Violent Crime

Epidemiological Study on Factors Associated with Severe Violent Offending

Doctoral dissertation

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ABSTRACT

Substance use disorders (SUDs), antisocial personality disorder (APD), borderline personality disorder, conduct disorder, and major mental disorders (MMDs) are associated with violent crime in the general population. Comorbid SUD has been observed to increase the risk of violent crime in MMD, but the role of coexisting personality disorders (PDs) in severe violence of persons with MMD has remained unclear. Study I assessed the prevalence of lifetime psychiatric disorders with the Structured Clinical Interview for DSM-IV Disorders, using both personal interviews and lifetime objective data, in a nationally representative sample of men with MMD and homicidal behaviour (N=90). Three diagnostic categories were identified: 47% of the offenders had triple disorder (MMD+APD+SUD), 27% had dual disorder (MMD+SUD), and 26% had pure MMD. The category (MMD+APD, no SUD) was absent. Study II (N=58) indicated that the homicidal behaviour of offenders with triple disorder was more often associated with arguments/fights with non-relatives when intoxicated; whereas persons with pure MMD more often killed relatives as a result of delusions. APD is a risk factor for severe violence in MMD, and always seems to be linked with co-existing SUD among homicide offenders with MMD. Prevention of severe violence among persons with MMD necessitates effective treatments for triple disorder. Dual disorder without APD may be a different syndrome than triple disorder, and may not increase the risk of severe violence in MMD.

It has been problematic to estimate the need for preventive interventions in respect of the environmental risks that may result in violent and chronic offending among high-risk children, because no data on quantitative risk ratios have been available. In studies III and IV, the criminal and prison files of the children (G1) and parents (G3) of homicide recidivists (HR), extracted from the prison files of the 1584 homicide offenders convicted in Finland during the years 1981–1993, were compared with data from matched controls. Among the parents (G3) the risk was increased up to 24-fold for violent crimes (p=0.01), and 17-fold for any criminality (p=0.0008). Among the children (G1), the OR for committing any crime was 5.0 (95% CI=1.3-23.1) but the risk for violent offending was not significantly increased (OR=3.1, 95% CI=0.3-37.6). The prevalence of index persons convicted of any crime (versus controls) was 13.2% (vs. 2.9%) in G1 and 36.4% (vs. 3.2%) in G3. Only 4.4% (vs. 1.5%) of G1 index parents, as compared to 18.2% (vs. 0.9%) of G3, had convictions for violent crimes. The disparity between index and control groups increased across generations both in the proportion of violent offenders (p=0.0023) and in the proportion of all criminal offenders (p=0.0019).The results indicated for the first time that it is possible to estimate the OR of later violent offending and criminality among groups of children on the basis of parental violent crime (homicide recidivism). The study also revealed the first evidence of inter-generational transmission of violent crime from violent parents to their offspring.

TIIVISTELMÄ

Päihdeongelmat (SUD), antisosiaalinen persoonallisuushäiriö (APD), epävakaa persoonallisuus, käytöshäiriö ja psykoottiset häiriöt (MMD) liittyvät väkivaltarikollisuuteen yleisväestössä. Päihdeongelmien on havaittu lisäävän psykoottisten henkilöiden väkivaltarikosriskiä. Koska persoonallisuushäiriöiden osuus mielisairauteen liittyvässä väkivaltarikollisuusriskissä oli epäselvä, tutkimuksessa I määritettiin SCID-IV-haastattelumenetelmää ja objektiivisia tietoja käyttäen elinaikaisten mielenterveyshäiriöiden esiintyvyyttä kansallisesti edustavassa mielisairaiden henkirikollisten ja henkirikoksen yrittäjien otoksessa (N = 90). Tutkimuksessa löydettiin kolme diagnostista kategoriaa: 47 %:lla todettiin kolmoishäiriö (MMD+APD+SUD), 27 %:lla kaksoishäiriö (MMD+SUD) ja 26 %:lla pelkkä mielisairaus (yksöishäiriö). Neljäs ryhmä, APD ilman päihdeongelmia, puuttui. Tutkimuksessa II vertailtiin yksöis- ja kolmoishäiriöisten henkirikoskäyttäytymistä osaotoksessa (N = 58). Kolmoishäiriöiset henkilöt surmasivat useammin päihtyneenä riidan tai tappelun yhteydessä ei-sukulaisen kuin yksöishäiriöiset, joiden henkirikokset liittyivät useammin harhaluuloihin ja kohdistuivat sukulaisiin. Tutkimus osoitti, että APD on mielisairaillakin vakavan väkivaltarikollisuuden riskitekijä, mutta se liittyi aina päihdeongelmaan. Vakavan väkivaltarikollisuuden ennaltaehkäisy edellyttää tehokkaita hoitomuotoja kolmoishäiriöisille. Kaksoishäiriö ilman APD:tä on mahdollisesti eri oireyhtymä kuin kolmoishäiriö, eikä se lisää mielisairaiden henkilöiden vakavan väkivaltarikollisuuden riskiä.

Korkean riskin lasten väkivaltarikollisuuteen johtavien ympäristötekijöiden kohdennettu ennaltaehkäisy on ollut vaikeaa ilman kvantitatiivisia riskilukuja erilaisten riskiryhmien väkivalta- ja rikollisuusriskistä. Tutkimuksissa III ja IV eriteltiin Suomessa vuosina 1981–1993 tuomituista 1 584 henkirikollisesta henkirikoksen uusijat (HR), joiden lasten (G3) ja vanhempien (G1) rikosrekisterejä ja vankiasiakirjoja verrattiin väestörekisteristä saatujen kaltaistettujen verrokkien vastaaviin tietoihin. HR:n lapsilla väkivaltarikollisuusriski (OR) oli 24-kertainen (p = 0.01) ja yleinen rikollisuusriski 17-kertainen (p = 0.0008). HR:n vanhemmilla rikollisuusriski oli 5-kertainen (95 % CI = 1,3–23,1), mutta väkivaltarikollisuusriski ei ollut tilastollisesti merkitsevä (OR = 3; 95 % CI = 0,3–37,6). Väkivaltarikollisten osuus (verrokkeihin verrattuna) oli vanhemmilla 4,4 % (vs. 1,5 %) ja lapsilla 18,2 % (vs. 0,9 %). Kaikkien rikollisten osuus oli 13,2 % (vs. 2,9 %) G1:ssä ja 36,4 (vs. 3,2 %) G3:ssa. Sekä väkivaltarikollisten että rikollisten osuus kontrolleihin verrattuna oli lisääntynyt merkittävästi 1. ja 3. sukupolvien välillä (p = 0,0019, p = 0,0023). Tulokset osoittivat ensi kertaa, että on mahdollista määrittää lapsiryhmien väkivalta- ja rikollisuusriskiä vanhempien vakavan väkivaltarikollisuuden perusteella ja että väkivaltarikollisuusriski voi siirtyä väkivaltarikollisilta heidän lapsilleen.

Yleinen suomalainen asiasanasto: henkirikokset; käyttäytymishäiriöt; mielenterveyshäiriöt; persoonallisuushäiriöt; päihdeongelmat; päihdeongelmaiset; riskikäyttäytyminen; riskitekijät; Suomi; väkivaltaisuus - ennaltaehkäisy; väkivaltaisuus - sukupolvet; väkivaltarikokset; väkivaltarikokset - ennaltaehkäisy; väkivaltarikokset - perhesuhteet;

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Abbreviations

ADHD	Attention Deficit Hyperactivity Disorder
APD	Antisocial Personality Disorder
APA	American Psychiatric Association
AUD	Alcohol Use Disorder
BPD	Borderline Personality Disorder
CD	Conduct Disorder
CI	Confidence Interval
DSM-IV	Diagnostic and Statistical Manual of mental disorders-IV
G1	1st generation, parents of homicide recidivists
G2	2nd generation, homicide recidivists
G3	3rd generation, children of homicide recidivists
HR	Homicide Recidivist (a person who has committed two or more homicides)
HRs	Homicide Recidivists (persons who have committed two or more homicides)
MMD	Major Mental Disorder
OPD	Other Personality Disorder
OR	Odds Ratio
OSUD	Other Substance Use Disorder
PD	Personality Disorder
PDS	Personality Disorders
SCH	Schizophrenia
SUD	Substance Use Disorder

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications:

I   Putkonen A, Kotilainen I, Joyal C.C., Tiihonen J. Comorbid Personality Disorders and Substance Use Disorders of Mentally Ill Homicide Offenders: A Structured Clinical Study on Dual and Triple Diagnoses. Schizophrenia Bulletin, 30:59-72, 2004.

II   Joyal C.C, Putkonen A, Paavola P, Tiihonen J. Characteristics and circumstances of homicidal acts committed by offenders with schizophrenia: Psychological Medicine, 34:433-442, 2004.

III   Putkonen A, Ryynänen O-P, Eronen M, Tiihonen J. The quantitative risk of violent crime and criminal offending: a case control study among the offspring of recidivistic Finnish homicide offenders. Acta Psychiatrica Scandinavica, 106 (Suppl. 412):54-57, 2002.

IV   Putkonen A, Ryynänen O-P, Eronen M, Tiihonen J. Transmission of violent offending and crime in three generations. Social Psychiatry and Psychiatric Epidemiology 42:94-99, 2007.

CONTENTS

1. INTRODUCTION

Violent crime is a significant public health problem causing considerable human suffering and bringing with it huge economic costs. Early prevention has been difficult, partly because epidemiological data on the origins of violent offending in the general population and in specific risk groups is scarce.

Young age, male gender and psychiatric disorders are general risk factors associated with violent crime. Among psychiatric disorders, substance use disorders (SUDs), antisocial symptoms and conduct disorder (CD) are strongly correlated with violent crime. Major mental disorders (MMDs) have been found to be moderate risk factors for violent crime in birth cohort studies (Hodgins, 1992; Tiihonen et al., 1997; Brennan, 2000; Arsenault et al., 2000). Comorbid SUDs have been observed to increase the risk for violent crime among persons with MMDs (Swanson et al., 1990; Eronen et al., 1996a; Hodgins et al., 1996a; Tiihonen et al., 1996; Räsänen et al., 1998; Brennan et al., 2000) but not to explain it alone (Tiihonen et al., 1997; Swanson et al., 2006). However, previous studies carried out on the basis of forensic mental state examination data have not reported higher prevalence of lifetime SUDs among total cohorts of homicide offenders with MMDs (Eronen et al., 1996a; Erb et al., 2001; Schanda et al., 2004) in comparison with the prevalence of SUD among persons with MMD in community studies (Regier et al. 1990; Kessler et al., 2005). Hodgins et al. (1996b) have suggested that it is stable antisocial behaviour rather than substance abuse which is correlated with violent offending among persons with schizophrenia (SCH). However, the literature has provided no direct evidence of the role of APD in severe violence of persons with MMDs. In this thesis, the aim of Study I was to assess the proportions of APD and SUD among a representative sample of psychotic homicide offenders by using a structured diagnostic instrument verified by lifetime documents and previous questionnaires to families and teachers. Study II assessed whether the homicidal behaviour of persons having MMDs comorbid with APD and SUDs (here called triple diagnosis) differed from the severe violence of persons suffering from pure MMD.

A large proportion of the crime problem is attributable to only a small number of persons, who also commit the majority of violent crimes (Tracy et al., 1990).

Family and adoption studies have demonstrated an association between parental and offspring aggressive behaviour, property offending, CD, APD and SUD, but only non-significant transmission of violent offending (Mednick et al., 1984). Twin studies have documented the magnitude of both genetic and environmental (pre- and postnatal, physical and psychosocial) factors on the development of antisocial behaviour. Behavioural genetic studies suggest that the effect of genes in some multi-factorial disorders and behaviours, such as CD, attention deficit hyperactivity disorder (ADHD), APD and even violent offending, is conditional, and modified by exposure to specific early environmental risks. For example, prenatal exposure to substances, childhood neglect or maltreatment (Räsänen et al., 1998; Caspi et al., 2002; Brookes et al., 2006) may initiate the development resulting in violent and antisocial behaviour in adulthood by a genetically vulnerable child. Although many early risk factors have been identified (Caspi et al., 2002, 2004), early preventive interventions have been rare. Prevention, to be effective, should be targeted at high-risk children (Foster et al., 2006). However, it is problematic to identify those most in need, and no quantitative risk ratios of future violent or any crime have been published. Also, the transmission of violent offending and crime throughout generations has remained unclear. The aims of Studies III and IV were to assess the quantitative risk of violent offending and criminality among a total national cohort of children and parents of homicide recidivists (HRs), compared to matched controls, and to study the inter-generational transmission of crime and violent offending.

2. REVIEW OF THE LITERATURE

2.1 Definition and assessment of psychiatric disorders

2.1.1 Definition of psychiatric disorders

The traditional medical model, i.e. the Virchow model, defined a disease as a clinical disorder only if the following five elements were known: etiology, pathology, symptoms, course, and outcome. A syndrome was defined as a collection of symptoms or signs that are present in at least two diseases. Symptom, syndrome and disease represent different levels of knowledge of pathological findings (Hakola 1964, 1973). Most psychiatric disorders are syndromes, not defined diseases.

Historically, the need for nomenclatures for mental disorders was clear but there was little agreement on which disorders should be included, and how they should be organized. The various nomenclatures differed in their relative emphasis on phenomenology, etiology and course as defining features, and were based on available knowledge of psychiatric disorders. The sixth edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-6), published by World Health Organization, included a section on mental disorders (WHO, 1952). In 1952 the American Psychiatric Association published a variant of ICD-6, Diagnostic and Statistical Manual (DSM-I), which also contained descriptions of the diagnostic categories. Later, ICD-9 was developed for the collection of basic health statistics, but without including diagnostic criteria (WHO, 1977). DSM-III was co-ordinated with the development of ICD-9. It was published in 1980 and revised in 1987, and provided a multi-axial system and medical nomenclature for clinicians and researchers (American Psychiatric Association, 2000). DSM-IV was developed on the basis of ICD-9 to reflect the best available clinical and research literature and the large field trials by the National Institute of Mental Health (NIMH), in collaboration with the National Institute on Drug Abuse (NIDA) and the National Institute of Alcohol Abuse and Alcoholism (NIAA). DSM-IV was published in 1994 (American Psychiatric Association, 1994), and its text revision (DSM-IV-TR) in 2000. ICD-10 was published in 1992. The authors of ICD-

10 and DSM-IV worked closely together to coordinate their efforts (American Psychiatric Association, 2000).

The codes and terms of DSM-IV were considered compatible with both ICD-9 and ICD-10. A mental disorder is conceptualized in DSM-IV as "a clinically significant behavioural or psychological syndrome or pattern that occurs in an individual and is associated with present distress, disability, or risk of suffering death, pain, disability, or important loss of freedom. *Whatever its original cause*, it must be a manifestation of behavioural, psychological or biological dysfunction in the individual" (American Psychiatric Association, 2000). Thus, DSM-IV diagnoses are not etiological diagnoses, but rather describe clusters of symptoms of dysfunction.

2.1.2 Diagnostic instruments and personality disorder (PD) diagnoses

Previously, in accordance with the diagnostic hierarchy, only one, the main diagnosis, was used for psychiatric disorders. As a result, PD was not diagnosed in the presence of MMD (Surtees and Kendell, 1979). More recently, the multi-axial system of the Diagnostic and Statistical Manual, i.e. the DSM-classification (American Psychiatric Association, 1994) promoted the possibility of the diagnosis of both lifetime MMD and PD within the same person.

The validity of the unstructured clinical interviews used to assign mental disorder diagnoses was poor (American Psychiatric Association, 2000). Structured diagnostic interviews, the Diagnostic Interview Schedule (DIS) the Structured Clinical Interview for DSM-IV (SCID), and semi-structured interviews (SIDP-IV and SADS), had several advantages, resulting in higher inter-rater reliability and a much more comprehensive assessment of psychopathological symptoms. Diagnostic instruments derived from the DSM-IV Axis II usually have good test-retest and inter-rater reliability, although their validity in assessing the constructs has been questioned (Westen, 1997). Studies that compared different rating instruments at the beginning of the 1990s showed good agreement for people with any PD. However, the average capacity of different instruments to similarly categorize patients by axis II diagnosis was low, partly because of lack of construct validity of specific DSM-IV PDs. Discriminative validity was, however, highest for APD and Borderline PD (Westen, 1997), which have been successfully

studied with these instruments. For example, in the Epidemiological Catchment Area (ECA) study, APD was the only DSM-III Axis II disorder investigated independently of Axis I disorders, because it meets the criteria of a clinical syndrome: the symptoms are highly inter-correlated, it has a genetic component, and it is found in every society (Bourdon et al., 1992). Having a criminal history does not necessarily imply that a person has both conditions of APD diagnosis, i.e. at least two symptoms of CD, and at least three symptoms of adult antisocial behaviour. In selected populations, such as prison populations, the SCID-II may not provide high discrimination power. However, in populations where APD is less common and information on CD and adulthood antisocial behaviour is available, the SCID for Axis II disorders is useful, giving valuable information about the etiology of violent behaviour. Not all persons with APD are violent, and one instance of violent behaviour such as homicide does not indicate a diagnosis of APD. Only one of the seven symptoms of APD is irritability and aggressivity, and three symptoms are needed for the diagnosis.

Studies on different diagnostic instruments have found that PD diagnosis cannot be made purely on the basis of direct questions (Perry, 1992). Clinical observation and objective information on interpersonal interaction over time are also always necessary. This finding emphasizes the importance of clinical examination, and may partly explain the different results from file-based and interview studies. In addition to the subjects' responses to structured interview questions, the use of collateral information is particularly important for diagnosing PDs. Unlike Axis I symptoms, the symptoms of PD are assumed to be both long-standing and generally cross-situational. Knowledgeable informants are therefore particularly helpful (Sher and Trull, 1996).

2.1.3 Comorbidity

Comorbidity, i.e. the co-occurrence of two or more mental disorder diagnoses within one individual, is substantial in community and clinical settings when diagnosed with current diagnostic methods. Although the term "comorbidity" has been questioned in psychopathology research for conceptual reasons, researchers encourage exploration of comorbidity patterns for better understanding of the nature of mental disorders (Sher and Trull, 1996). Possible

models for understanding comorbidity of two mental disorders are: 1. one disorder causes the other, 2. both disorders may be co-effects or co-consequences of a common cause or a disease process, 3. mutual causality may lead to comorbidity, 4. comorbidity may be a chance result attributable to the high base rates of the disorders in a particular setting, and 5. the criteria sets for these two disorders may overlap (Sher and Trull, 1996).

2.2 Psychiatric disorders associated with violent crime

Specific DSM-IV-TR criteria of the disorders are presented in the Appendix.

2.2.1 Major mental disorders (MMDs)

The lifetime prevalence of MMDs (DSM-IV) was 3.5% in the recent Health 2000 Study of a nationally representative sample (N=8,028) of the population aged over 30 years in Finland (Perälä et al., 2007). The diagnoses were assessed using the Composite International Diagnostic Interview from self-reports, medical examination, and national registers. Lifetime prevalence of SCH was 0.87, of schizoaffective disorder 0.32%, of schizophreniform disorder 0.07%, of delusional disorder 0.18%, of bipolar disorder 0.24%, of major depressive episode with psychotic features 0.35%, of substance-induced MMD 0.42%, and of MMD due to general medical condition 0.21%. In the ECA Study, 0.6%-1.2% of the US population aged 25 years or over was diagnosed with SCH (Regier, 1990).

In the UK, 4.4% of the general population reported incident psychotic symptoms in the British National Psychiatric Morbidity Survey of household population (N=8580). Persons living in rural areas, those with few close friends and relatives, smokers, those who drank in a harmful manner, and those with many adverse life events had an increased risk of incident psychotic symptoms (Wiles et al., 2006).

2.2.2 Personality disorders (PDs)

DSM-IV-TR (American Psychiatric Association, 2000) defines a PD as an enduring pattern of inner experience and behaviour that deviates markedly from the expectations of the individual's culture, and is manifested in at least two of the following areas: cognition, affectivity, interpersonal functioning and impulse

control. It is pervasive and inflexible across a broad range of personal and social situations. It leads to clinically significant distress or impairment in social, occupational or other important areas of functioning. The pattern is stable and of long duration, and its onset can be traced back at least to adolescence or early adulthood. It is not better accounted for as a manifestation or consequence of another mental disorder, nor due to the direct physiological effects of a substance or a general medical condition.

The prevalence of any DSM-III PD was 13.4% in a structured interview study of a representative sample of the community population of Oslo studied without objective anamnestic data. Prevalence was highest among less educated persons living in the centre of the city (Torgesen et al., 2001).

Despite the definition of PD as inflexible, pervasive, stable and of long duration, research increasingly reveals that PD patients show major fluctuations. For example, in a multi-site UK study, 40% of patients with borderline PD no longer met the criteria after 6 months of follow-up (Coid, 2003). However, measures of personality using the 5-factor model of neuroticism, extraversion and other personality inventories remained stable. Coid (2003) concluded that while personality may show stability over time, PD fails to do so.

2.2.3 Antisocial personality disorder (APD)

"APD is a pattern of disregard for and violation of the rights of others" (American Psychiatric Association, 2000).

In previous literature, APD has a prevalence of 2-3% in most Western societies, and is 4–5 times more prevalent among men than women (Coid, 2003). The lifetime prevalence of APD in the US general population according to the ECA Study was estimated to be 4.5% among males and 0.8% among females (Regier et al., 1990). The 2001–2002 National Epidemiologic Survey of Alcohol and Related Conditions (NESARC) studied the DSM-IV diagnoses in a representative sample of the US population. APD was diagnosed in 3.6% (5.5% of males and 1.9% of females), adult antisocial behaviour in 12.3%, and CD without APD in 1.1% of the adult population (Compton et al., 2005). Two European surveys based on structured clinical interviews in the general population without objective anamnestic data indicated a lower prevalence of DSM-III APD: 0.7% in Oslo

(Torgesen et al., 2001), and 0.6% in the UK (Coid, 2003). The highest prevalence rates in the NESARC study were in the 25 to 44 years age band and in inner-city populations. The symptoms were thought to diminish in middle age, but 20% of those with previous APD diagnosis continued to meet the criteria at 45 years of age (Compton et al., 2005). The prevalence rates of APD in societies are highly dependent on the sampling method, since persons with APD are unevenly distributed in societies, and their numbers are likely to accumulate in institutions and antisocial subgroups seldom interviewed in cross-sectional diagnostic studies of general populations. In a meta-analysis of 62 surveys (N=23,000), about half of the prisoners in western countries met the diagnostic criteria of APD including CD symptoms (Fazel and Danesh, 2002).

Comorbidity of APD with other psychiatric disorders is very common. As many as 84% of individuals in the US having APD also had alcohol use disorder, and a strong association of active APD with SCH and mania has been reported (Regier et al., 1990). In the National Comorbidity Survey (N=5,877), over half (54%) of the persons with APD had a comorbid anxiety disorder (Goodwin and Hamilton, 2002). The reason for the strong comorbidity of APD and SUDs is unknown. Compton et al. (2005) suggested that the reason could be a common neurobehavioral disinhibition factor in the risk for both SUDs and APD, which includes a prominent component of impaired executive decision making in youth at risk for SUDs.

APD is associated with increased rates of many aversive consequences: chronic offending, violent crime, school drop-out, homelessness, lower socio-economic status, and raised mortality in early adulthood (Coid, 2003; Compton et al., 2005). A subgroup of persons having APD also meets the criteria of psychopathy defined by Hare (Hare, 1991). Among male psychopaths assessed with SCID in UK prisons (Coid, 1992), APD was the most common DSM-III PD (86%), and in Broadmoor Secure Hospital the second most common (38%) after BPD. Among female psychopaths in three secure hospitals, 44% of subjects had APD (Coid, 1992).

2.2.4 Conduct disorder (CD)

"CD is a repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated" (American Psychiatric Association, 2000).

CD is one of the most frequently diagnosed child psychiatric disorders. Its prevalence has increased over recent decades, and may be higher in urban than in rural settings. Rates vary depending on the nature of the population and methods of ascertainment. Among males, from 6% to 16%, and among females, from 2 to 9%, of persons have suffered from CD during their lifetime (American Psychiatric Association, 2000).

In the ECA Study, approximately one in three children with CD had adulthood APD (Robins, 1978; Robins and Price, 1991). Of those with CD, 51% went on to have APD in the early period, whereas only 15% of those not meeting the criteria of CD later had adulthood APD. The combination of CD and ADHD was found in 78% of those with early APD. APD in early adult life was predicted by three variables: CD, hyperactivity, and any transitional crime. CD predicted later SUDs and other psychiatric disorders. The severity of conduct problems is an important predictor of outcome (Robins, 1993; Simonoff et al., 2004), for example, the number of hyperactive and CD symptoms (Hill, 2003). Hyperactivity and CD showed equally strong prediction of APD and criminality in a British twin study (N=225 twins, Simonoff et al., 2004). Conduct problems in young children were associated with many other adverse factors, such as ineffective parenting practices, discordant and unstable families, poor peer relationships and educational failure. However, such problems predicted APD independently of these family and social factors (Hill, 2003). As many as 40% of children with CD had serious psychosocial disturbances in adulthood, including SUD, MMD, higher risk of mortality and APD (Coid, 2003). In the ECA study, CD was associated with criminality through its association with juvenile delinquency, substance abuse, and adult antisocial behaviour. Four specific dimensions of conduct problems were significantly related to crime: truancy, running away from home, vandalism and fighting. Over 90% of juvenile delinquents have had CD as children (Scott, 1998).

Early versus late starters

Persistent and pervasive aggressive and disruptive behaviour before age 11 was strongly associated with the persistence of antisocial behaviours through adolescence into adulthood in the Cambridge study (Farrington et al., 1975). Children with early onset aggressive and disruptive behaviour differed from those with later onset. They had lower IQs, more attentional and impulsivity problems, neuropsychological deficits, and greater peer difficulties, and were also more likely to come from adverse family circumstances than the adolescence-onset group. In the Dunedin Multi-disciplinary Health and Development Study, the early starters also had more self-reported crimes, more fights and higher rates of convictions for violent offences. They were more likely to use violence in their partner relationships, hit their children, and have disagreements with co-workers and supervisors. The age at onset-distinction has good predictive validity. However, late-onset antisocial behaviours may have more long-lasting consequences than previously supposed (Hill, 2002). In the Cambridge study, the late starters were more likely to commit undetected crimes in adulthood, even though their work performance and close relationships were unimpaired (Nagin et al., 1995)

2.2.5 Borderline personality disorder (BPD)

DSM-IV defines BPD as "a pattern of instability in interpersonal relationships, self-image and affects, and marked impulsivity" (American Psychiatric Association, 2000).

The prevalence of BPD has been estimated to be about 2% in the general population, about 10% among patients in outpatient mental health clinics, and about 20% among psychiatric inpatients (American Psychiatric Association, 2000). It is more prevalent in younger age-groups (19–34 years), and among females (75% vs. 25%). BPD is the most frequent PD found in in-patient settings, although APD may cause more burdens on society and the criminal justice system (Coid, 2003).

BPD is associated with poor work history and single marital status, and is more common in urban areas. It is often comorbid with SUD, APD, and mood disorders (American Psychiatric Association, 2000), and has a 9% suicide rate (Coid, 2003). BPD was the most common (91%) DSM-III PD assessed with SCID among female

psychopaths in UK secure hospitals. Among 150 male psychopaths from UK secure hospitals and prisons, over half (55% and 56% respectively) had BPD (Coid, 1992), and also often APD (38% and 86%).

2.2.6 Substance use disorders (SUDs)

Substance Abuse is a maladaptive pattern of substance use manifested by recurrent and significant adverse consequences related to the repeated use of substances. Substance Dependence is a cluster of cognitive, behavioural and physiological symptoms indicating that the individual continues the use of the substance despite significant substance-related problems. Repeated self-administration can result in tolerance, withdrawal, and compulsive drug-taking behaviour (American Psychiatric Association, 2000).

Epidemiology

In the 2001–2002 NESARC study, the lifetime prevalence of self-reported DSM-IV use disorder for different substances was as follows: AUD 30% of the US population (42% among males and 19% among females); any drug use disorder 10% (13% and 7%), amphetamine use disorder 2% (2.5% and 1.5%) (Compton et al., 2005), hallucinogen use disorder 1.7% (2.5% and 1%), marijuana use disorder 8.5% (11.8% and 5.4%), cocaine use disorder 2.8% (3.9% and 1.8%) and opioid use disorder 1.4% (2.0% and 0.9%). The structured clinical DSM interview studies resulted in lower prevalence rates. The National Comorbidity Survey Replication (NCS-R) study of a nationally representative survey of English-speaking household residents in the US found SUD only in 15%, AUD in 13%, alcohol dependence in 5%, drug abuse in 8%, and drug dependence in 3% (Kessler et al., 2005). Among the adult population of Oslo, the lifetime prevalence of AUD was 33% (alcohol dependence in 13% plus alcohol abuse in 20%). The 12-month prevalence was 16% for lifetime alcohol use disorder; 10% for dependence and 6% for abuse (Kringlen et al., 2001). Comorbidity of different SUD, APD, SCH, mood and anxiety disorders is common. Comorbid symptoms such as depression may also result from intoxication and withdrawal (American Psychiatric Association, 2000).

SUDs and risk of violent behaviour

SUDs are associated with increased risk of aggressive behaviours toward self and others (Eronen et al., 1997). Substance intoxication and withdrawal states can be associated with increased anxiety, irritability, agitation, impaired impulse control, disinhibition, decreased pain sensitivity, and the impaired reality testing hypothesized to account for the increased aggressive behaviours (American Psychiatric Association, 2006). In particular, intoxication with alcohol, cocaine, methamphetamine, PCP, anabolic steroids, and hallucinogens may be associated with aggression. Withdrawal syndromes from alcohol, opioids, sedatives, hypnotics, and cannabis can also increase violent behaviour (American Psychiatric Association, 2006).

Type 1 and 2 alcoholism

Alcohol dependence is a heterogeneous disorder. Cloninger et al. (1981; Cloninger, 1987) defined two different types of alcoholism on the basis of clinical features and patterns of heritable personality traits. Type 1 begins in adulthood with dependence on the anxiety-relieving effects of alcohol, and is unassociated with antisocial behaviour. Such anxious and socially conforming persons are low in novelty seeking, and high in harm avoidance and reward dependence. Type 2 is more heritable, and associated with early onset SUD and antisocial behaviour and with abuse of many substances for their euphoric effects. It is also associated with impulsive-aggressive temperament and high novelty seeking since childhood. Further, Type 2 persons score low in harm avoidance and low in reward dependence (Cloninger, 1987). In spite of individual variations in the degree of the traits, this typology has subsequently proved useful. The great majority of persons having alcohol dependence belong to type 1 and seldom behave violently. Persons suffering from type 2 alcoholism are prone to violent behaviour during alcohol intoxication, and often have APD (Cloninger, 1995). No studies have been published on type 1 or type 2 alcoholism among patients with SCH.

Differences of brain dopaminergic neurotransmission have been reported among type 1 and type 2 alcoholics. Type 1 alcoholics have lower dopamine 2 (D2) receptor densities in the striatum than type 2 alcoholics or healthy controls (Tiihonen et al., 1995). A common functional genetic polymorphism in the COMT

gene, which results in a three to four-fold difference in COMT enzyme activity, was significantly more common among type 1 alcoholic populations in Finland than in the general population (p=0.0004) (Tiihonen et al., 1999). Since ethanol-induced euphoria is associated with the rapid release of dopamine (DA) in limbic areas, subjects who inherit the allele encoding the low activity COMT variant may have a relatively low dopamine inactivation rate, and therefore be more vulnerable to the development of ethanol dependence (Tiihonen et al., 1999). Whole hemisphere autoradiography studies (Tupala et al., 2001, 2003) confirmed that lower D2 receptor density in the nucleus accumbens, amygdala and brain reward circuits was also specific for type 1 alcoholism. These differences supported Cloninger's neurogenetic model of two alcohol subtypes.

Virkkunen et al. (1994) reported an association between extreme impulsive violent behaviour and low cerebrospinal fluid concentration of serotonin metabolite 5-HIAA. However, a later study showed larger abnormalities in low glucagon and non-oxidative glucose metabolism than in 5-HIAA levels among habitual violent offenders with alcoholism (Virkkunen et al., 2007). Variations in human serotonin transporter gene promoter region (5-HTTLPR) may moderate an individual's psychopathological reactions to stressful experiences (Caspi et al., 2004). The shorter (s) allele having lower transcriptional activity has been observed to be associated with lower levels of serotonin uptake, type 2 alcoholism, and both violent and suicidal behaviour (Hallikainen et al., 1999; Nolan et al., 2000).

2.2.7 Dual and triple diagnoses of persons with MMDs

Dual diagnosis: MMD with SUD

SUDs are more common among persons with MMDs compared to the general population. In the ECA study, the lifetime prevalence of SUDs in the US among persons with SCH was 47%, compared to 16.7% in the general population (Regier et al., 1990). About a third (33.7%) of persons with SCH had a lifetime AUD (vs. 13.5% of the general population). In selected samples, the prevalences are even higher. For example, as many as 92.3% of prisoners with SCH in the ECA study also had SUD (Regier, 1990). However, the prison populations did not include offenders who had been found "not guilty by reason of insanity". Increased

vulnerability to substance abuse has been documented before and after the psychotic symptoms of a person with SCH (Hambrecht and Hafner, 1996). Demographic correlates of SUD among persons with SCH are similar to those of the general population. Males, younger people, and persons of lower education are more likely to have alcohol and drug use disorders (Mueser et al., 2000).

SUDs among persons with MMDs and associated with poor treatment outcome (Drake and Mueser, 2000), increased psychotic symptoms (Negrete et al., 1986), medication noncompliance (Drake et al., 1991), hostile and threatening behaviour (Drake et al., 1991), depression, suicidal behaviour, and psychosocial problems such as homelessness (Drake et al., 1991). However, substance users generally have fewer negative symptoms, more social contacts, better social – leisure functioning, but more interpersonal and family problems and earlier age of psychiatric hospitalization (Salyers and Mueser, 2001).

Cannabis abuse in MMDs

A meta-analysis of 53 studies reported life-time cannabis use in a mean 42%, and current use in a mean 23%, of psychotic individuals (Green et al., 2005). All the results demonstrated higher prevalence of cannabis use among psychotic individuals than in the non-psychotic population. Cannabis exacerbates psychotic symptoms and increases the risk of psychotic relapse (Linszen et al., 1994). The frequency of cannabis use was the strongest predictor of relapse over 12 months among young people with recent-onset psychosis, in comparison with other risk factors such as medication adherence, duration of untreated psychosis, stress, and expressed emotion among young people with recent-onset psychosis (Hides et al., 2006). The distal effects of cannabis use over three or four years are more strongly associated than recent cannabis use with the onset of psychosis. Abuse of cannabis has been associated with the development of SCH (Arsenault et al., 2004) and age at onset of psychosis (Barnes et al., 2006). In a Danish follow-up study, as many as 45% of 535 persons treated for cannabis-induced psychosis were later diagnosed with SCH spectrum disorders (Arendt et al., 2005). Paranoid SCH was the most common diagnosis (N=167, 31%).

MMD with APD and SUD

The prevalence of APD is higher among persons with SCH than among the general population. In the ECA study, the prevalence compared to the general population was about 7-fold among males and 12-fold among females (Robins et al., 1991; Robins, 1993). In another community study, 23% of men and 17% of women with SCH had DSM-III APD (Hodgins et al., 1996b). Among persons with MMD in different treatment settings, the prevalence of comorbid APD was highest (81%) in prisons (Abram and Teplin, 1991; Hodgins et al., 1996b). In a multi-site (after-care) study in Canada, Finland, Germany and Sweden, the prevalence of DSM-IV APD was 26% among discharged male forensic patients and 15% among discharged male general psychiatric patients with SCH-spectrum disorders (N=232) (Moran and Hodgins, 2004; Hodgins et al., 2007).

The prevalence of SUD among persons having both MMD and APD in communities is unknown. In the After-care study (Moran and Hodgins, 2004), prevalence was 82% in persons having APD and SCH and 41% in persons with SCH but no APD (p<0.001). AUD was diagnosed in 77% (vs. 51%), and drug use disorder in 65% (vs. 38%) of the study population. The same study (Moran and Hodgins, 2004) did not indicate any differences in the course and symptoms of SCH between persons with a comorbid APD and those without one. However, APD-SCH patients had higher scores in the Psychopathy Check-List Revised (PCL-R, Hare, 1991), i.e. more often showed lack of remorse or guilt, shallow affect, lack of empathy, and failure to accept responsibility for their own actions. They had committed more crimes (mean 23 vs. 6), and more violent crimes (mean 5 vs. 2). However, the rate of homicides was not significantly higher among these patients. A strong association between APD and childhood attention/concentration problems, poor academic performance, placements in institutions before age 18 years, and a father with criminal record and violent offending was reported among persons with SCH (Moran and Hodgins, 2004).

The earlier studies had reported an association of APD with early-onset substance use and persistent, particularly non-violent, criminality from adolescence onwards (Hodgins et al., 1996b; Tengström et al., 2001), more severe psychiatric symptoms, and a stronger family history of SUD and psychiatric hospitalization in SCH (Mueser et al., 1997). APD has also been associated with

increased severity of substance abuse, psychotic symptoms, and violent behaviour (Moran et al., 2003).

As many as forty per cent of the Dunedin birth cohort members with SCH had met the criteria of CD by age 15. CD was associated with earlier age of onset of SCH (Kim-Cohen et al., 2003). Among out-patients with dual diagnosis (MMD+SUD; N=178), those with adult APD symptoms without CD had the most severe drug abuse, followed by those with full APD, compared with those with CD only and no APD. Full APD patients had the greatest criminal justice involvement. The authors suggested that a late-onset APD subtype may develop in MMD secondary to substance abuse, but much criminal behaviour in patients with dual disorders may also result from early onset of full APD (Mueser et al., 2006).

2.3 Violent crime

Violent crime is a significant public health problem, causing severe medical and social problems (Lopez, 2006), considerable human suffering and huge economic costs (Miller et al., 1993). Young age, male gender, and psychiatric disorders (Hodgins, 1992) are general risk factors for violent crime. The total incidence of violent crime is unknown, since a high proportion of such crime remains undetected, unregistered and uncleared. For example, in the 2000 International Crime Victims Survey of 17 countries, the percentage of robbery offences reported to police varied from 30 to 75%, assaults from 15 to 70%, and sexual assaults from 28 to 65%, of the rates reported by victims in population studies (Ministry of Justice Reports, 2002). In addition, many national differences in definitions of violent crime, recorded crime figures and methods of data collection hamper the comparison of national statistics of less severe violent crime. Severe violent crimes such as homicides and attempted homicides are likely to be more comprehensively reported, investigated and recorded than less severe ones.

A large proportion of crime problems is attributable to only a small number of persons who commit the majority of violent crimes (Tracy et a al., 1990). For example, in the retrospective Philadelphia 1945 birth cohort study (N=9,945 males), the 6% of offenders with at least five police contacts at age 17 were responsible for over half of the delinquency in the birth cohort. These offenders had committed about 70% of the homicides, rapes, and aggravated assaults, and

over 80% of the robberies. At age 30, chronic offenders constituted 15% of the cohort, and had committed 74% of the official crimes. They also accounted for over 80% of the personal injury offences and property offences recorded since the onset of their career. Tracy et al. concluded that in any group of cohort subjects, the offences are distributed unevenly. Most are never arrested, some commit a few crimes and then desist, while others will reoffend frequently, and some very frequently (Tracy et al., 1990). Thus the greatest contribution to reducing violent crime is likely to be achieved if early prevention efforts can be targeted at the populations with the highest risk for recidivistic violent offending.

2.3.1 Homicides in Finland

The annual clearance rate of homicides has traditionally been high, over 85–95% (International Criminal Police Organization), and many of the outstanding uncleared cases each year have been solved during the following years (Oral information from Statistics Finland). The annual number of homicides has remained relatively stable, varying between 168 and 183 during the nineties (Lehti, 2002). Lehti studied homicides committed in Finland between 1998 and 2000. The majority (91%) of the homicide offenders were males (N=507), as were 72% of the victims (N=300). Only 50 of the homicide offenders and 118 of the victims were female. Geographically, the incidence of homicide was highest in Northern and Eastern, and lowest in Southern Finland. The mean age of the offenders was 41–42 years. Prevalence was highest among 30–34 year old men and 40–44 year old women. Only three offenders were younger than 15 years. Approximately half the homicides were associated with alcohol abuse of socially and economically marginalised men. Of the offenders, 44% were unemployed (vs. 6-9% of the general population during the study period). The employed offenders were unskilled labour or without a trade. As many as 77% had earlier criminal convictions (vs. 27% of the general population), and 54% had committed earlier violent crimes (vs. 5% of the general population). The majority of homicide offenders (72%) had previously committed more than two, and one in four more than five violent crimes. The victim was usually a friend (56%) or family member (35%), and unknown in only 9% of the homicides. All the child victims were killed by family members (Lehti, 2002).

The majority of homicides were committed in a private residence (72%). The most common weapons used were a knife (46%) and a gun (23%). No weapon was used in 16%. Both the offender and the victim were intoxicated during 85% of the homicides; only 8% of male and 25% of female offenders were sober. The most common motives were quarrels when intoxicated (27%), and conflicts between current or ex-spouses or with new partners (24%). Conflict between criminals preceded 4% of the homicides (N=12). Five of these were associated with organized crime. Two of the homicides were sexual crimes. In 6% of the homicides (N=26), the offender committed suicide after the homicide (Lehti, 2002).

About 10% of homicides were classified by police in the category "associated with mental disorders". Half of these homicides occurred between close relatives. These homicides, usually caused by psychotic motives, included 43% of all matricides, and a third of homicides against the person's own children. Also, 9% of spousal homicides belonged to the class "associated with mental disorders". In a quarter of the homicides, the victim was a friend, and in a quarter an unknown person. About half of these offenders were intoxicated (Lehti, 2002).

2.4 Psychiatric disorders and violent crime

2.4.1 Psychiatric disorders and violent crime in the general population

Several studies have reported the association between psychiatric disorders and violent crime. The optimal study design might be a prospective study, comparing the occurrence of violent behaviour between persons with and without clinically assessed psychiatric disorders in large, unbiased birth cohorts with validated psychiatric diagnoses and unbiased method to clarify the criminal behaviour. Birth cohort studies are very laborious and expensive, and few have been carried out. The Copenhagen and Stockholm (Hodgins, 1992) and Oulu (Tiihonen et al., 1997; Räsänen et al., 1998) studies were carried out using registered data of both crime and mental disorders, and the Dunedin study using both crime registers and self-reported crime and psychiatric disorders (Arsenault et al., 2000). The risk (Odds Ratio) of violent crime in the Dunedin Study (New Zealand) was 1.9 (95% CI=1.0–3.5) among persons with alcohol dependence, 3.8 (95% CI=2.2–6.8) among persons with marijuana dependence and 2.5 (95% CI=1.1–5.7) among persons

with schizophrenia-spectrum disorder. Persons with at least one of these disorders constituted one fifth of the sample, but accounted for half of the violent crimes (Arsenault et al., 2000).

In birth cohort studies from Finland (Tiihonen et al., 1997), Sweden (Hodgins, 1992), and Denmark (Brennan et al., 2000), and studies using psychiatric case registers in Australia (Wallace et al., 1998) and the UK (Wesley, 1994) the risk of becoming a violent offender was two to six-fold for males and two to eight-fold for females among persons with MMDs, compared to the same-aged general population. In the 26-year Prospective Study of the 1966 Northern Finland Birth Cohort data (N=11,017), 14% of persons with SCH and 17% of persons having mood disorders with psychotic features had committed violent crimes. The OR of violent offending was 7.0 for all cohort members with SCH, and 8.0 for those having mood disorders with psychotic features. When the lowest and the highest socioeconomic classes were compared with the reference group, no marked correlation between criminality and socioeconomic status was found (Tiihonen et al., 1997).

The association of specific psychiatric disorders with violent crime was clear in the Epidemiologic Catchment Area (ECA) Study on a cross-sectional population sample of 18,571 adults in years 1980 and 1984 at five sites in the US (Bourdon et al., 1992). DSM-III psychiatric disorders at any time of life were obtained from personal interviews, and comprehensively linked with self-reported crime at three sites (Robins, 1993). The sample was weighted to represent the structure of the nation, including institutional residents (Robins, 1993). A greater proportion (55%) of people with a psychiatric disorder, compared to those without one (20%), reported violent behaviour in the past year (Swanson et al., 1990). The most prevalent disorders among violent persons were SUDs (42% vs. 5% among non-violent persons) (Swanson et al., 1990). Since the ECA study was based on self-reporting of arrests and convictions, and lacked independent verification of criminality (Robins, 1993) or psychiatric history, the results were likely to be underestimates.

Recently, a cross-sectional interview survey of national household population in England, Wales and Scotland (N=8,397, Coid et al., 2006) reported associations between DSM-IV psychiatric disorders and the severity, chronicity and victims of

violence. Hazardous drinking was associated with over half of the incidents involving injury. Persons who reported violent behaviour when intoxicated were more likely to report injuring a victim (OR=42) and being injured (OR=35). Violence when intoxicated was increased 5-fold by alcohol dependence and nearly 3-fold by drug dependence. Occurrence of a PD doubled the risk of violence when intoxicated. APD independently increased the risk of violence when intoxicated by 3.3-fold. Nearly one in three persons with APD reported being violent when intoxicated. Persons with PDs and substance dependence were more likely to report violent incidences, injuries to their victims, injuries to themselves, multiple violent incidences and multiple victim types. APD brought the greatest risk, over 4-fold, of injury to the victim. The population attributable risk for victim injuries of the disorders (i.e. the proportion of injuries that could have been prevented if the disorder had been eliminated), was 24% for APD, 30% for alcohol dependence, 21% for drug dependence, 37% for any PD, 51% for hazardous drinking, 14% for neurotic disorders and only 1% for psychosis. Thus, prevention of APD would have reduced the proportion of persons reporting injuries to others by almost a quarter. Psychosis was independently associated only with an increase in recidivistic violence (reporting 5 or more violent incidents). The study measured self reported victim injuries in self-reported psychosis, and lacked objective data (Coid et al., 2006), like many community studies. Self-reported crime rates may supply more information about total criminal behaviour than crime registers because of the high rate of unregistered less severe violent crimes. However, the studies may exclude the most severely violent, psychotic and antisocial individuals, who live in institutions or antisocial subgroups or are homeless, and therefore underestimate the association between the most severe psychiatric disorders and criminal behaviour.

2.4.2 Violent offending among persons with MMD

Fazel and Grann (2006) compared the hospital discharge registers (N=98,082) and crime registers (N=303,264) in Sweden to study the population attributable risk of persons with MMDs. Among persons with MMDs, 6.6% (vs. 1.8% of the general population) had been convicted of violent crime, with a mean of 3.2 times per psychotic person. About 0.3% of patients (N=21) vs. 0.1% of the general

population (N=118) were convicted at least 10 times. The overall crude OR for violent crime was 3.8. The OR was higher among women (6.1), than among men (4.0). Psychotic male patients committed approximately nine times more violent crimes (427 crimes per 1000 male patients) than female patients (47 per 1000 female patients). The OR of males was the highest among those aged 25–39 years (OR=10), while the OR of females was highest in the age group over 40 years (OR=5.7). For SCH, the OR was 6.3, and for other psychoses 3.2. The population attributable risk fraction (PAF) was, however, higher for other psychoses (2.9%) than for SCH (2.3%). The highest risk fractions among persons with MMD were reported for homicide and attempted homicide, 18.2%, and arson, 15.7%. The PAFs for other crimes were 7.5% for threats and harassment, 6.3% for assaulting an officer, 4.9% for sexual offences, 3.6% for robbery, and 3.1% for common assault. In several studies, the effect of MMDs has been higher for women than for men (Hodgins et al., 1996a; Hiday et al., 1998; Wessely, 1998). Nearly a fifth of community-dwelling women with chronic psychosis (N=304) in UK committed assault during a two-year follow-up study (Dean et al., 2006). Assaultive behaviour (according to self-reports, case notes and manager's reports) was associated with previous violence (OR=5.9), non-violent convictions (OR=2.6), victimization (OR=2.5), and cluster B personality (OR=2.7) (Dean et al., 2006).

The risk of violence among persons with MMD is associated with many factors such as medication non-compliance (Vartiainen and Hakola, 1992), and active psychotic symptoms (Link and Stueve, 1998). The National Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) project (Swanson et al., 2006) investigated the correlates and prevalence of minor and serious violence (any assault using a lethal weapon or resulting in injury, any threat with a lethal weapon; or any sexual assault) during the previous six months. The family and self-reports of 1,410 inpatients and outpatients with SCH living in the community at 56 sites in the US were studied. Inclusion criteria included SCH, decision-making capacity, and e.g. suboptimal antipsychotic treatment. Treatment resistant and mentally retarded patients were excluded. The results indicated that positive psychotic symptoms, such as persecutory ideation, increased the risk of minor and serious violence, but only when the scores for negative symptoms were low. Five

out of seven positive symptoms on the Positive and Negative Symptom Scale (PANSS) were significantly associated with serious violence: hostility, suspiciousness/persecution, hallucinatory behaviour, grandiosity, and excitement. In particular, the combination of delusional thinking with suspiciousness/ persecutory ideation was strongly associated with serious violence (OR=2.9). Five out of seven specific PANSS negative symptoms decreased the risk of serious violence: lack of spontaneity and flow of conversation, passive/apathetic social withdrawal, blunted affect, poor rapport and difficulty in abstract thinking. Childhood conduct problems were significantly associated with any violence. Serious violence was associated with psychotic and depressive symptoms, CD, and victimization. The authors concluded that specific clusters of symptoms may increase or decrease violence risk in SCH patients (Swanson et al., 2006).

2.4.3 The prevalence of MMD among homicide offenders

SCH is over-represented among homicide offenders. In UK prisons, 10.9% of males convicted of homicides had SCH (Taylor and Gunn, 1999). However, the prison samples exclude those in hospitals. Among 1,423 arrested homicide offenders in Finland over a 12 year period, 93 individuals, amounting to 7% of male (N=1,302) and 7% of female homicide offenders (N=127) had SCH diagnosis in forensic psychiatric evaluations for court proceedings (Eronen et al, 1996c). The types were paranoid SCH in 50%, undifferentiated SCH in 23%, disorganized SCH in 11%, residual SCH in 3% and catatonic SCH in 1% of offenders. Paranoid, schizoaffective and residual types were over-represented in comparison with the rates occurring in the general population (Eronen et al., 1996c). Schizoaffective disorder was diagnosed in 12% of offenders. Among 36 homicide recidivists (HR) convicted in Finland over 13 years, 67% had alcoholism, 64% PD, 11% SCH, and 6% major depression (Eronen et al., 1996a).

In Austria, DSM-IV diagnoses of homicide offenders with MMDs investigated between the years 1975–1999 were made on the basis of hospital files. 77% of males and 70% of females with MMD had SCH (N=77). The paranoid subtype was the commonest among males (63%), and schizoaffective (35%) among females. Major depressive or manic episodes were not associated with increased likelihood of committing homicide (Schanda et al., 2004).

2.5 Serious violence and comorbid SUD and APD in MMDs

2.5.1 Do SUD and APD increase violent offending in MMDs?

Several studies have indicated that persons with MMDs have an increased risk for community violence, other violent offences and homicide, particularly if they have co-existing SUDs (Swanson et al., 1990; Eronen et al., 1996b; Hodgins et al., 1996a; Tiihonen et al., 1996; Räsänen et al., 1998; Brennan et al., 2000). In the 1966 Northern Finland birth cohort data, 7% of non-alcoholic persons with SCH, and 36% of subjects with dual diagnosis (SCH+MMD) had committed violent crimes. The OR was 3.6 for SCH without SUD. Men with SCH and alcoholism (dual diagnosis) had 25-fold OR for violent behaviour in comparison with mentally healthy men (Räsänen et al., 1998). However, in the CATIE data (Swanson et al., 2006) the significant bivariate effect of substance abuse on serious violence by persons with SCH was rendered non-significant when controlled for age, positive symptoms, childhood conduct problems, and recent victimization. The authors suggested that the effect of substance abuse on serious violence may be indirect, and mediated by serious violence at a young age, childhood conduct problems and arrest history (Swanson et al., 2006). These three mediating factors are also symptoms of APD. Hodgins et al. (1996b) had hypothesized that it is the syndrome of stable antisocial behaviour, rather than substance abuse, which is related to violent offending among persons with SCH. However, no clinical studies of the role of APD in severe violence of a comprehensive sample of homicide offenders with MMDs have been published. Data from high risk subgroups among dually diagnosed (MMD+SUD) persons are important as SUDs are common among persons with MMDs. For example, the lifetime prevalence of SUD among persons with MMDs in the ECA study was 47% (Regier et al., 1990).

Moran et al. (2003) reported an association between premorbid ICD-10 PDs and the number of physical assaults during a two year follow-up among community-dwelling patients with MMD in the UK 700 study data (N=670). However, the seriousness of the assaults was not recorded, and the significant result included all PDs (6% of the sample had dissocial PD according to ICD-10). Persons with severe APD are more likely to be in institutions than in the community. The epidemiology of severe violence may differ from that of more

common and less severe forms of violence, and be more closely associated with individual features. The literature has so far provided no direct evidence of an association between any comorbid PD and the severe violence of psychotic individuals.

It is difficult to study clinically the association of APD, MMD and homicide. The optimal study design, a prospective cohort study, would have to be very large in order to achieve sufficient statistical power, owing to the rarity of both homicides and MMDs in the general population. No such studies have been published. Symptoms of APD are likely to be under-documented since in earlier hierarchic diagnostic nomenclatures, APD was not diagnosed in the presence of MMD. Community studies underestimate the prevalence of APD, since persons with APD tend to gather and reside, or be selected, in populations or facilities with a very high prevalence of APD and SUD (Abram and Teplin, 1991). In most western countries, it is also impossible to obtain objective historical documents for individuals from large populations. Without such documents, CD symptoms, which are needed for the DSM-IV diagnosis of APD, are under-diagnosed, and the resulting prevalence remains low. In many Western countries, prison populations include homicide offenders with MMD (Côté and Hodgins, 1990; Taylor and Gunn, 1984), while other psychotic homicide offenders are resident in psychiatric hospitals. Offenders with MMD and a comorbid APD may be more likely than persons with pure MMD to end up in prison, since they resemble the majority of prisoners, and the causality between homicide and mental illness may be less clear among them. Therefore the hospital or prison populations in countries where MMD is not a criterion for hospital treatment are not nationally representative samples of psychotic homicide offenders. Possibly the next best available method to clarify the roles of APD and SUD in MMDs would be a structured clinical study, verified with lifetime documents, from a nationally representative sample of psychotic homicide offenders, in a country where the clearing rate of homicides is high. No such studies have been available, and the role of APD and SUD in severe violence of persons with MMD has remained unclear.

2.5.2 Prevalence of SUD, PDs and APD among homicide offenders with MMD

The previous studies carried out using forensic psychiatric examination data from nationally comprehensive samples of mentally ill homicide offenders are collected in Table 1. They have indicated lower prevalence of SUDs among male homicide offenders with SCH (8–46%) than among non-psychotic homicide offenders (61%) (see the document study of Gottlieb et al., 1987, Table 1). Documents may have under-recorded comorbid SUD because SUD is substantially under-diagnosed in both psychiatric care settings (Drake and Mueser, 2000; Hansen et al., 2000) and prisons (Abram and Teplin, 1991).

Three national studies of homicide offenders with MMDs have reported the prevalence of comorbid PD diagnoses in the mental state examination reports for court proceedings (Table 1: Lindqvist, 1986; Putkonen et al., 2001; Schanda et al., 2004). Lindqvist found that 9% of psychotic homicide offenders of both sexes (N=34) in Northern Sweden during 1970–1981 were diagnosed with a PD. Hanna Putkonen et al. reported that 32% of female homicide offenders with MMD examined for court proceedings in Finland (N=34) had a PD diagnosis. Among the homicide offenders studied in Austria during 1975–1999, 96 offenders had MMDs. Among the 77 offenders with SCH, 17% of males and 12% of females had PD according to DSM-IV on the basis of forensic psychiatric examinations reports (Schanda et al., 2004). Taylor et al. (1998) studied the records of patients in three UK secure hospitals and diagnosed 231 homicide offenders with ICD-10 psychosis. Among them, 78 had an "independent PD". Since a substantial number of homicide offenders with MMD in UK are in prisons, rather than secure hospitals, the study failed to represent all homicide offenders in UK. No structured clinical studies of the prevalence of PD among a comprehensive sample of homicide offenders have been published. Since the symptoms of PDs may remain undiagnosed in the presence of MMD, these prevalence rates may have been underestimates.

Two previous studies, both published in one article (Erb et al. 2001), have reported the prevalence of comorbid APD among a nationally representative sample of mentally ill homicide offenders (Erb et al., 2001). Only 8% of all male homicide offenders with SCH in West Germany during 1955–1964 (N=284), and 14% of male homicide offenders with SCH in Hessen during 1992–1996 (N=29),

had DSM-III APD. These studies were carried out on the basis of hospital documents and crime registers (see Table 1). No structured clinical studies of the prevalence of APD among a comprehensive sample of homicide offenders have been published. However, a smaller structured study of persons with MMD incarcerated in Quebec penitentiaries (Côté and Hodgins, 1992) reported that 64% of 11 homicide offenders with SCH had APD and 73% had alcohol use disorder. Among 36 persons with affective disorders (2 with bipolar disorder, 5 with atypical bipolar disorder and 29 with major depression), the prevalence of APD was 65–100% and of SUD 60–100% in each diagnostic group. The sample set did not include those mentally ill homicide offenders who had been found "not guilty of homicide by reason of insanity".

Table 1. The prevalence of personality disorders (PD), antisocial personality disorders (APD) and substance use disorders (SUDs) in previous studies of mentally ill persons with homicidal behaviour, calculated on the basis of published data.

Author(s), year	Subjects of the study	Number, gender and diagnostic distribution of mentally ill homicide offenders	Method	Prevalence of		
				PD	APD	SUD
Lindqvist, 1986	All 64 homicide offenders, (60 m + 4 f) in Northern Sweden during 1970–1981.	34 with "mental disease, mainly males"	Diagnoses of forensic psychiatric examination reports were collected.	9% (6%+SUD)	-	32%*
Gottlieb et al., 1987 Gabrielsen et al., 1992	251 of 263 homicide offenders investigated for court proceedings in Copenhagen during 1959–1983	58 with psychosis (42 m + 16 f), 16 of whom with SCH	Diagnoses of psychiatric examination reports were collected. Substance abuse* of A) psychotic and B) non- psychotic offenders.	-	-	A: 33%, (B: 61%) m: 40% f: 12%
Eronen, 1995	124 female homicide offenders examined for court proceedings in Finland 1980–1992	18 f. with SCH	Diagnoses of forensic psychiatric examination reports were collected.	-	-	33%*
Eronen et al., 1996b	1 428 homicide offenders examined for court proceedings in Finland during 12 years (75% of all).	93, (86 m + 7 f) with SCH	DSM-III-R diagnoses were made on the basis of forensic psychiatric examination reports.	-	-	m:44%* f: 43%*
Putkonen H et al., 1998	132 women examined for court proceedings after committing or attempting homicide in Finland 1982–1992, (75% of all females)	15 f. with SCH	Diagnoses of forensic psychiatric examination reports were collected.	-	-	20%*
Erb et al., 2001	All homicide offenders and attempted offenders with SCH in Eastern Germany 1955–1964	276 (232 m + 52 f) with SCH	DSM-III-R-diagnoses were made on the basis of forensic psychiatric examination reports, hospital records, crime registers and annual assessments for court purposes.	-	8%	8%*
	Homicide offenders and attempted offenders with SCH in Hessen (1992–1996)	29 (25 m + 4 f) with SCH	DSM-III-R-diagnoses were made on the basis of forensic psychiatric examination reports, hospital records, crime registers and yearly assessments for court purposes.	-	14%	38%*, 31%**
Putkonen H et al., 2001	125 women examined for court proceedings after committing or attempting homicide	34 f with psychosis	Diagnoses of forensic psychiatric examination reports were collected.	32%	-	-
Schanda et al., 2004	992 homicide offenders in Austria 1975–1999	53 m + 24 f with MMD	DSM-IV diagnoses were made on the basis of hospital registers	m: 17% f: 12%	-	m: 46% f: 12%

*Alcoholism or alcohol abuse or other drugs definitely characterized the daily life, **other substance abuse

m = males, f = females, SCH = schizophrenia, SUD = substance use disorder

2.6 Inter-generational transmission of antisocial and violent behaviour

Family, adoption and twin studies have described the transmission of crime but not of violent offending between parents and children (Mednick et al., 1984). Behavioural genetic studies have measured empirically the genetic-environmental interaction (Caspi et al., 2002, 2004). No previous studies have reported the quantitative risk ratios for violent offending and crime among children or parents of a national cohort of violent offenders compared with controls.

2.6.1 Family studies

Several studies have reported increased criminal behaviour among male relatives of criminal subjects (Farrington et al., 1975; Hutchings and Mednick, 1977; Bohman, 1978). In Stockholm, Jonsson (1967) also compared the parents and grandparents of 100 delinquent boys with the parents and grandparents of non-delinquent boys. The prevalence of criminal offenders among the parents and grandparents of delinquent boys was greater, and increased in every generation. However, in another comparison between the delinquent boys and 222 normal boys (Jonsson and Kälvsten, 1964), no association between sons' and fathers' criminality was found. Nevertheless, there was an association between alcohol abuse of fathers and their sons (Andersson et al., 1976). Among the children of major offenders, the crime rate was twice as high as among the offspring of non-offenders (Wilson, 1975).

Eva Johanson (1981) followed up 128 young male recidivistic property offenders consecutively released from a Swedish youth prison in 1951, along with controls from the same parish, and also collected data concerning the parents and children of the offenders. Of the index offenders, 46% had previously committed at least one violent crime (the most serious crimes were one aggravated assault and one rape). The crime records and medical data of the families of the controls and the families of index offenders were compared without calculating quantitative risk ratios. Ten of the 128 controls were registered for crimes. The fathers and brothers of the index subjects were significantly more often registered for any crime than the fathers and brothers of the controls. The sons of the inmates had a significantly increased crime rate (18 out of 41 sons=44%, p=0.01) in comparison with the sons of the controls (N=3), and there was also more non-severe violence

among them. Among the daughters, criminality was infrequent (N=1), as well as among the daughters of the controls. The crimes of the sons of the original subjects were more often violent than the crimes of the parents, although no severe violent crimes were registered. In the comparison of the three generations, 6 out of 18 criminal children (33%) had 5 grandfathers with crime register, and 4 also had a grandmother registered of crime. No quantitative risk ratios were published, but Johanson concluded that the criminality did not appear more often in three generations than could be expected by chance (Johanson, 1981).

Predictors of crime and violent offending in family studies

In the Cambridge Study in Delinquent Development (Farrington et al., 1975; Farrington, 1979; Farrington, 1990), 383 boys from a low-income London suburb were followed up to age 32, and the conviction records of children and their parents were compared. At the age of 24–25 years, 51% of the convicted fathers (N=102) vs. 24% of the non-convicted fathers (N=281), had a delinquent son. Of the criminal fathers, 38% had a recidivistic son compared with 12% of the non-criminal fathers. Only 6% of the sons accounted for 52% of the recorded convictions. There was a close link between paternal convictions from a long time previously, before the son was born, and the delinquency of the sons. Among the sons whose mother, but not father, had convictions (N=21), 45% had been convicted. Among those sons whose father, but not mother, had convictions (N=73), 45% had been convicted. Among the sons with both parents convicted (N=29), 65% were delinquents, compared with only 22% of the sons with no parents convicted (N=260). In the whole cohort, up to age 32, 37% of the sons had been convicted of criminal offences. The peak age for the number of offences was 17 years. Those who were convicted at the earliest ages tended to become the most persistent offenders, committing a large number of offences at high rates and over long time periods. The convicted men differed significantly from the non-convicted men in most aspects of their lives. The most important childhood predictors of crime were socio-economic deprivation, poor parenting, family deviance, school problems, hyperactivity-impulsivity-attention deficit, and antisocial behaviour as a child (Farrington, 1995). The familial precursors of violent

offending and chronic offending were parental criminality, poor parental supervision and separation from parents (Farrington, 1991).

In the Copenhagen birth cohort with follow-up time up to age 34 (N=4,269), violent offences were predicted by the combination of birth complications and maternal rejection, but not by either of these alone. This combination also differentiated violent and non-violent offenders, and predicted the most serious forms of violent crimes, such as robbery, rape or murder, in comparison with all other subjects, being associated with violent offending before age 18. Poor social circumstances were independently predictive (Hill, 2002).

Early separation from parents was associated with increased risk for violent offending (RR=1.73, 95% CI=1.42-2.11) and violent recidivism (RR=1.47; 95% CI=1.10-1.98) among males separated at birth from their parents for an average of seven months because of tuberculosis in Finland. The risk of criminal behaviour was slightly increased among both males (RR=1.14, 95% CI=1.01-1.29), and females (RR=1.54, 95% CI= 1.18-2.00) (Mäki et al., 2003). It is common for mothers of children with conduct problems to have histories of neglect or abuse themselves (Routh et al., 1995). These mothers also often have adult relationships characterized by violence (Moffitt and Caspi, 1998).

In a family study of 816 Australian children born between 1981–1984 in Brisbane, paternal, but not maternal, alcohol use disorders (AUDs) predicted violent and non-violent delinquency of children. Executive functioning mediated the relationship between paternal AUD and the violent delinquency of a child, whereas family stress mediated the relationship between paternal AUD and both violent and nonviolent delinquency. The authors suggested that paternal AUD may be associated with child executive functioning and family stress, which may in turn lead to child delinquency (Grekin et al., 2005).

Aggressive behaviour is a stable trait that predisposes a child to later antisocial behaviour, criminality and physical aggression (Huesman et al., 1984) In a family study by Huesman et al (1984), the stability of aggression across generations within a family, when measured at comparable ages, was even higher than the stability across ages. The authors assessed psychological tests, self rated aggressive incidents and some criminal records of the followed-up index children and their children. However, the aggressiveness of the parents of the index

children was evaluated only from the parents' reports of the severity of punishments they would use in response to specific misdeeds by the index children (Huesmann et al., 1984). Since this study and several other studies have demonstrated intergenerational continuity in parenting (Shaw, 2003), it has remained unclear whether it was the method of parenting or the aggressive behaviour that was shared by all three generations. Among followed-up twins in the UK (N=225 twin pairs), violent crime was independently predicted by adult APD and reading problems, and also by any previous crime. The absence of childhood aggression did not, however, indicate a good prognosis when multiple other CD and hyperactivity symptoms were present (Simonoff et al., 2004).

A study of the risk factors for crime and violent offending in SCH compared the health care registers and criminal records of persons born in Helsinki between 1951 and 1960. Poor educational attainment, poor grades for attention at school, higher birth weight and larger head circumference were significantly associated with the risk for criminal offending in adulthood among persons with SCH. The association between delivery complications and later violent offending among males was of borderline significance (Cannon et al., 2002).

2.6.2 Adoption studies

Most adoption studies of children separated at birth from their biological parents have demonstrated an association between parental and offspring criminal offending (Hutchings and Mednick, 1975), but only non-significant association between parental and offspring violent offending (Mednick et al., 1984; Moffitt 1987). Bohman (1978) found no association between parental and adoptee criminality in the Swedish adoption data (N=2,000). However, when he compared the later criminality of both adopted children of biological parents with serious crimes (N=200) and adopted children of severe alcohol abusers (N=200) with the criminality of matched control adoptees, whose parents were neither criminal offenders nor alcohol abusers, only the children of the alcohol abusers differed significantly from the controls (p=0.05). Late adoption placement (after one year of age) was associated with a higher prevalence of alcohol abusers (33% vs. 24%). Bohman concluded that if a genetic composition existed for criminality, it was

related to alcoholism. Criminality was prevented by adoption, whereas adoption was not so influential when the biological parent had alcoholism.

The genetic and environmental factors affecting antisocial behaviour have been described since the 1970s (Crowe, 1974). Cadoret et al. (1995a) reported that parental APD predicted increased risk of CD, adolescent aggressiveness, adult APD and drug abuse among offspring. Substance abuse and PDs in biological parents were associated with later criminal behaviour of adopted sons. It was suggested that adverse adoptive home environment interacted with a genetic background of APD to result in significantly increased aggressiveness and CD in adopted persons in the presence, but not in the absence, of parental APD. Male gender, foetal alcohol exposure and adverse environment were risk factors for adult antisocial syndrome (Cadoret et al., 1995a). The individual differences in aggression seem to result from both heritable and environmental factors (Miles and Carey, 1997).

2.6.3 Twin studies

Estimates of the heritability of antisocial behaviour are between 41% and 80% depending on the definition of the genotype. Heritability estimates for psychopathy are even higher (Larsson et al., 2006a). Heritability of individual symptoms of CD may differ. In a twin study of 1,100 twin pairs, heritability estimates were 49% for aggressive domain, 55% for non-aggressive domain, and 53% for full-scale CD (Gelhorn et al., 2005). Gelhorn et al. have suggested that DSM-IV CD domains are influenced by unique genetic and environmental factors, but also share some common genetic and environmental influences (Gelhorn et al., 2006).

Genetic influences on antisocial behaviour were more important in socio-economically advantaged environments, while environmental factors were more influential in less advantaged environments, in a longitudinal twin study including 1,480 twin pairs carried out in Sweden (Tuvbland et al., 2006). Heritability of antisocial behaviour was higher for girls than for boys. A common genetic factor loaded substantially on both psychopathic personality traits and antisocial behaviour. However, a common shared environmental factor loaded exclusively on antisocial behaviour. Larsson et al. (2006b) suggested that the genetic overlap between psychopathic personality traits and antisocial behaviour may reflect a

genetic vulnerability to externalizing psychopathology. The finding of shared environmental influences in antisocial behaviour only suggests an etiological distinction between psychopathic personality dimensions and antisocial behaviour (Larsson et al., 2006b).

The Environmental Risk (E-risk) Longitudinal Twin Study, a nationally representative birth cohort of 1,116 twin pairs and their families, investigated how genetic and environment factors shape children's development (Trezniewski et al., 2006). The results indicated that physical maltreatment plays a causal role in the development of children's antisocial behaviour (Jaffee et al., 2004). The association between childhood educational difficulties and antisocial behaviour resulted primarily from environmental factors common to both. This association was stronger for boys. The candidate environmental factors (age of mother at first birth, family size, social deprivation, socioeconomic status, maternal reading ability, stimulating home environment, maternal depression, and child neglect) only weakly mediated the association. For boys, poor reading ability led to antisocial behaviour, and antisocial behaviour led to poor reading ability. By contrast, the correlation between reading achievement and ADHD was best explained by common genetic influences (Trezniewski et al., 2006). Positive adjustment in children exposed to socio-economic deprivation was promoted by maternal warmth, stimulating activities, and the child's outgoing temperament. Resilience was partly heritable. The protective processes operated through both genetic and environmental effects (Kim-Cohen et al., 2004). Maternal depression following, but not preceding, the birth of the twins was associated with child antisocial behaviour at 7 years of age. The combination of depression and APD symptoms in mothers posed the greatest risk for the children's later antisocial behaviour (Kim-Cohen et al., 2005). A twin experiencing maternal negativity and less warmth had more antisocial behaviour problems (Caspi et al., 2004). Maternal emotional attitude toward the child may play a causal role in the development of antisocial behaviour (Caspi et al., 2004).

2.6.4 Behavioural genetic studies

Gene-environment interaction occurs when the effect of exposure to an environmental pathogen is conditional on a person's genotype, or when the

environmental experience moderates the effect of genes on health (Moffitt et al., 2005). Behavioural genetic studies have empirically measured some gene-environment interaction processes resulting in antisocial and criminal behaviour. The gene provides a blueprint for the chain of amino acids that forms the proteins and enzymes that do the actual work. For many genes, the environment can influence whether or not the genes are transcribed to build the proteins. For example, environmental stress influences the expression of many genes by initiating ("turning on") the transcription of some genes, inhibiting ("turning off") the transcription of others, and changing the level of transcription of still other genes (Carey and Gottesman, 2006).

Early adverse experiences during sensitive phases of development alter a constellation of physiological and behavioural processes. For example, prenatal stress reduces brain neuron proliferation and may affect the number of neurons throughout life in rats. Elevated rates of glucocorticoid hormones facilitate cell death particularly in the hippocampus, the brain area important for learning and memory (Gunnar, 1998). The atrophy of dendrites after a brief exposure is reversible, but may become permanent with prolonged exposure to high glucocorticoid levels (Gunnar, 1998). However, these effects could be counteracted by neonatal handling, suggesting that infantile maternal stimulation may also reverse the appearance of behavioural disorders induced by early life stress (Lemaire, 2006). Appropriate parental input is critically important for normative development of the hypothalamic-pituitary-adrenal axis and neurotransmitter system function (Higgley et al., 1994). Primates removed from their mothers and deprived of early participation in social groups later exhibit aberrations in neurochemical function, neuroendocrine stress axis activity, and many aspects of social behaviour (Newman et al., 2005).

In humans, Caspi et al. (2002) reported that one particular gene predicted antisocial behaviour in conjunction with childhood adversity. Genotypes associated with high levels of monoamine oxidase A (MAO-A) activity protected against the effect of childhood maltreatment and adversity on the development of antisocial behaviour and CD. Maltreatment was defined by Caspi et al. as a composite index including prospective information about maternal rejection, repeated loss of a primary caregiver, harsh discipline, and retrospective self-reports of physical and

sexual abuse. Foley et al. (2004) replicated the finding for CD. They defined "maltreatment" as parental neglect as reported by the parent, together with inter-parental violence and inconsistent discipline reported by the child (Widom et al., 2006). Maltreated males whose genotype conferred low levels of MAO-A developed CD, personality disposition towards violence, and APD significantly more frequently than those with high-activity MAO-A. They were also significantly more often convicted of violent crimes in adulthood than the children with high-activity MAO-A. On the other hand, the males with high MAOA activity had no elevated antisocial outcomes, even when they had experienced childhood maltreatment. As many as 85% of the severely maltreated men having a low-active MAO-A genotype in the Dunedin birth cohort developed some form of antisocial behaviour (Caspi et al., 2002). Caspi et al. suggested that deficient MAO-A activity may dispose the organism toward neural hyperactivity to threat, and that a functional polymorphism in neurotransmitter-metabolizing enzyme MAOA moderates the influence of childhood maltreatment on neural systems implicated in antisocial behaviour. Later the buffering effect of high activity MAO-A genotype against increased risk of violent and/or antisocial behaviour was replicated in the E-risk study among white children, but not among non-white (Widom, 2006).

More recently, several other associations have been documented. For example, interaction between increased paternal alcohol abuse and dopamine receptor 4 (DRD4) gene polymorphism was associated with temperamental novelty-seeking in a preliminary Finnish study (N=2,149) (Lahti et al., 2005). Variations in human serotonin transporter gene promoter region (5-HTTLPR) moderate psychopathological reactions to stressful experiences from early developmental periods onwards (Caspi et al., 2003). The shorter (s) allele having lower transcriptional activity has been associated with lower levels of serotonin uptake, type 2 alcoholism, and violent behavior (Hallikainen et al., 1999). A prospective study in children with ADHD from England and Taiwan indicated that a common haplotype of dopamine transporter gene (DAT1) was associated with ADHD and mediated the effect of maternal alcohol use during pregnancy on the development of ADHD (Brookes et al., 2006).

2.6.5 Transmission of psychiatric disorders associated with violent crime

Hicks et al. (2004) used structured equation modelling of the Minnesota Twin Family Study to estimate simultaneously the general and specific transmission mechanisms of CD, adult APD, alcohol dependence and drug dependence. Transmission of general vulnerability to all these externalizing disorders accounted for most familial resemblance. This general vulnerability was highly heritable (h2=0.80). Disorder-specific vulnerabilities were also detected for CD, alcohol dependence and drug dependence. The authors concluded that the mechanism underlying the familial transmission of externalizing disorders (antisocial behavior and substance dependence) is primarily a highly heritable general vulnerability. The latent correlation between mother and father externalizing disorders revealed substantial assortative mating. Assortative mating is very common among substance abusing parents and those with APD (Merikangas et al., 1992). The familial aggregation of SUD and antisocial behaviour disorders tends to be the same among men and women, although women may require greater familial loading before expressing the disorder (Merikangas et al., 1998).

The estimates of the heritability of SUD on the basis of family, twin, and adoption studies of persons with alcohol dependence range from 50% to 60% (Dick, 2006). This effect may be partially explained by the concurrent familial distribution of APD, which may predispose to the development of SUD (Dick, 2006). Cadoret suggested, on the basis of adoption data, that there are two genetic pathways to drug abuse/dependency (Cadoret et al., 1995b). One proceeded directly from the biological parent's SUD to SUD among the offspring. The other commenced with APD of the biological parent and proceeded through intervening variables of adoptee aggressiveness, CD and APD to drug use/dependency (Cadoret, 1995b). A Norwegian twin study of 1,386 twin pairs suggested that the twin resemblance of illicit drug abuse was largely due to genetic factors. The heritability of drug abuse or dependence ranged from 58% to 81% (Tuvblad, 2006). Among the twins from the Vietnam Era Twin Registry (N=3,372 twin pairs), genetic factors (34% of the variance), shared environment (28% of the variance) and non-shared environment (38% of the variance) had significant influences of similar magnitude on the individual's risk of developing a drug use disorder (Tsuang et al., 1996).

Parental behaviour during child-rearing years is associated with elevated risk of offspring PD in adulthood. In the Children in the Community study (Johnson, 2006) (N=593 families), significant effects were found to be low parental nurturing and aversive harsh punishment. The risk of PD was not attributable to offspring behavioural and emotional problems or parental psychiatric disorder, and did not diminish over time. Low parental affection or nurturing was associated with increased risk for offspring APD (p=0.003), BPD (p=0.002), paranoid (p=0.002), avoidant (p=0.01), and schizoid (p=0.046) PD. Harsh punishment was associated with increased risk for offspring BPD (p=0.001), paranoid PD (p=0.004), passive-aggressive PD (p=0.046), and schizotypal PD (p=0.02). The authors concluded that parenting behaviour may mediate the association of childhood behavioural and emotional problems and parental psychiatric disorder with risk for the development of offspring PD. BPD is five times more common among first-degree relatives of persons with BPD than in the general population (American Psychiatric Association, 2000).

3. AIMS

Study I

To assess the lifetime prevalence of APD and SUD among a representative sample of mentally ill homicide offenders and homicide attempters using a structured clinical research method verified with objective lifetime documents.

Study II

To investigate whether the homicidal behaviour of offenders with triple disorders (MMD+APD+SUD) differed from the homicidal behaviour of persons with pure MMD.

Study III

To test the hypothesis that the quantitative risk (OR) of violent offending and criminality among children of violent offenders can be estimated on the basis of parental crimes.

Study IV

To investigate whether the increased risk (OR) and prevalence of criminal and violent offenders (versus controls) was already present among the parents (G1) of the homicide recidivists (G2), and to compare the results with the corresponding data of the children (G3) of the homicide recidivists (versus controls) to clarify the putative transmission of violent crime and criminal offending across three generations.

4. SUBJECTS AND METHODS

4.1 Homicide offenders with MMDs (Study I)

On 1st March 1998, there were 99 forensic patients in the Niuvanniemi psychiatric state hospital who had been diagnosed in forensic psychiatric examination as suffering from MMD during a homicidal act. Two of these patients were female. Ninety-three persons were willing to be interviewed between March and May of 1998. Three persons were excluded: one female, and two males who had not received a psychotic disorder diagnosis when the diagnoses were ascertained in the study overview. In the final analysis, 90 males were evaluated using the Structured Clinical Interview for DSM-IV (SCID-IV) for Axis I and II disorders (First et al., 1996a; 1996b). The information concerning the assessment of SUD was insufficient in two cases. Five persons could not be assessed for Axis II disorders in the absence of confirmed information about their behaviour before the age of 15. One of these persons had already been excluded from the SUD assessment. All but two were Caucasian. Of the participants, 65 (72%) had committed one or more homicides, and 25 (28%) had attempted to kill someone but the victim survived. The mean age of the participants was 43.6 years (range 21–73 years, SD 11.5). The participants were committed to the hospital between 1948 and 1997 (mean 1989, SD 9.60), 35 of them (39%) during the previous three years. The mean duration of treatment before the study was 8.7 years (range 1–50 years, SD 9.60).

DSM-IV Axis I and Axis II diagnoses were assessed using the *SCID-IV Research Version* (First et al., 1996a; 1996b) by two forensic psychiatrists. According to the SCID protocol, all available information was used. Information given by a participant during the interview was subsequently verified through other sources. All the medical and psychiatric data on all participants were studied along with their forensic psychiatric examination reports. These reports included the forensic psychiatric evaluation ordered by the court, standardized psychological tests, physical examinations, observation by the hospital staff during a 4–8 week period in a psychiatric hospital, and multi-professional interviews (see Eronen et al., 2000). The examination reports included data from medical records, schools, social welfare offices, the military, prisons and crime registers, along with the

questionnaires completed by the family, teachers and other persons who knew the offender. Because of the limited ability of most patients to use the self-report personality questionnaire, all items were assessed when required. The interviews lasted from 2 to 8 hours. In order to test inter-rater reliability, 15% of the participants were studied by both interviewers. The concordance rates (kappa) between the raters were 1.00 concerning presence or absence of MMD and PD, and 0.86 concerning diagnosis of SUD.

In order to ascertain whether selective discharge might have affected the results, we used χ^2 test to compare the results of the patients who had been hospitalised for less than three years with the data of the patients whose treatment had lasted longer. In a similar way, we investigated whether the results among the homicide offenders differed from the results among those charged with attempted homicide. The prevalence and comorbidity of PD, SUD and MMD diagnoses were calculated for the entire sample, and also for the main MMD groups. The co-occurrence of PD and SUD for each MMD group was compared with that of other patients using χ^2 test. A p-value lower than 0.05 was considered to be statistically significant. SPSS 8.0 for Windows was used for the statistical analyses.

4.2 Characteristics and circumstances of homicides (Study II)

A comparison was made between two male subsamples (N=58) of psychotic homicide offenders from Study I: those with a comorbid APD (N=35) (SCH-APD), and those without APD or any other PD (SCH, N=23). The males had either SCH (N=54) or schizo-affective disorder (N=4). Information about the motive for the homicide was obtained from the previous interviews and data sources described in Study I. The determinant factors preceding the index crime were classified by two other investigators in three exclusive categories: manifestations of psychosis; argument and/or fight with the victim unrelated to psychotic symptoms; and the absence of either of these factors. An offence was classified as influenced by psychosis only if both investigators considered the offence to be a consequence of at least one psychotic manifestation. Five cases were excluded from the psychosis-related category because the investigators were unable to agree on them (3 with APD and 2 without APD). The inter-rater alpha coefficient of intra-class correlation was 0.90. Delusions were rated as either persecutory, grandiose,

religious, reference, or thought insertion. Auditory hallucinations were sub-typed as command hallucinations or others. The intra-class correlation coefficient for inter-rater reliability in the determination of delusion subtypes was 0.94. For the homicidal acts judged to be unrelated to psychotic symptoms, the investigators determined whether they were a consequence of a fight or an argument unassociated with psychosis. Possible alcoholic intoxication of the offender at the time of the homicide was ascertained from mental state examination report data obtained from various sources, including self-reports, statements of witnesses, and the results of eventual blood samples. The category "not intoxicated at the moment of the crime" included only cases in which this was specifically indicated in the files. The differences between the proportion of persons with triple disorders and the proportion of persons with pure MMD were compared using χ^2 test. The normally distributed continuous variables were compared using variance analyses.

4.3 Offspring and parents of recidivistic homicide offenders (Studies III and IV)

Homicide recidivists (HRs, G2)

A total of 1,584 homicide offenders were convicted in Finland over a period of thirteen years, from January 1, 1981, to December 31, 1993. From that total, all the homicide offenders who had committed two or more homicides separated by a time period of 24 hours or more (HRs, G2) were identified (Eronen et al., 1996a). The names, domiciles and dates of birth of these 34 males and one female had been collected from prison registers for a previous study (Eronen et al., 1996a). Permission for this new study was obtained from the Ministry of Social Affairs and Health, the Ministry of Justice, Statistics Finland, the Population Register Centre, the National Research and Development Centre for Welfare and Health (STAKES), the Medical Director of Niuvanniemi Hospital, and the Ethics Committee of the University of Kuopio.

The HRs were born between the years 1920 and 1968. Five of them had died between the years 1990 and 1995. The mean age of the HRs was 46 years (SD 11, median 43). At the time of the first homicide, their mean age had been 30 (SD 12, median 26) years; and during the index homicide 39 (SD 14, median 34) years. In forensic psychiatric evaluations, 69% of the offenders were diagnosed as

alcoholics, 63% had a PD, and 60% had both these disorders. SCH was diagnosed in 11% and major depression in 6% (Eronen, 1996a).

Children of HRs (G3)

Data of the children (G3) of the HRs were obtained from population registers. A total of 20 children were found, 10 males and 10 females, born between 1960 and 1993, and all living in Finland. Nine children (45%) were excluded because they were younger than 15 years and therefore did not appear in crime registers or prison registers. One had already died at the age of five. The persons included in the study (N=11) were 18–37 years old (mean 26, SD 5, median 25). The males (64%) had a mean age of 28 years (SD 5, median 29), and the females 23 years (SD 4, median 22).

Controls for the children of HRs (G3)

Statistics Finland provided the data of 20 controls for each index child, matched by sex, place of birth, date of birth (in the same month and year as the index children) and date of death (i.e., same or later than the indexed persons). Information on possible residence outside Finland was also obtained to control the time during which it was possible for these persons to be registered for a crime in Finland. One control was living abroad, and was subsequently substituted by a new control. For the final analysis, 220 controls were obtained.

Parents of HRs (G1)

Data of the parents of HRs (G1) were obtained from population registers using the same method as for the data of G3. All the parents, 35 index mothers and 33 index fathers, were included in the study. Those periods of time when it was impossible for them to be registered for a crime in Finland (e.g. because of being abroad) were excluded from their personal controls´ crime records (in fact, the controls had not offended during the excluded periods).

The G1 mothers (N=35) and their controls (N=70) were born between 1887 and 1941 and the fathers (N=33) and their controls (N=66) between 1882 and 1942. One mother had moved abroad in the same year that her child (HR) was born, and one father at the age of 44. Two fathers had lived abroad, one for eight years, and

the other for two years. The death had occurred of 70% of the fathers and 46% of the mothers.

Controls for the parents of HRs (G1)

Statistics Finland supplied the data of 2 controls for each parent, matched with the same criteria as for G3. Thirteen of the controls had their final domicile abroad and were substituted by new controls. (The crime registers of the substituted controls contained no crimes). For the final analysis, 136 controls were obtained for the parents.

Methods

The crime records of the index and control subjects of G1 and G3 were obtained from the Central Criminal Records Office. The Central Prison Register provided the prison files of those subjects who had been incarcerated because of a criminal act in Finland. The criminal histories of G1 and G3 index subjects and controls were documented. The cumulative convictions of each set of controls were counted on the day of death of the indexed person, or if the person was still alive, at the beginning of the study. The odds ratio (OR), 95% confidence interval (95% CI), and p-value (Fisher 2-tail exact test) of parents and children were calculated both for being charged with committing a violent offence (i.e., assault, robbery, manslaughter, murder and rape) and for being charged with committing any crime. The prevalence of convicted persons and the prevalence of violent offenders were assessed in each group. The differences in prevalence between index and control groups were calculated. Finally, the p-values were calculated for the disparity of these (index versus control) differences between G1 and G3, in order to clarify whether the prevalence of crime and violent offending had increased throughout generations (Altman and Bland, 2003).

5. RESULTS AND DISCUSSION

5.1 Study I

5.1.1 PDs and SUDs among homicide offenders with MMDs

PDs

Fifty-one percent (N=43) of the 85 offenders with MMD received one or more lifetime PD diagnosis. APD was diagnosed in 47% (N=40). Borderline PD was found in 11% (N=9), but only in one case (1%) without APD. Other PD was diagnosed in 15% (N=13), but only in three cases (3%) without APD. Many subjects fulfilled the criteria for several PDs. Figure 1 indicates the comorbidity of specific PDs. (The summary rates in the diagram differ slightly from the rates counted from the total because of decimal rounding).

Figure 1. Personality disorders (PD) among persons with major mental disorders and homicidal behaviour (N=85).

APD = antisocial personality disorder (47%)
BPD = borderline personality disorder (10%)
OPD = other personality disorders (15%)
      avoidant (5.8%)
      obsessive-compulsive (3.5%)
      passive-aggressive (3.5%)
      depressive (2.3%)
      narcissistic (2.3%)
      histrionic (1.2%)
      schizoid (1.2%)
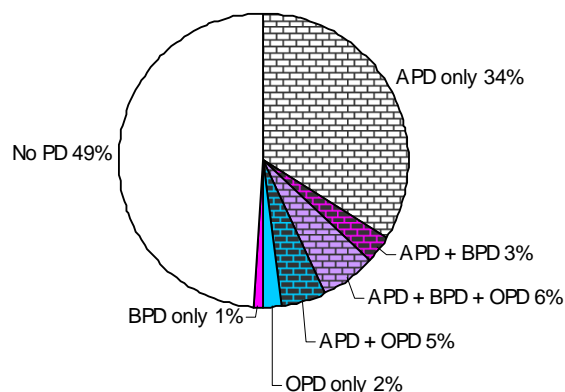
SUDs

A diagnosis of SUD was obtained for 74% (N=65) of the 88 offenders with MMD who could be assessed for SUD. All but two of them (N=63, 72% of total) had an alcohol use disorder (AUD); in 89% (N=56, 64% of total) it was alcohol dependence. The prevalence of SUD was about 1.6 times greater among mentally ill homicide offenders when compared to the rate among persons with SCH in the ECA study (Regier et al., 1990).

About half (49%) of the persons having SUD had abused other substances than alcohol (N=32, 36% of the total); 91% of them (N=29, 33% of total) had other

substance dependence. In only two cases (6%, 2% of total), another SUD was found in the absence of alcohol use disorder. Figure 2 indicates the comorbidity of alcohol use disorders and other substance disorders.

Figure 2. Substance use disorders (SUD) among persons with major mental disorders and homicidal behaviour (N=88)
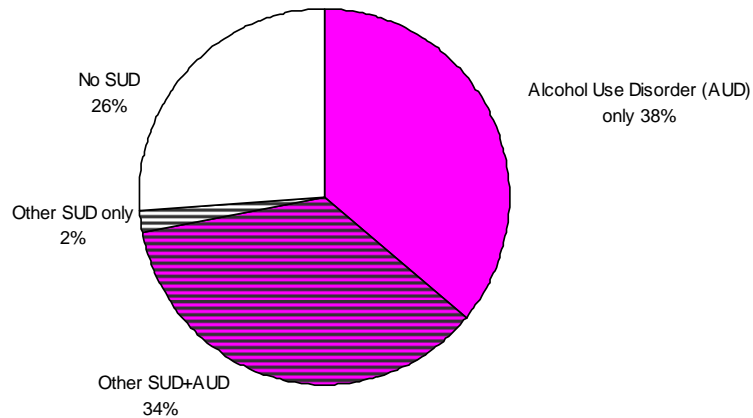
Comorbidity of PD and SUD

About half (51%, N=43) of the 84 offenders who could be assessed for both PD and SUD were diagnosed with PD. PD was found in every case with SUD. Among the remaining 42 offenders without PD, half (N=21, 24.5% of the total) had SUD, and half (N=21; 24.5% of the total) had pure MMD. Among the offenders having SUD (N=65), the prevalence of PD was 66%, including 61% (N=40) with APD (Figure 3). (The summary rates in the diagrams may differ slightly from the rates counted from the total, because of decimal rounding, and because of the difference in the N totals between the persons that could be assessed for SUD (N=88) and PD (N=85).

Figure 3. Comorbidity of personality disorders (PD) and substance use disorders (SUD) among persons with major mental disorder (MMD) and homicidal behaviour (N=85)
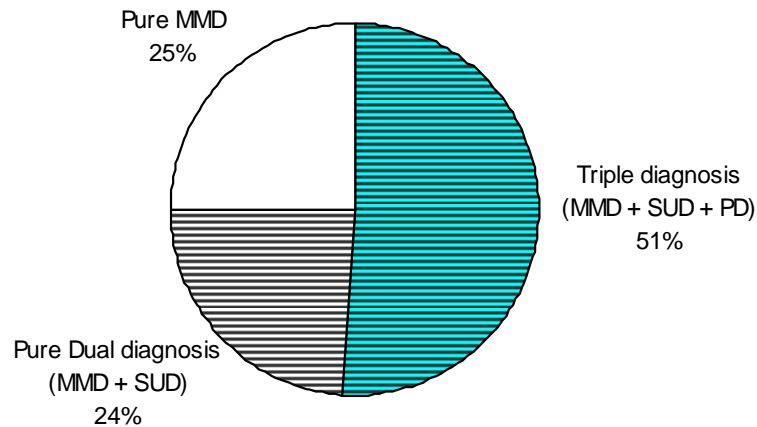
5.1.2 Three diagnostic categories of homicide offenders with MMDs

Figure 3 indicates the three diagnostic categories of severe violent offenders revealed by this study: pure MMD, pure dual disorder, and triple disorder. Since the diagnostic validity of other PDs is not as good as that of APD, and only 3% of the offenders (N=3) had PD without APD, the comorbidity of APD and SUD is particularly important. The diagnostic categories were therefore identified more accurately on the basis of APD and SUD diagnoses (Figure 4). The largest category, triple diagnosis (APD+SUD+MMD), accounted for 47.1% (N=40) of the offenders. This category was nearly twice as large as the other two. Among the 45 offenders without APD, pure dual disorder (SUD+MMD) was diagnosed in about half of the cases (51%; N=23, 27.0% of the total); and pure MMD in another half (49%; N=22, 25.9% of the total). APD was always comorbid with SUD. The fourth possible category, "APD without SUD" was not found (Figure 4).

Figure 4. Comorbidity of antisocial personality disorder and substance use disorders among persons with major mental disorder (MMD) and homicidal behaviour (N=85): triple, dual and single diagnoses
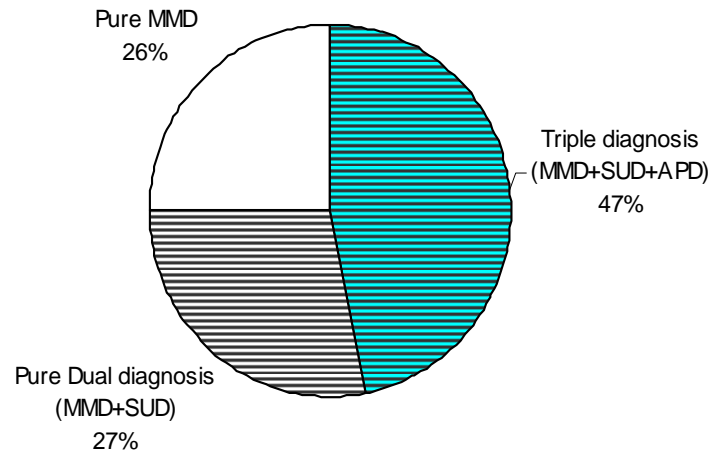
5.1.3 PDs and SUDs in specific MMDs

The majority (78%, N=70) of the offenders were diagnosed with SCH, 17% (N=15) with schizo-affective psychosis, and 5% (N=5) with other psychoses. The prevalence of PD was significantly higher among the group with SCH which it was possible to assess for PD (N=65, χ^2=4.44, df=1, p=0.035) than among the remaining subjects (N=20). The group with schizo-affective disorder (N=15) had a significantly higher prevalence of SUD than the remaining subjects (N=73, χ^2=14.86, df=1, p=0.0001).

5.1.4 Discussion of Study I

The role of PD has been unclear in severe violence of persons with MMD. The present results revealed three distinct diagnostic categories of severely violent persons with MMD. They demonstrated that APD is an important risk factor for homicidal behaviour among persons with MMD, but only when co-existing with SUD. Neither APD without SUD (the category absent from this study) nor SUD without APD were as dangerous risk factors for severe violence as the combination of APD and SUD. We named the combination MMD+APD+SUD 'triple diagnosis' and the accompanying disorder 'triple disorder'. Nearly half (47%) of the offenders with MMD had triple disorder. Among the other half, i.e. the offenders

without APD, the proportions of SUD (51%) and pure MMD (49%) were nearly identical, and were in line with the prevalence of lifetime SUD among MMD in communities. This finding suggests that pure dual diagnosis, i.e. MMD with SUD but without APD, possibly does not increase the risk of severe violence more than the psychotic symptoms do.

In theory, the result that the fourth possible category, APD without SUD, was not found among mentally ill homicide offenders could suggest either that the prevalence of APD without SUD is very low, i.e. that nearly all subjects having MMD and APD in the general population would also have SUD, or that APD without SUD is not an important factor in the severe violence of persons with MMD. The few studies of persons with both SCH and APD have always documented lower than 100% prevalence of SUD among such persons; for example, it was 82% in the After-Care study (Moran and Hodgins, 2004). Thus, APD exists without SUD in other populations of persons with MMD. The present finding may indicate that APD without SUD is unlikely to be associated with severe violence among persons with SUD.

The present results also suggested that among substance abusing persons with MMD (i.e. MMD+SUD), those with an additional lifetime diagnosis of APD have a particularly high risk for severe violence. Such persons accounted for approximately 2/3 (64%) of the substance abusing homicide offenders. The prevalence of APD among persons with dual diagnosis in communities is unknown, but it is unlikely that over 60% of these persons would have APD.

Among non-psychotic persons, the majority of individuals with alcohol use disorders are social drinkers, and seldom become violent when intoxicated (Cloninger type 1 alcoholism). However, persons with type 2 alcoholism are particularly prone to violence when intoxicated, and also often have APD (Virkkunen, 1974). There may also be two different types of alcohol use disorders among persons with MMD. Triple diagnosis may resemble type 2 alcoholism, and be associated with a high risk for violence when intoxicated. It is possible that persons with pure dual diagnosis (MMD+SUD) do not become severely violent when intoxicated more frequently than persons with pure psychosis (without SUD).

Since current psychiatric disorder diagnoses define clusters of symptoms, rather than etiological entities, they may be misleading when the risk of violence in

specific disorders is considered. SUD without APD may be a different disorder than SUD with APD.

To the best of our knowledge, Study I was the first structured clinical study of PD and SUD among a nationally representative sample of homicide offenders with MMD. It reported higher prevalence of lifetime PD (51%), APD (47%), SUD (74%) and alcohol use disorders (72%) than previous non-structured studies, in which only 8-14% of homicide offenders with SCH had DSM-III APD, and 8-44% had PD (see Table 1). The low prevalence of SUD in the previous studies of homicide offenders with SCH was not in accordance with the previous replicated findings that SUDs are more common among persons with SCH, in comparison with the general population, and that SUDs in SCH are associated with an increased risk for homicidal behaviour. The previous studies reported diagnoses that were made on the basis of file documents and forensic psychiatric examination reports, and without current structured patient interviews. SUD is substantially under-diagnosed and under-documented in psychiatric care settings (Hansen et al., 2000; Drake and Mueser, 2000) and in prisons (Abram and Teplin, 1991). Also, the symptoms of PD were traditionally neither determined nor documented in patients who met the criteria of MMD (Surtees and Kendell, 1979). In spite of the introduction of the multi-axial system of DSM-classification (American Psychiatric Association, 1994) PDs are likely to be under-diagnosed among persons with MMD. Thus, the use of a structured study with clinical interviews and objective lifetime documentation may result in higher prevalence rates for the co-existing disorders, and provide important new data concerning the epidemiology of severe violence committed by psychotic persons.

The real prevalence of lifetime SUD and APD among Finnish homicide offenders may be even higher than the present results. The use of several information sources diminished the possibility of under-diagnosing SUD and APD. However, such under-diagnosis remained a possibility if the offender, parents, teachers and lifetime records had all failed to mention the symptoms. The opposite case, i.e. false reports of SUD, CD symptoms or adult APD symptoms, was unlikely to occur, because the patients were not proud of such histories, and the lifetime documentation from different sources was compared with the subjective information from the patient. Most of the patients had been under

clinical observation in the hospital for several years and were well known to the interviewers; their crime registers and lifetime hospital and social documentation of previous APD symptoms were also available.

During the period of the homicides included in this study, the clearance rate of homicides in Finland was very high (over 90%, Statistics Finland, 2000). There was a comprehensive pre-trial practice of diagnosing MMD among violent offenders, and severely violent offenders with MMD were only in exceptional cases convicted and sent to prison. The National Authority for Medicolegal Affairs ordered severely violent offenders with MMD to be committed primarily in state psychiatric hospitals, and only rarely directly in local psychiatric hospitals (oral information, Eira Hellbom). Selective discharge was excluded by comparing the patients who had been in the hospital for less than three years with those who had been hospitalized over three years earlier. There was no substantial difference between the persons who were admitted to the state hospital during the previous three years (N=35) and those who had been in the hospital for longer than three years (N=55) concerning the prevalence of PD (χ^2=0.10, df=1, p=0.76, N=85), or SUD (χ^2=1.13, df=1, p=0.29, N=88). Nor was there a statistically significant difference between those who had committed a homicide (N=65, 72%) and those who attempted to commit a homicide (N=25, 28%) concerning the prevalence of PD (χ^2=1.26, df=1, p=0.26, N=85) or SUD (χ^2=1.86, df=1, p=0.17, N=88). We therefore believe that our sample was sufficiently representative of mentally ill Finnish males with homicidal behaviour.

Substance abuse among persons with MMD increases vulnerability toward negative outcomes, which include violence, legal problems and incarceration. Substance abusing persons with MMD are less capable of being helped by traditional psychiatric or substance abuse treatments. Alcohol and most other psychoactive drugs increase the risk of violent behaviour by, for example, pharmacologically disinhibiting aggressive impulses (Virkkunen, 1974). Substance abuse can increase conflict and volatility in social relations, thus exacerbating symptoms of perceived threat and hostility (particularly in persons with active psychoses). Substances may substitute or interfere with prescribed psychotropic medications that might otherwise control high-risk symptoms. Substance abuse may increase economic stress and survival demands, and, finally, may also

expose the user to criminal affiliations and surroundings. Violent acts committed by persons with APD and SUD may result from certain psychotic symptoms (Link and Stueve, 1998), although the violence is more likely to reflect interactions between a variety of factors (such as personality traits, history of violent behaviour, substance abuse) and antisocial behaviour (Arsenault et al., 2000; Tengström et al., 2001). There are promising data available concerning integrated treatments for dually diagnosed persons (Ridgely et al., 1990; Drake et al., 1998; Drake and Mueser, 2000), but there is little evidence concerning specific treatments for persons with triple diagnoses. APD is associated with poor compliance, not only for traditional treatments but also for integrated treatments for dually disordered persons (Robins et al. 1991). No controlled studies of specific treatments for persons with triple diagnoses (MMD+SUD+APD) have been published. Consequently, it is unclear whether such persons can be treated with the methods currently available. The lack of data on the specific treatment needs of this subgroup may be associated with their poor outcome and the increased risk for severe violence. In the treatment of violent offenders with MMD, distinguishing the three categories (persons with triple diagnoses, persons with pure dual diagnoses, and persons with pure MMD) is of clinical importance because the risk factors for violence and the treatment needs of each group are likely to be different. Antisocial peers, disadvantaged neighbourhoods (Silver et al. 1999), and also easy access to alcohol and some other psychoactive drugs may be particularly detrimental for patients with a triple diagnosis (APD+SUD+MMD). Among persons with APD, detection of psychotic symptoms and administration of novel antipsychotic medication in the early phase of the MMD may also decrease substance abuse (Drake and Mueser, 2000) and violent behaviour. The effectiveness of integrated treatments for dually diagnosed persons might be improved if the persons with pure dual disorders and those with a history of APD were treated in separate settings. Further research is needed to demonstrate whether the prognosis of different groups of violent offenders with MMD can be improved by specific integrated, multidisciplinary, long-term treatment programs, according to the needs of persons with dual and triple diagnoses. The prevention of severe violence by mentally ill persons necessitates the creation of effective treatments for those with dual diagnoses who also have a history of APD.

5.2 Results of Study II

The index crime was influenced by psychotic symptoms in a greater proportion of persons with pure MMD (83%) than of offenders with triple disorder (46%, χ^2=7.90, df=1, P<0.01). Among persons with triple disorder, arguments or fights were more common (34% vs.9%, χ^2=5.31, df=1, P<0.05), and a greater proportion assaulted non-relatives (77% vs. 43%). The differences were significant both for the proportion of relatives (χ^2=6.81, df=1, P<0.01) and for the proportion of household members (χ^2=8.13, df=1, P<0.01). Persons with triple disorder were more often intoxicated during the index crime (71% vs. 30%; χ^2=10.07, df=1, P<0.01). Every intoxicated offender had used alcohol, often drinking with the victim.

The persons with triple diagnoses had on average more previous convictions for violent offences when compared to persons with pure MMD (6.0+-4.1; vs. 2.2+-1.5; F(1,55)=13.75; P<0.01). They had been younger at the time of their first violent offence (22.0+-8.3 vs. 27.2+-10.1; F(1,55)=3.62, p=0.06), and had received significantly fewer years of education (7.7+-1.5 vs. 9.7+-2.7; F(1,57)=10.29, P<0.01).

However, there was no significant difference between persons with triple and single diagnosis regarding age at onset of first psychotic symptom*s* (23.6 $\pm$ 7.4 vs. 24.5 $\pm$ 8.5 years), age at index crime (32.3 $\pm$ 8.1 vs. 32.2 $\pm$ 8.6 years*),* or the most common type of SCH (Paranoid SCH). In the total sample (N=58), 60% of the homicides followed delusions and/or related hallucinations. In both groups, the most common type of symptomatic drive was delusional, usually paranoid. In the homicides considered to be direct consequences of psychotic symptoms, neither the number nor the nature of the central triggering symptoms differed between the groups.

There were 85 victims, 46 victims of persons with triple disorders (N=35, ratio 1:1.3), and 39 victims of persons with pure MMD (N=23, ratio 1:1.7, no statistically significant difference). A significant majority (86%) of all offenders had either a personal or professional relationship with the victims. Nearly half (47%) assaulted a member of their own household, including parents and roommates, while a minority (14%) assaulted total strangers. The crimes occurred in most cases in private residences (78%).

5.2.1 Discussion of Study II

Study II indicated that the homicidal behaviour of persons with triple disorder differed significantly from that of the offenders with pure MMD, and in some aspects resembled the severe violence of non-psychotic persons with APD. For instance, homicides by persons with triple disorder were more often associated with arguments or fights with non-relatives during alcohol intoxication with the victim, whereas a greater proportion of persons with single MMD killed relatives because of delusions. However, both groups had been equally psychotic in respect of the diagnosis (paranoid SCH), the age at onset of psychosis, the most common type of symptomatic drive (paranoid delusion), and the number and nature of the central triggering symptoms. Tailored treatments for persons with triple disorders, including substance abuse treatments, are needed for effective prevention of severe violent crime among persons with MMD.

5.3 Studies III and IV

5.3.1 HRs with criminal children and parents

Seven of the HRs (20%) had altogether 11 children who were older than 15 years of age (the minimum age required for conviction of a crime in Finland). Four male HRs (N=4) had criminal offspring. Three of the HRs had committed two homicides, and one five homicides. At the time of the first homicide, the HRs with criminal offspring were 30–37 (mean 34) years old, and during the latest 31–45 (mean 38) years old. However, they had been convicted of a mean 10 (6–14) violent crimes before the first homicide. The convicted index children (N=4), three males and one woman, were 22–26 (mean 24) years old. All controls with convictions (N=7) were males. The children had been 7–14 (mean 8) years old at the time of the first homicide and 8–20 (mean 13) years old at the time of the latest homicide of their parents. At the time of the first convicted violent crime of their parent, they were –3 – +8 (mean 1.5) years old. The children themselves were convicted of their first crime at a mean age of 17 (range 15–20) years. The violent crimes of both the children and the controls were assaults and robberies**.**

Eleven of the HRs (31.4%), all males, had either parents or children who had been registered for committing a crime; six fathers, three mothers and four children. Only in one family was criminality detected in all three generations. Eight

of the HRs (22.9%) had criminal parents. Three parents of two HRs and two children of two other HRs (5.7%) were convicted of violent crimes. Among the seven HRs who had any children over 15 years of age, nearly one third (29%) had a child convicted of a violent crime, and the majority (57%) had children registered for committing any crime.

All those HRs who had criminal parents or children had a dual diagnosis including both an alcohol use disorder and some other psychiatric disorder. The majority (73%) were diagnosed with a PD, 18% had paranoid SCH (but also the symptoms of APD), and 9% had epilepsy. Although the details of the interaction between the generations were unknown, the documentation revealed that both sons convicted of violent crimes had suffered personally from the severe violence of the HR parent.

5.3.2 Violent criminality

Three out of 68 G1 index parents (4.4%; 2 males and one female), compared with two out of 136 G1 controls (1.5%; both males), had committed documented violent crimes (Figure 5). The odds ratio (OR) for becoming a violent offender was 3.1, but the result remained non-significant (95% CI=0.34-37.64; p=0.33). Two (18.2%) males out of G3 index offspring (N=11) had committed violent crimes, vs. 2 males (0.9%) out of the G3 controls (N=220). The OR for violent offending was high at 24.2-fold among them (95% CI=1.5-352.6; p=0.01, Study III).

Figure 5. Prevalence and gender of violent offenders among parents and children of homicide recidivists.
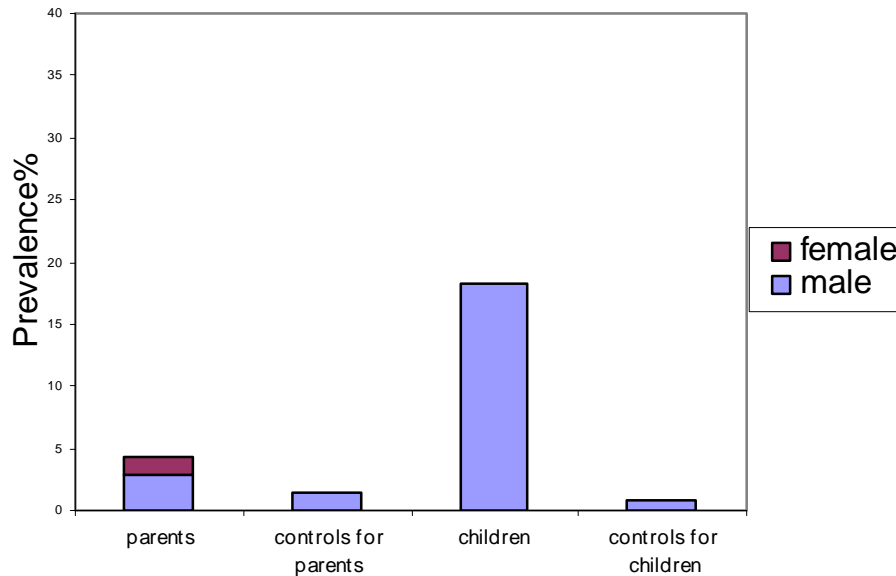
Crimes in three generations

The violent crimes of the G1 fathers were assaults. The only mother convicted of a violent crime had committed an unarmed robbery; two other convicted mothers were registered for property crimes. All index fathers convicted, and also all controls convicted, had been intoxicated with alcohol during some crimes, but none of the mothers or their controls had been intoxicated. None of the G1 index persons had committed severe violent offences or sexual crimes, i.e. aggravated violent or sexual crimes, armed robbery, homicide or attempted homicide. One G1 control person had committed an aggravated violent crime (a rape). (All HR had committed two or more homicides, and most of them also other severe violent crimes.) As many as 9% of the G3 index subjects vs. 0.9% of the controls had committed severe violent crimes.

5.3.3 Any criminality

Nine G1 index parents (13.2%, 6 males and 3 females) vs. 4 controls (2.9%, 3 males and one female) had been registered for committing any crime (Figure 5). The OR for criminality among the parents statistically significantly increased to

five-fold in comparison with the controls (95% CI=1.34–23.08; p=0.01). Four G3 children (36.4%; one female and three males), vs. seven G3 controls (3.2%, all males) were convicted of any crime. Their risk of any criminal offending was 17.4-fold (95% CI=2.9-88; p=0.0008). Because of the small number of subjects, the confidence intervals were large.

Figure 6. Prevalence and gender of criminal offenders among parents and children of homicide recidivists
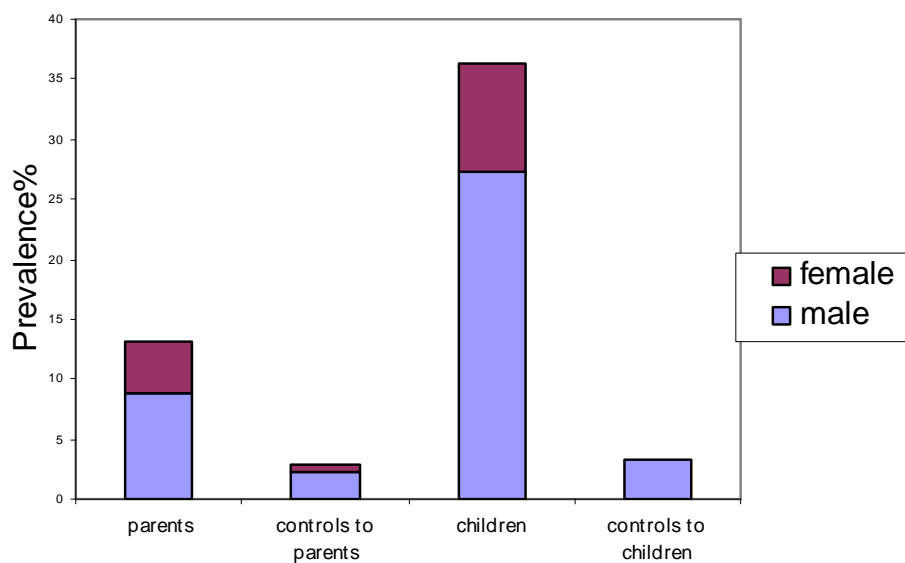
5.3.4 Transmission of violent criminality

Figure 7 illustrates transmission of violent criminality across three generations. The prevalence of violent offenders had increased between G1 and G3 index persons from 4.4% to 18.2%, while between the G1 and G3 controls, prevalence had, on the contrary, decreased from 1.5% to 0.9%. The difference in the proportions of violent persons between index and control groups had increased statistically significantly across the generations, from 2.9% in G1 to 17.3% in G3 (p=0.0019, Figure 6). The results indicated that severely violent HRs (G2) had parents (G1) who were more, but not statistically significantly more, violent than the matched G1 controls, but produced offspring (G3) with a very high risk of committing a violent crime (OR=24) in comparison with the G3 controls.

Figure 7. Transmission of violent criminality across three generations related to Finnish homicide recidivists: prevalence of violent criminality among index persons versus controls, differences in prevalence between index and control population, ORs, 95% exact CIs, and p-values for the OR. The p-value for the difference between G1 versus G3 (2.9 vs. 17.3) was 0.0019.

	Index	Controls	Difference	OR (95% exact CI)	p
1st Generation Parents	**4.4%** (3 of 68)	1.5% (2 of 136)	**2.9%**	**3.1** (0.3–37.6)	0.33
2nd Generation HRs	**100%** (N=35)				
3rd Generation Children	**18.2%** (2 of 11)	0.9% (2 of 220)	**17.3%**	**24.2** (1.5–352.6)	0.011

5.3.5 Transmission of any criminality

Figure 8 illustrates transmission of any criminality across three generations. The prevalence of criminal offenders had increased between G1 and G3 index generations from 13.2% to 36.4%, while among the controls it had only increased from 2.9% to 3.2%. The difference in the proportions of criminal offenders between index and control groups had increased in a statistically significant way (p=0.0023) between generations G1 (10.3%) and G3 (33.2%). The results indicated that an increased risk of crime was transmitted across three generations.

Figure 8. Transmission of any criminality across three generations related to Finnish homicide recidivists: prevalence of criminality among index persons versus controls, difference in prevalences between index and control populations, ORs, 95% exact CIs, and p-values for the OR. The p-value for the difference between G1 versus G3 (10.3 vs. 33.2) was 0.0023.

|	Index	Controls	Difference	OR (95% exact CI)	p
1st Generation parents	**13.2%** (9 of 68)	2.9% (4 of 136)	**10.3%**	**5.0 (**1.3–20.3)	0.01
2nd Generation HRs	**100%** (N=35)				
3rd Generation children	**36.4%** (4 of 11)	3.2% (7 of 220)	**33.2%**	**17.4 (**2.9–87.9)	0.001

5.3.6 Discussion of Study III

In the present naturalistic case-control study, the risk of violent offending and criminal behavior was evaluated among a total cohort of parents and children of recidivistic severely violent offenders, HRs, who were extracted from the total of the homicide offenders (N=1,584) convicted in Finland during 13 years. It was hypothesized that if the increased risk of violent crime could be detected in any offspring population, it should be found in the present sample. The method made it possible to study the risk of an individual becoming a violent offender. Since the rate of solving homicides in Finland has been on the average 95% during the years in which the homicides were committed by the HRs (Eronen et al., 1996b), it was possible to find nearly all of the recidivistic homicide offenders convicted over 13 years in a nation of about 5 million inhabitants. By using matched controls, it was possible to minimize potential errors caused by hidden criminality, the effect of historical and local changes in conviction policy, clearing rate, and age-related changes in offending.

The results indicated that it is possible to discover the increased quantitative risk for violent offending and crime among a total cohort of high-risk children. This

method enabled the first documentation of a statistically significant risk of violent offending among children of violent offenders, i.e. inter-generational transmission of violent crime. The offspring of HRs had a high risk of becoming violent offenders (OR=24.4), and also a substantially increased risk of any criminal offending (OR=17.4). The effect was strong, since the results were significant despite the small number of the children of HRs older than 15 years (N=11). Early preventive efforts on the basis of parental homicide recidivism would not have been possible for the children in the study, since the HRs committed the first homicide when their child was on average 8 years old and the second homicide when the child was on average 13 years old. However 84% of the living homicide recidivists were 23–77 (mean 43) years old, and 84% of them were younger than 51 years. Many of them had young children, and some may produce children in the future. On the basis of these results, these children, and the children of other homicide recidivists, could be better identified for early prevention, by means of, for example, intensive motherhood care, substance abuse treatment for the parents since pregnancy, parenting programs, and home visits and after-care by a family nurse.

In somatic medicine, quantitative risk ratios (OR and RR) of diseases and public health problems are essential parameters used in making decisions on preventive interventions. These ratios compare the number of affected and unaffected individuals among a comprehensive sample of exposed vs. unexposed individuals (Saunders-Dawson and Trapp, 1994). This approach is an efficient way to identify individuals at risk and to evaluate when the risk is sufficiently high to warrant the initiation of a time-consuming and resource-consuming prevention program. Such information has been applied effectively to prevent public health problems generated by genetic vulnerability and environmental risk factors by implementing intervention programs, and to assess the risk of violent crime and criminal offending among persons suffering from psychiatric disorders (Hodgins, 1992; Tiihonen et al., 1997; Eronen et al., 1996b).

Although a significant association between parental and offspring property offending and recidivism has earlier been documented, previous studies, conducted with other methods, have been unable to document a significant association between parental and offspring violent crime. No quantitative risk

studies of children of severely violent offenders have been published to date. The possibility of estimating the quantitative risk for violent offending and criminality among the offspring of violent offenders, and the highly increased risk for violent crime and criminality among the children of HRs, may be generalized to other industrialized countries with relatively low homicide and organized crime rates, but probably not to countries with higher crime rates, such as the United States.

Criminal records and prison registers in Finland lack information on delinquency and crimes before the age of 15. The least severe crimes are not always detected, but the resulting methodological errors were considered to be similar among the index children and the controls. It is possible that the risk will increase over the coming years, as the children were young during the study (18–37, mean 26 years). The large number of children under the age of 15 (45%) excluded would also require later studies. The results supply no reason to stigmatize the children of violent offenders, as the majority of these children of even the most violent offenders had not been convicted of any crime.

The method presented in this report can be used to study and compare the quantitative risks of different risk groups. This may provide the opportunity to identify high risk groups with early markers, and to initiate preventive interventions among high risk children and their families at an early stage in order to reduce as many risk factors as possible. The opportunity to predict violent offending is important when planning a prevention program, as the prevention policy and the interventions can be aimed at the needs of the most vulnerable individuals without expending economic and social resources on those not in need. Since the highest proportion of violent crimes are committed by only a few individuals, the benefits of preventing any such individuals from entering a lifelong criminal career are considerable. By assessing more than one risk factor, it may be possible to identify larger numbers of the most vulnerable individuals who are prone to becoming violent offenders. This may be helpful in solving some of the political, ethical and economic problems of crime prevention. The children of homicide recidivists make little contribution to the total crime rate, but these results are sufficiently encouraging to use them to identify larger risk groups, in order to have a greater impact on public health. The children of severely violent parents, as a specific high-risk group for violent crime and other criminal behaviour, need particular help

to combat the pre- and postnatal, physical and psychosocial environmental risks associated with the antisocial and violent behaviour and SUD of the parents.

5.3.7 Discussion of Study IV

In Study IV, the OR and prevalence of violent offending and of any criminal behaviour were evaluated among the total cohort of parents of the HRs from Study III in order to study the origins of the severe violence of the HRs, and the transmission of violent offending and crime across three generations. The results indicated that the HRs were not the offspring of severely violent offenders. Their G1 parents, unlike the index G3 children, had not committed severe violent crimes, and only 4.4% of them, vs. 1.5% of the controls, were registered for committing any violent crimes. They had a three-fold, but not statistically significantly, increased risk of being a violent offender (p=0.33). The wide range of the 95% CI (0.34–37.64) suggested that the results might be statistically insignificant because of the low number (N=68) of the parents. However, this group had a five-fold, statistically significantly increased (p=0.01) risk for any criminal offending, when compared to matched controls. Thus, in comparison with the control generations, a significantly increased risk of criminal offending was transmitted across three generations, but a significantly increased risk of violent crime only from HRs to their children. The difference in the prevalence of violent and criminal offending between index and control persons has increased significantly over the generations.

Individual differences in aggression result from the interaction of heritable and environmental factors (Miles and Carey, 1997). The antisocial lifestyle and substance abuse of the parents increase the risk of a developing foetus, infant and child for later antisocial and violent behaviour. Transmission accounted for most familial resemblance of externalizing behaviours in the Minnesota Twin Family study (Merikangas et al., 1998). In the present study, also, SUD and APD were likely associated with the transmission of crime and violent offending. Among the HRs, 67% had previously been diagnosed with alcohol use disorder, 64% had had a PD, and 11% had SCH (Eronen et al., 1996b). Our method did not reveal the diagnoses of G1 and G3, but all offending G1 fathers, as also all offending controls for fathers, had abused alcohol during their criminal behaviour. The HRs having

criminal parents or children were diagnosed with at least two diagnoses that included in every case alcohol abuse; and in 73% also PD (Eronen et al., 1996b).

In the present studies, both G3 sons who had committed severe violent crimes had personally suffered from severe violence at the hands of the alcoholic father (HR). Since we had no documentation of adverse factors suffered by the other G3 individuals, nor by the controls, the quantitative association of these very traumatic events with the later violent offending of the son remained unclear. Nor was the length of the periods that the G1 and G2 fathers had resided with the children studied. However, a large British twin study has demonstrated that those children whose fathers had high levels of antisocial behaviour had the worst behaviour problems when the father lived at home (Jaffee et al., 2003). G2 fathers had resided in prison for years; however, they had committed the homicides so late in the children's life that both violent G3 sons had suffered personally from their severe violence.

The persistency of untreated childhood antisocial behaviour and the high costs of chronic offending and violent crime underline the importance of preventive interventions. Many earlier prevention studies of children with CD have failed to show any long term effects on crime and violent offending. A recent case-controlled prevention study reported that the children with most severe symptoms of CD derived the greatest benefit from the program (Foster et al., 2006). Thus, expensive interventions to reduce future violence of children with CD may be cost-effective if they are targeted at the most high-risk children, who are particularly costly to society when left untreated (Foster et al., 2006). However, more data than merely the diagnosis of CD or ADHD are needed for early identification of the high risk subtypes of CD (Hill, 2003). Targeted early prevention of CD in the high risk subgroups by attempting to intervene at an even earlier stage is needed, in order to prevent inter-generational transmission within high-risk families (Coid, 2003). The earliest risk factors for chronic offending or violent crime of the genetically vulnerable children, such as intrauterine exposure to alcohol, drugs and nicotine (Brookes et al., 2006; Räsänen et al., 1999), neglect and maltreatment (Caspi et al., 2002), and other early stressful life events (Caspi et al., 2003, 2004), may be particularly harmful, and also further increase the developing individual's vulnerability to later risk factors. Long-standing prenatal stress at

sensitive phases of development reduced offspring hippocampal cell number and proliferation all throughout life in rats (Caspi et al., 2004). However, infantile stimulation and good neonatal handling were reported to reverse these changes, and it has even been suggested that such behaviours reverse the appearance of behavioural disorders induced by early stress (Lemaire et al., 2006). Such results encourage further study of early interventions for parents and infants. Treatment of addictions is important for all parents suffering from substance dependence, and essential for families in which the parents have a history of habitual offending and APD. Early prevention of the environmental risks of children of violent offenders, particularly those with APD and SUD, may prevent the lifelong criminal career of the offspring. Successful preventive efforts in one generation may improve the life of several generations.

6. CONCLUSIONS

Among persons with MMD, those having APD with SUD, named here triple disorder (MMD+SUD+APD), are a particular risk group for severe violence. They accounted for nearly half (47%) of the homicides of the nationally representative sample of psychotic homicide offenders. Neither APD without SUD (the non-existing category in this study), nor SUD without APD (pure dual disorder, nearly as common as pure MMD), but the combination of APD and SUD was the most dangerous category for severe violence among persons with MMD. The results suggest that pure dual disorder, (SUD+MMD without APD) may not increase the risk of severe violence among persons with MMD more than pure MMD alone. The risk factors for homicidal behaviour in pure dual disorder may be associated more with psychotic symptoms than with SUD. Dual disorder appears to be a different syndrome from triple disorder.

The homicidal behaviour of psychotic persons with triple disorder differed from that of patients with pure MMD in some respects, such as the greater importance of arguments/fights with non-relatives when intoxicated with alcohol, and the smaller impact of delusions. Prevention of severe violence among persons with MMD necessitates that effective treatments should be developed for persons with triple disorder.

It is possible to estimate quantitatively the risk of violent and criminal offending in a comprehensive population of high-risk children on the basis of parental criminality. An increased risk of any criminal offending compared to controls was transmitted across three generations, but violent crime significantly only from HRs to their children.

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APPENDIX

DSM-IV-TR diagnostic criteria for disorders mentioned in the text (According to American Psychiatric Association 2000).

Schizophrenia
A. Two or more, each present for a significant portion of time during a 1-month period (or less if successfully treated).
   1. delusions
   2. hallucinations
   3. disorganized speech (e.g. frequent derailment or incoherence)
   4. grossly disorganized or catatonic behaviour
   5. negative symptoms, i.e. affective flattening, alogia or avolition
   (Only one symptom is needed if the delusions are bizarre or hallucinations consist of a voice's running commentary on a person's behaviour or thoughts; or two or more conversing voices)
B. Social/occupational dysfunction
C. Duration: at lest 6 months including at least 1 month of A. symptoms
D. Schizoaffective Disorder and Mood Disorder With Psychotic Features have been ruled out (no mood episodes concurrently with the active-phase symptoms, or the duration of mood episodes has been brief relative to the duration of the active and residual periods)
E. The disturbance is not due to direct physiological effects of a substance (drug of abuse, a medication) or general medical condition
F. In Autistic Disorder or Pervasive Developmental Disorder the additional diagnosis of Schizophrenia is made only if prominent delusions or hallucinations are also present for at least a month (or less if successfully treated)

Schizoaffective disorder
A. An uninterrupted period of illness during which, at some time, there is either a Major Depressive Period, a Manic Episode, or a Mixed Episode concurrent with symptoms that meet Criterion A for Schizophrenia
B. During the same period of illness, there have been delusions or hallucinations for at least 2 weeks in the absence of prominent mood symptoms
C. Symptoms that meet criteria for mood episode are present for a substantial portion of the total duration of the active and residual periods of the illness
D. The disturbance is not due to the direct physiological effects of a substance or a general medical condition

Delusional Disorder
A. Non-bizarre delusions of at least 1 month duration
B. Criterion A for Schizophrenia has never been met
C. Apart from the impact of the delusion or its ramifications, functioning is not markedly impaired and behaviour is not obviously odd or bizarre
D. If mood episodes have occurred concurrently with delusions, their total duration has been brief relative to the duration of the delusional periods
E. The disturbance sin t due to the direct physiological effects of a substance or a general medical condition

Antisocial Personality Disorder
A. There is a pervasive pattern of disregard for and violation of the rights of others occurring since age of 15 years, as indicated by three or more of the following:
   1. failure to confirm social norms with respect or lawful behaviours as indicated by repeatedly performing acts that are grounds for arrest
   2. deceitfulness indicated for repeated lying, use of aliases, or conning others for personal profit or pleasure
   3. impulsivity or failure to plan ahead
   4. irritability or aggressiveness, as indicated by repeated physical fights or assaults
   5. reckless disregard for safety of self or others
   6. consistent irresponsibility, as indicated by repeated failure to sustain consistent work behavior or honor financial obligations

7. lack of remorse, as indicated by being indifferent to or rationalizing having hurt, mistreated or stolen from another

B. The individual is at least age 18 years
C. There is evidence of Conduct Disorder with onset before age 15 years
D. The occurrence of antisocial behaviour is not exclusively during the course of Schizophrenia or Manic Episode

Conduct Disorder
A. repetitive and persistent pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated, as manifested by the presence of three or more of the following criteria in the past 12 months, with at least one criterion present in the past 6 months:
1. often bullies, threatens or intimidates others
2. often initiates physical fights
3. has used a weapon that can cause serious physical harm to others
4. has been physically cruel to people
5. has been physically cruel to animals
6. has stolen while confronting a victim
7. has forced someone into sexual activity
8. Has deliberately engaged in fire setting with the intention of causing serious harm
9. destroyed other's property
10. has broken into someone else's house, building or car
11. often lies to obtain goods or favours or to avoid obligations
12. has stolen items of nontrivial value without confronting a victim
13. often stays out at night despite parental prohibitions, beginning before age13 years
14. has run away from home overnight at least twice while living in parental or parental surrogate home
15. is often truant from school, beginning before age 13 years
B. The disturbance causes clinically significant impairment in social, academic or occupational functioning
C. If the individual is age 18 years, the criteria are not met for Antisocial Personality Disorder

Borderline personality disorder
A pervasive pattern of instability of interpersonal relationships, self-image and affects, and marked impulsivity beginning by early adulthood and present in a variety of contexts, as indicated by five or more of the following:
1. frantic efforts to avoid real or imagined abandonment
2. a pattern of unstable and intense interpersonal relationships characterized by alternating between extremes of idealization and devaluation
3. identity disturbance markedly and persistently unstable self-image or sense of self
4. impulsivity in at least two areas that are potentially self- damaging
5. recurrent suicidal behaviour, gestures, threats, or self-mutilating behaviour
6. affective instability due to a marked reactivity of mood
7. chronic feelings of emptiness
8. inappropriate, intense anger or difficulty controlling anger
9. transient, stress-related paranoid ideation or severe dissociative symptoms

Substance Abuse
1. recurrent substance use resulting in a failure to fulfil major role obligations at work, school, or home
2. recurrent substance use in situations in which it is physically hazardous
3. recurrent substance-related legal problems
4. continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance

Substance dependence

A maladaptive pattern of substance use, leading to clinically significant impairment and distress, as manifested by three (or more) of the following, incurring at any time in the same 12-month period:

1. tolerance
2. withdrawal
3. the substance is taken in larger amounts or over a longer period than was intended
4. there is a persistent desire or unsuccessful efforts to cut down or control substance use
5. a great deal of time is spent in activities necessary to obtain the substance, use the substance, or recover from its effects
6. important social, occupational, or recreational activities are given up or reduced because of the substance use
7. the substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance.

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