



# LUND UNIVERSITY

## Mentally disordered offenders in Sweden

### differentiating recidivists from non-recidivists in a 10-year follow-up study

Krona, Hedvig; Nyman, Marielle; Andreasson, Helena; Vicencio, Nicolas; Anckarsäter, Henrik; Wallinius, Märta; Nilsson, Thomas; Hofvander, Björn

*Published in:*

Nordic Journal of Psychiatry

*DOI:*

[10.1080/08039488.2016.1236400](https://doi.org/10.1080/08039488.2016.1236400)

2017

*Document Version:*

Peer reviewed version (aka post-print)

[Link to publication](#)

*Citation for published version (APA):*

Krona, H., Nyman, M., Andreasson, H., Vicencio, N., Anckarsäter, H., Wallinius, M., Nilsson, T., & Hofvander, B. (2017). Mentally disordered offenders in Sweden: differentiating recidivists from non-recidivists in a 10-year follow-up study. *Nordic Journal of Psychiatry*, 71(2), 102-109. <https://doi.org/10.1080/08039488.2016.1236400>

*Total number of authors:*

8

#### General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

#### Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

## **PREPUBLICATION COPY**

### **Mentally disordered offenders in Sweden: Differentiating recidivists from non-recidivists in a 10 year follow-up study.**

Hedvig Krona, Marielle Nyman, Helena Andreasson, Nicolas Vicencio, Henrik Anckarsäter, Märta Wallinius, Thomas Nilsson, Björn Hofvander

Nordic Journal of Psychiatry, Published online: 05 Oct 2016

© 2016 Taylor & Francis

The final, definitive version of this paper has been published in:

<http://dx.doi.org/10.1080/08039488.2016.1236400>

N.B.: When citing this work, cite the original article.

**Full title:**

**Mentally disordered offenders in Sweden:  
Differentiating recidivists from non-recidivists in a  
10 year follow-up study**

Running title:

**10-year follow-up study of mentally disordered offenders**

Hedvig Krona<sup>a</sup>, MD, Marielle Nyman<sup>a</sup>, BSc, Helena Andreasson<sup>a</sup>, BSc, Nicolas Vicencio<sup>a</sup>,  
MD, Henrik Anckarsäter<sup>b</sup>, PhD, Märta Wallinius<sup>a</sup>, PhD, Thomas Nilsson<sup>b</sup>, PhD, Björn  
Hofvander<sup>a</sup>, PhD

<sup>a</sup>Lund University, Department of Clinical Sciences, Lund, Sweden

<sup>b</sup>Institute of Neuroscience and Physiology, Department of Forensic Psychiatry and  
Centre of Ethics, Law and Mental Health, University of Gothenburg, Sweden

Correspondence to: Hedvig Krona, Division of Forensic Psychiatry, Malmö, Sege Park B6,  
SE-205 02 Malmö, Sweden Phone: +46 40 33 10 00; fax: +46 40 33 55 54

E-mail: [hedvig.krona@med.lu.se](mailto:hedvig.krona@med.lu.se)

## **Abstract**

**Background** Forensic psychiatric patients present a challenge as they manifest severe mental disorders together with criminal behaviour. There are well-known risk factors for criminal behaviour in the general population, yet our knowledge of what predicts reconviction in the Swedish forensic population in the long-term perspective is still insufficient.

**Aims** The study aims to; (1) describe background and clinical characteristics of forensic psychiatric patients in a 10-year follow-up, (2) analyse risk factors associated with recidivism, (3) test the predictive validity of risk factors for general and violent criminality.

**Methods** Detailed information on all offenders from the Malmö University Hospital catchment area sentenced to forensic psychiatric in-patient treatment from 1999 until 2005 ( $n=125$ ) was collected. Court decisions were collected up until the end of 2008 (median follow-up time 6.2 years, range 0.6 to 9.7 years).

**Results** Relapse in general crime ( $n=30$ ) was predicted by low educational attainment, mental disorder in a first degree relative and low age at first sentenced crime. Relapse in violent crime ( $n=16$ ) was predicted by low educational attainment and low GAF scores. Patients with a restriction order were less likely to relapse in both crime categories.

**Conclusions** Signs of childhood adversities together with early debut in criminality appeared as important risk factors for general and violent recidivism. Forensic psychiatric treatment combined with a restriction order was demonstrated as a protective factor against recidivism, suggesting that the risk of recidivism is strongly related to the level of supervision. Though the low number of recidivism cases is highly desirable, it unfortunately reduces the power of the analyses in this paper.

**Keywords:** Forensic psychiatry; Risk assessment; Violent recidivism; Prediction

## 1. Background

Forensic psychiatric patients present challenges to treatment providers due to their complex problem constellations, with major mental disorders in combination with criminal behaviour and psychosocial problems (1-5). The pronounced vulnerability of this patient group can be seen in increased mortality and suicide risk when compared to the general population (2, 6, 7). The risk of criminal recidivism among forensic psychiatric investigatees (8) and patients (9) is elevated, albeit at a modest level when compared to offenders in prison (10). Recidivism rates of 4% to 15% have previously been reported for forensic psychiatric patients (9, 11-13). However, a recent long-term study on mentally disordered offenders revealed that differences between sanction groups become non-significant over time, with a long-term recidivism rate of 47% in a population based Swedish cohort of mentally disordered offenders (14).

The most prominent risk factors for criminal and violent recidivism are similar among forensic psychiatric patients, offenders in prison and the general population; early-onset antisocial behaviour, substance use disorders, and personality disorders (4, 15-18).

Furthermore, previous studies have shown that early childhood adversities such as mental disorder and substance use in a first degree relative as well as psychological and physical abuse are also significant risk factors for violent behaviour in adult life (17, 19).

Major mental disorders carry an increased risk for criminal recidivism (20-22); however, this risk increase has been debated as to whether it is due to comorbid substance use disorders (23). A subgroup of high-risk offenders has been identified both in general populations (24, 25) and among forensic psychiatric patients (26), characterized by an early onset and a persistent offending pattern. The evidence that the pathway of offending behaviour is important to consider in both assessments and preventive interventions, regardless of psychiatric comorbidity such as psychosis, is mounting (27).

In consideration with the differences in legislation between countries, further knowledge on the characteristics of forensic psychiatric patients in the Nordic countries is needed in order to tailor the much needed mental health treatment interventions and criminal preventive efforts directed towards this group.

### ***Aims***

The general aim of this paper is to give a detailed description of a total cohort of offenders sentenced to forensic psychiatric in-patient treatment in Sweden and to report rates of general and violent reconvictions at a 3-10 years follow-up. More specifically, the study aims to; (1) describe background and clinical characteristics of the cohort, (2) analyse associations between baseline risk factors and recidivism in general and violent crime and (3) test the predictive validity of identified risk factors of recidivism in general and violent crime.

## **2. Material and methods**

### ***2.1 Forensic Psychiatric Treatment in Sweden***

According to Swedish legislation, a court-ordered pre-trial forensic psychiatric investigation (FPI) is a prerequisite for a sanction to forensic psychiatric treatment and is therefore required for all offenders who may have a mental disorder severe enough to meet the medicolegal definition of severe mental disorders and who have been found guilty of a crime severe enough to warrant a prison sentence. The FPIs are conducted by teams consisting of forensic psychiatrists, psychologists, social workers and nurses. In some cases a minor forensic psychiatric screening report (FPSR) carried out by a forensic psychiatrist alone, is sufficient. Further descriptions of the Swedish criminal system and forensic psychiatric treatment have previously been published (5, 28).

Based on the risk assessments in the FPIs/FPSRs, the court decides if the forensic psychiatric treatment shall be combined with a restriction order - special court supervision (SCS). When the risk is assessed as high, the care is combined with SCS meaning that a county administrative court decides on all privileges, including discharge. When care is given without SCS, the chief medical officer decides on privileges and discharge. Thus, forensic psychiatric treatment in Sweden is not time-limited, as discharge is stipulated to depend upon progress.

## ***2.2 Forensic psychiatric follow-up studies – the Malmö cohort***

This paper reports psychosocial, criminological and psychiatric baseline data together with the first wave of follow-up data from the Forensic psychiatric follow-up studies – the Malmö cohort (UPPRÄTT-Malmö study). It's based on a nationally representative, total cohort of patients sentenced to forensic psychiatric in-patient treatment and consists of 101 men and 24 women, aged 17-79 (median age 38) at the time of the FPI. The patients belonged to the catchment area of the Malmö University Hospital and were sentenced to involuntary forensic psychiatric in-treatment during 1999 - 2005. Most patients underwent a FPI ( $n=97$ , 78%), and a lesser number a FPSR ( $n=28$ , 22%). Structured protocols were used to obtain data from the FPIs and FPSRs. The basic treatment conditions, including length of stay and prevalence of adverse events have previously been published (29).

## ***2.3 Clinical assessments***

Psychiatric diagnoses for Axis I and II according to the Diagnostic and Statistical Manual of Mental Disorders 4<sup>th</sup> Edition (DSM-IV, (30)) were set using semi-structured interviews, generally by the SCID I (31) and the SCID II (32), by senior consultant psychiatrists (Axis I) and clinical psychologists (Axis II). In the FPSRs, the personality disorder diagnoses were set in clusters and hence, statistical analyses of specific personality disorders were not feasible.

Subtypes of diagnoses were collapsed into broader categories according to the headings of DSM-IV (30) in order to enable statistical analyses.

Psychometrical assessments of cognitive function (Synonyms, Reasoning and Block tests (SRB) (33), Raven's Progressive Matrices (34) or Wechsler Adult Intelligence Scales-Revised (WAIS-R) (35)) were only performed at the FPIs and due to the severe clinical conditions only a proportion of the patients ( $n=58$ , 60%) were able to participate in these investigations.

#### ***2.4 Risk measures***

The HCR-20 (36) is a 20-item risk assessment checklist developed for the purpose of assisting the structured clinical judgment in violence risk assessments with items rated on a three-point scale ("not present" to "definitely present"). In this study, only the 15 historical and clinical items of the HCR-20 were rated and used independently as well as a total score, since the risk management items could not be rated due to their focus on individual treatment and management plans that not yet had been developed. When an item had been omitted in the HCR-20, the mean score was calculated and assigned to that item. It should be noted that this procedure does not correspond to the clinical procedure recommended for use of the HCR-20, and that the current ratings must be seen in light of these limitations that was due to the setting of data collection.

The Hare Psychopathy Checklist-Screening Version (PCL:SV, (37)) was used for assessment of psychopathic personality traits. The PCL:SV is a 12-item rating scale, highly correlated with the 20-item full version (38, 39). The items are scored from detailed descriptions in the manual and rated on a three-point scale (0 = does not apply, 1 = may apply or in some respects applies, 2 = does apply) measuring the interpersonal, emotional, and behavioural aspects of the construct of psychopathy. When no more than one item at the PCL:SV had been omitted,



a score was assigned according to the PCL:SV manual (37). In one case the PCL:SV assessment was missing two items and was therefore omitted.

Only participants who had undergone a full FPI were rated with HCR-20 and PCL:SV, and in most cases this had been performed by the original FPI team. In cases where ratings were missing ( $n=25$ ), these were performed retrospectively based on information from the forensic psychiatric investigations and on extensive file and register reviews in each case.

### ***2.5 Follow-up data collection and measures***

The National Council of Crime Prevention provided dates of new crimes and convictions, dates of legal force of new sentences, and following periods of sanctions. Since patients in some cases were reconvicted during their forensic psychiatric care, time at risk was calculated from each patient's intake date until reconviction or the 31<sup>st</sup> of December 2008, when the follow-up period ended. The median follow-up time was 6.2 years (range 0.6 to 9.7 years).

*Violent crimes* were defined as homicide, manslaughter, causing another person's death, assault and battery, arson, robbery, unlawful threats, violation of integrity, unlawful coercion, molestation, violence against an officer, and sexual offences including sexual molestation. All crimes included attempted and aggravated forms. *Recidivism* was defined as criminal convictions during the follow-up period and is presented as violent or general (i.e. all convictions, including violent).

### ***2.6 Statistical analysis***

Fisher's exact  $\chi^2$ -test was used for group comparisons in dichotomous variables and Mann-Whitney  $U$  test for continuous variables as data was not normally distributed. All statistics were calculated using anonymized data, using two-tailed p-values. Due to missing data for

some variables, the percentages given are based on the valid percentages. To measure effect size, Phi scores for Fisher's exact  $\chi^2$ -test and  $r$ -scores for Mann-Whitney  $U$  test are presented. Per Cohen's model for Phi, effect sizes of 0.20 are small, 0.50 a medium effect and 0.80 a large effect. Cohen's model for  $r$  states that 0.10 is a small effect, 0.30 a medium effect and 0.50 a large effect. All independent variables that had  $p < 0.30$  in univariate analyses were included in the Cox regression model, thereafter one insignificant independent variable was excluded at a time, starting with the variable with highest  $p$ -value until all remaining predictors had  $p < 0.05$ . Multicollinearity was tested for by using a linear regression model with exclusion of any covariate with a VIF  $> 3.0$ . In agreement with Benjamini and Hochberg (40) and Nakagawa (41) we included effect sizes (Phi) instead of correcting for multiple testing. This reduces the risk of Type II errors and enables the reader to evaluate the clinical importance of the results. Statistical analyses were performed using the SPSS 22.0.

## ***2.7 Ethical considerations***

This study was approved by the regional ethical review board in Lund (64/2007). Since the study is register-based, consent was not considered necessary as it would not be possible to contact most participants due to the length of time that had passed after finishing treatment and because contact could pose a risk to vulnerable subjects with mental health and/or legal problems.

## **3. Results**

### ***3.1 Background and clinical data***

As can be seen in Tables 1 and 2, this cohort was predominantly male and two thirds ( $n=84$ , 67%) received treatment with SCS. Approximately half of the cohort ( $n=64$ , 51%) had a migration background, defined as either having one or both parents from another country than

Sweden or as having migrated to Sweden themselves. The majority of the index crimes were of violent nature ( $n=105$ , 84 %). A majority of the cohort ( $n=78$ , 65%) was previously registered as offenders and approximately one third of the cohort ( $n=41$ , 34%) had been convicted of more than five crimes previous to the index crime. In total 41 patients (34%) had committed violent crimes prior to the index crime.

The number of assigned Axis I mental disorders varied from zero to eight per patient. Fifty patients (40%) had one solitary Axis I diagnosis, but the majority, 58% ( $n=72$ ), were assigned two or more diagnoses and 28% ( $n=35$ ) had three or more diagnoses. Three patients (2%) had no Axis I diagnoses. A small proportion of the cohort – 11 in total, had a neurodevelopmental disorder. Three patients (2%) had ADHD, another three (2%) had autism spectrum disorder and two (2%) had both diagnoses combined. The three remaining patients (2%) had other neurodevelopmental disorders.

Personality disorder diagnoses are presented in clusters; 34 (27%) patients had one or more personality disorder diagnosed, most commonly in cluster B ( $n=20$ , 16%). Thirty-three patients (26%) had made one or more suicide attempts previously and 9% ( $n=11$ ) made one or more suicide attempts during their in-patient stay (this number includes four completed suicides). Seven patients (6%) died during follow-up.

Table 1 – Background characteristics

Table 2 – Clinical characteristics

### ***3.2 Associations between background and clinical variables and recidivism in crime***

A total of 30 patients (24%) relapsed in any form of criminality during the follow-up period and out of these a partition, 16 (13%), relapsed in violent crime. Univariate analyses of background and clinical data were made to identify variables associated with recidivism in general and violent crime and these results are presented in Table 1 and 2.

### ***3.3 Predictors of general and violent recidivism***

In the Cox regression analysis, several background variables were significantly associated with the risk of general recidivism, while no clinical characteristics reached significance (Table 3). Having a first degree relative with a major mental disorder ( $p=0.021$ ), a low educational attainment ( $p<0.001$ ) and a low age at first criminal offence ( $p=0.001$ ) were all positive predictors of recidivism in any type of crime. Treatment combined with SCS was a negative predictor of recidivism in any crime ( $p<0.001$ ).

When analysing recidivism in violent crime with a Cox regression analysis, only low educational attainment ( $p=0.048$ ) reached significance among the background variables. Among the clinical variables, having a low GAF score (The Global Assessment of Functioning-scale) at the time of the FPI was significantly predictive of violent recidivism ( $p=0.009$ ). The presence of a cluster B personality disorder was retained in the best fitting model, though it was borderline significant ( $p=0.056$ ). Treatment combined with SCS ( $p=0.022$ ) was negatively predictive of violent recidivism.

Table 3 Cox regressions

## 4. Discussion

Forensic psychiatric patients are sometimes described as "the triply troubled" (42) since they present with the combination of psychiatric symptoms, violent behaviour and substance use disorders. Substance use has been linked to several negative outcomes in convicted populations, e.g. higher rates of reconvictions (43), heavier psychiatric burden (44) and higher mortality (45) and is one of the most important risk factors for criminal recidivism (23, 43, 46). Half of the patients in the cohort ( $n=60$ , 48%) met the criteria for substance use disorder, yet it was neither associated with nor predictive of recidivism. Degl'Innocenti and colleagues found that 63% of Swedish forensic psychiatric patients had a previous history of substance use (47). These figures included cases where the full criteria for substance use disorder were not met, which might explain why their prevalence was higher. In this study, the low base rate of recidivism might, at least in part, account for the lack of association between substance use disorders and recidivism.

A higher frequency of neurodevelopmental disorders would have been expected as there is strong evidence for the link between neurodevelopmental disorders, conduct disorder and violent criminality (48). Recent studies have found these disorders to be clearly overrepresented in forensic populations (49-51). However, the Swedish penal system did not include neurodevelopmental disorders in the medicolegal definition of severe mental disorders at the time and thus, they were not of immediate focus during the FPIs. In hindsight, symptoms of neurodevelopmental disorders may have been attributed to other diagnoses such as personality disorders.

Thirty patients (24%) relapsed in any crime and out of these, 16 (13%) relapsed in violent crime. This recidivism rate is in line with the results from other long-term follow-up studies of mentally disordered offenders and patients discharged from special hospitals where

reconvictions typically vary as a result of the length of the follow-up period (9, 10). In a previous five-year follow-up of a smaller group of forensic psychiatric patients compared to a group sentenced to prison, 15% in the psychiatric group relapsed in any criminality and 11% in violent criminality (28). Reconvictions were significantly more common in the prison group yet the authors showed that relapse rates were highly dependent on individual characteristics as well as on level of supervision. The present study confirms this; the absence of SCS was highly predictive of recidivism in both general and violent crime which strengthens the conclusion that Lund and colleagues made (28); the level of supervision is important in modulating risk for recidivism and could be an important protective factor against recidivism. In a previous study on the same cohort, the SCS has been shown to be correlated to up to five times longer in-treatment time compared to patients treated without SCS (29).

Considering risk factors for recidivism, the current study confirms the important family and early onset risk factors suggested in prior research (9, 17). As shown by several studies (52-54), childhood adversity is a good predictor of criminality in later years. These environmental risk factors correlates with neurodevelopmental disorders (24, 55-57) and when combined with an early onset of antisocial behaviour, in the form of conduct disorder, they constitute a strong developmental background of chronic criminal behaviour (58, 59). The UPPRÄTT study does not contain detailed information on childhood disruptive behaviour disorders but age at first sentences crime was clearly linked to criminal recidivism. Previous criminal and aggressive behaviors have consistently been identified as one of the best predictors for new crimes (17, 60-62). In addition, we know that disruptive behaviour disorders are important developmental precursors of cluster B personality disorders (mainly borderline personality disorder and antisocial personality disorder) (3, 49, 51-54). In the current study, this cluster of

impulsive personality disorders was clearly linked to recidivism, both in general and in violent crimes, which is in line with previous studies (4, 16-18).

The link between major mental disorders, particularly psychosis, and violence that has been shown in previous papers (1, 46, 63) was not apparent in the present study. The debate of whether or not psychosis is predictive of violence is continuing and previous epidemiological studies showing that the elevated risk of offending in patients with psychotic disorders are attributable to the concomitant substance use (17, 46) are challenged. A recent study showed an association between psychiatric disorders, particularly psychotic and bipolar disorders, and violent reoffending, not accounted for by substance use disorders (64). In the present study, all patients were under surveillance and received medication regularly, which, as in accordance with findings in previous research (65), may have lessened the risk of recidivism due to some mental disorders.

The GAF scores estimated at the time of the FPI predicted recidivism in violent crime. Low GAF scores indicate a low psychological and social functioning and this combined with a potentially chronic major mental disorder indicates that the functioning level is at risk of being continuously reduced. In line with this, a large proportion of the cohort had no occupation ( $n=115$ , 94%), and a significant proportion of the recidivism groups had a poor financial situation ( $n=11$ , 37% in general recidivism,  $n=6$ , 38% in the violent recidivism group), further affirming the vulnerability and societal marginalisation that these patients face.

Finally, the lack of associations between criminal recidivism in this group of forensic psychiatric patients and measures commonly used in risk assessments need to be commented upon. There might be several explanations to the lack of association between recidivism and the PCL:SV, that otherwise is well established as a predictor of criminal recidivism. One explanation could be the rather low rate of recidivism in the cohort; it's a well-known fact that

the lower the rate of the outcome that is to be predicted, the lesser is the chance to successfully identify predictors. Another possible explanation is that our cohort differs in demographic characteristics from those that have been used in the original validation of the PCL:SV. For example, the samples used in Cooke and colleagues (39) contained a majority of non-psychiatric participants. The importance of such differences have been highlighted in a meta-analysis, since its results implied that the more different the tested sample is from the original validation sample for an assessment tool, the weaker is the predictive validity (66). Previous research has also shown that only a limited number of the items in risk assessment measures contribute to the predictive validity (62). Thus, it might be possible that the here identified predictive variables “possessed” all the predictive accuracy and thereby made it impossible for the risk assessment measures to explain any of the variation in recidivism. Furthermore, as described in the methods section, the HCR-20 was not used as a clinical risk assessment tool but only used in a 15-item version (historical and clinical variables). Thus, conclusions on the predictive validity of the HCR-20 cannot be drawn from the current study.

## **5. Conclusions**

The strength of this paper is that it confers baseline and follow-up data of a cohort containing all cases sentenced to forensic psychiatric in-patient treatment in a defined geographical area and time, which makes it representative for comparison with other studies of forensic psychiatric patients. The size of the cohort is the greatest limitation and hinders stronger predictions. The principal findings are that signs of childhood adversities in conjunction with early debut in criminality are important risk factors for general criminal recidivism, and thus key variables in predicting future criminal behaviour. The protective element of a restriction order suggests that the risk of recidivism is strongly related to the level of supervision as all patients in the cohort, regardless of SCS, had low functioning levels and were given court



ordered, involuntary treatment on the grounds of a major mental disorder. No diagnosis was proven to be either a risk factor or a predictive factor for recidivism, with the exception of cluster B personality disorder which reached borderline significance. This problem constellation might actually conceal neurodevelopmental diagnoses, which at the time were not highlighted in practice as much as they are now. The absence of a presumed higher prevalence of neurodevelopmental diagnoses is a limitation of this paper and as previous papers have shown (68), there is a need to further address the possible presence of neurodevelopmental disorders in forensic psychiatric settings.

One important limitation of the current study is that the ecological validity (69) has not been entirely accounted for in the analyses of risk factors. This hampers the conclusions that can be drawn from the results, since forensic psychiatric patients are subject to intensive treatment efforts that strive to refrain them from committing new crimes. Nevertheless, the presence of a restriction order in the form of SCS, and its value as a protective factor against recidivism, in some way taps into ecological validity by accounting for some of the context of the follow-up. Studies accounting for the effect of received treatment on risk of recidivism in forensic psychiatric patients are needed.

Future studies of this cohort will continue with follow-up times ranging up to 15 years with focus on recidivism, to further address the heightened risks of relapse in crime in the forensic psychiatric population. Results from somatic assessments and functional neuroimaging investigations will be analysed and presented with the overall aim to provide in-depth information of the longitudinal psychiatric, somatic, neurofunctional and criminological characteristics of forensic psychiatric patients.

## 6. References

1. Hodelet N. Psychosis and offending in British Columbia: characteristics of a secure hospital population. *Crim Behav Ment Health*. 2001;11(3):163-72. Epub 2002/06/06.
2. Tabita B, de Santi MG, Kjellin L. Criminal recidivism and mortality among patients discharged from a forensic medium secure hospital. *Nordic journal of psychiatry*. 2012;66(4):283-9. Epub 2012/01/04.
3. Soderstrom H, Sjodin AK, Carlstedt A, Forsman A. Adult psychopathic personality with childhood-onset hyperactivity and conduct disorder: a central problem constellation in forensic psychiatry. *Psychiatry Res*. 2004;121(3):271-80.
4. Wallinius M, Nilsson T, Hofvander B, Anckarsater H, Stalenheim G. Facets of psychopathy among mentally disordered offenders: Clinical comorbidity patterns and prediction of violent and criminal behavior. *Psychiatry Res*. 2012;198(2):279-84. Epub 2012/03/17.
5. Svennerlind C, Nilsson T, Kerekes N, Andine P, Lagerkvist M, Forsman A, et al. Mentally disordered criminal offenders in the Swedish criminal system. *Int J Law Psychiatry*. 2010;33(4):220-6. Epub 2010/07/30.
6. Bjork T, Lindqvist P. Mortality among mentally disordered offenders: a community based follow-up study. *Crim Behav Ment Health*. 2005;15(2):93-6. Epub 2006/02/14.
7. Jones RM, Hales H, Butwell M, Ferriter M, Taylor PJ. Suicide in high security hospital patients. *Soc Psychiatry Psychiatr Epidemiol*. 2011;46(8):723-31. Epub 2010/06/16.
8. Kivimies K, Repo-Tiihonen E, Kautiainen H, Tiihonen J. Previous forensic mental examination is a useful marker indicating effective violence relapse prevention among psychotic patients. *Nordic journal of psychiatry*. 2014;68(5):311-5. Epub 2013/09/21.
9. Nilsson T, Wallinius M, Gustavson C, Anckarsater H, Kerekes N. Violent recidivism: a long-time follow-up study of mentally disordered offenders. *PLoS One*. 2011;6(10):e25768. Epub 2011/10/25.
10. Grann M, Danesh J, Fazel S. The association between psychiatric diagnosis and violent re-offending in adult offenders in the community. *BMC Psychiatry*. 2008;8:92. Epub 2008/11/27.
11. Friendship C, McClintock T, Rutter S, Maden A. Re-offending: patients discharged from a Regional Secure Unit. *Criminal Behaviour and Mental Health*. 1999(9):226-36.
12. Maden A, Scott F, Burnett R, Lewis GH, Skapinakis P. Offending in psychiatric patients after discharge from medium secure units: prospective national cohort study. *BMJ*. 2004;328(7455):1534. Epub 2004/06/01.
13. Yoshikawa K, Taylor PJ, Yamagami A, Okada T, Ando K, Taruya T, et al. Violent recidivism among mentally disordered offenders in Japan. *Crim Behav Ment Health*. 2007;17(3):137-51. Epub 2007/06/28.
14. Lund C, Hofvander B, Forsman A, Anckarsater H, Nilsson T. Violent criminal recidivism in mentally disordered offenders: a follow-up study of 13-20 years through different sanctions. *Int J Law Psychiatry*. 2013;36(3-4):250-7. Epub 2013/05/16.
15. Coid J, Yang M, Roberts A, Ullrich S, Moran P, Bebbington P, et al. Violence and psychiatric morbidity in a national household population--a report from the British Household Survey. *Am J Epidemiol*. 2006;164(12):1199-208. Epub 2006/10/13.
16. Elonheimo H, Niemela S, Parkkola K, Multimaki P, Helenius H, Nuutila AM, et al. Police-registered offenses and psychiatric disorders among young males : the Finnish

- "From a boy to a man" birth cohort study. *Soc Psychiatry Psychiatr Epidemiol*. 2007;42(6):477-84. Epub 2007/04/24.
17. Falk O, Wallinius M, Lundstrom S, Frisell T, Anckarsater H, Kerekes N. The 1 % of the population accountable for 63 % of all violent crime convictions. *Soc Psychiatry Psychiatr Epidemiol*. 2013. Epub 2013/11/01.
  18. Yu R, Geddes JR, Fazel S. Personality disorders, violence, and antisocial behavior: a systematic review and meta-regression analysis. *J Pers Disord*. 2012;26(5):775-92. Epub 2012/09/28.
  19. Reavis JA, Looman J, Franco KA, Rojas B. Adverse childhood experiences and adult criminality: how long must we live before we possess our own lives? *Perm J*. 2013;17(2):44-8. Epub 2013/05/25.
  20. Arseneault L, Moffitt TE, Caspi A, Taylor PJ, Silva PA. Mental disorders and violence in a total birth cohort: results from the Dunedin Study. *Arch Gen Psychiatry*. 2000;57(10):979-86. Epub 2000/10/04.
  21. Fazel S, Grann M. The population impact of severe mental illness on violent crime. *AJ Psychiatry*. 2006;163(8):1397-403. Epub 2006/08/01.
  22. Walsh E, Buchanan A, Fahy T. Violence and schizophrenia: examining the evidence. *Br J Psychiatry*. 2002;180:490-5. Epub 2002/06/04.
  23. Fazel S, Langstrom N, Hjern A, Grann M, Lichtenstein P. Schizophrenia, substance abuse, and violent crime. *JAMA*. 2009;301(19):2016-23. Epub 2009/05/21.
  24. Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: a developmental taxonomy. *Psychol Rev*. 1993;100(4):674-701. Epub 1993/10/01.
  25. Odgers CL, Moffitt TE, Tach LM, Sampson A, Taylor RJ, Matthews CL, et al. The protective effects of neighborhood collective efficacy on British children growing up in deprivation: a developmental analysis. *Dev Psychol*. 2009;45(4):942-57. Epub 2009/07/10.
  26. Pedersen L, Rasmussen K, Elsass P, Hougaard H. The importance of early anti-social behaviour among men with a schizophrenia spectrum disorder in a specialist forensic psychiatry hospital unit in Denmark. *Crim Behav Ment Health*. 2010;20(4):295-304. Epub 2010/07/16.
  27. Kooyman I, Walsh E, Stevens H, Burns T, Tyrer P, Tattan T, et al. Criminal offending before and after the onset of psychosis: examination of an offender typology. *Schizophr Res*. 2012;140(1-3):198-203. Epub 2012/07/24.
  28. Lund C, Forsman A, Anckarsater H, Nilsson T. Early criminal recidivism among mentally disordered offenders. *Int J Offender Ther Comp Criminol*. 2012;56(5):749-68. Epub 2011/08/02.
  29. Andreasson H, Nyman M, Krona H, Meyer L, Anckarsater H, Nilsson T, et al. Predictors of length of stay in forensic psychiatry: The influence of perceived risk of violence. *Int J Law Psychiatry*. 2014;37(6):635-42. Epub 2014/03/19.
  30. AP. A. Diagnostic and statistical manual of mental disorders, DSM-IV. Washington DC: American Psychiatric Association Press; 1994.
  31. First MB, Gibbon M, Spitzer RL, Williams JB. Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version (SCID-CV). Washington, D.C.: American Psychiatric Press, Inc.; 1996.
  32. First MB, Gibbon M, Spitzer RL, Williams JBW, Benjamin LS. Structured Clinical Interview for DSM-IV Axis II Personality Disorders, (SCID-II). Washington, D.C.: American Psychiatric Press, Inc.; 1997.
  33. Dureman I, Sälde H. SRB - Synonymer, Reasning och Block test. 1959.
  34. Raven J, Raven JC, Court JH. Manual for Raven's Progressive Matrices and Vocabulary Scales. Section 1: General overview. 1998 ed ed. Oxford : Oxford Psychologists, 19981998.

35. Wechsler D. WAIS-R Manual. Wechsler Adult Intelligence Scale - Revised. San Antonio, TX.: The Psychological Corporation; 1981.
36. Webster CD, Douglas KS, Eaves D, Hart SD. HCR-20: Assessing risk for violence. Vancouver, British Columbia, Canada: Mental Health, Law and Policy Institute; 1997.
37. Hart SD, Cox DN, Hare RD. The Hare Psychopathy Checklist: Screening Version. Toronto, ON: Multi-Health Systems.; 1995.
38. Hare RD. Hare Psychopathy Checklist-Revised (PCL-R). Toronto, ON: Multi-Health Systems; 1991.
39. Cooke DJ, Michie C, Hart SD, Hare RD. Evaluating the Screening Version of the Hare Psychopathy Checklist—Revised (PCL:SV): An Item Response Theory Analysis. *Psychological Assessment*. 1999;11(1):10.
40. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society*. 1995;57(1):289-300.
41. Nakagawa S. A farewell to Bonferroni: the problems of low statistical power and publication bias. *Behavioral Ecology*. 2004;15(6):1044-5.
42. Lindqvist P. Mental disorder, substance misuse and violent behaviour: the Swedish experience of caring for the triply troubled. *Crim Behav Ment Health*. 2007;17(4):242-9. Epub 2007/09/29.
43. Grann M, Fazel S. Substance misuse and violent crime: Swedish population study. *BMJ*. 2004;328(7450):1233-4. Epub 2004/05/25.
44. Hakansson A, Schlyter F, Berglund M. Associations between polysubstance use and psychiatric problems in a criminal justice population in Sweden. *Drug Alcohol Depend*. 2011;118(1):5-11. Epub 2011/03/23.
45. Chang Z, Lichtenstein P, Larsson H, Fazel S. Substance use disorders, psychiatric disorders, and mortality after release from prison: a nationwide longitudinal cohort study. *Lancet Psychiatry*. 2015;2(5):422-30. Epub 2015/09/12.
46. Fazel S, Gulati G, Linsell L, Geddes JR, Grann M. Schizophrenia and violence: systematic review and meta-analysis. *PLoS Med*. 2009;6(8):e1000120. Epub 2009/08/12.
47. Degl' Innocenti A, Hassing LB, Lindqvist AS, Andersson H, Eriksson L, Hanson FH, et al. First report from the Swedish National Forensic Psychiatric Register (SNFPR). *Int J Law Psychiatry*. 2014;37(3):231-7. Epub 2013/12/04.
48. Patterson GR, DeGarmo DS, Knutson N. Hyperactive and antisocial behaviors: comorbid or two points in the same process? *Dev Psychopathol*. 2000;12(1):91-106. Epub 2000/04/25.
49. Siponmaa L, Kristiansson M, Jonson C, Nyden A, Gillberg C. Juvenile and young adult mentally disordered offenders: the role of child neuropsychiatric disorders. *J Am Acad Psychiatry Law*. 2001;29(4):420-6. Epub 2002/01/12.
50. Soderstrom H, Nilsson T, Sjodin AK, Carlstedt A, Forsman A. The childhood-onset neuropsychiatric background to adulthood psychopathic traits and personality disorders. *Compr Psychiatry*. 2005;46(2):111-6. Epub 2005/02/22.
51. Billstedt E, Anckarsater H, Wallinius M, Hofvander B. Neurodevelopmental disorders in young violent offenders: A cross-sectional study of prison inmates. Submitted, not yet in print. 2016.
52. Copeland WE, Miller-Johnson S, Keeler G, Angold A, Costello EJ. Childhood psychiatric disorders and young adult crime: a prospective, population-based study. *AJ Psychiatry*. 2007;164(11):1668-75. Epub 2007/11/03.

53. Pingault JB, Cote SM, Lacourse E, Galera C, Vitaro F, Tremblay RE. Childhood hyperactivity, physical aggression and criminality: a 19-year prospective population-based study. *PLoS One*. 2013;8(5):e62594. Epub 2013/05/10.
54. Sourander A, Elonheimo H, Niemela S, Nuutila AM, Helenius H, Sillanmaki L, et al. Childhood predictors of male criminality: a prospective population-based follow-up study from age 8 to late adolescence. *J Am Acad Child Adolesc Psychiatry*. 2006;45(5):578-86. Epub 2006/05/04.
55. Sampson RJ, Laub JH. Crime and deviance in the life course. *Annual Review of Sociology*. 1992(18).
56. Moffitt TE, Caspi A, Harrington H, Milne BJ. Males on the life-course-persistent and adolescence-limited antisocial pathways: follow-up at age 26 years. *Dev Psychopathol*. 2002;14(1):179-207. Epub 2002/03/15.
57. af Klinteberg B, Almquist Y, Beijer U, Rydelius PA. Family psychosocial characteristics influencing criminal behaviour and mortality--possible mediating factors: a longitudinal study of male and female subjects in the Stockholm Birth Cohort. *BMC Public Health*. 2011;11:756. Epub 2011/10/04.
58. Hofvander B, Ossowski D, Lundstrom S, Anckarsater H. Continuity of aggressive antisocial behavior from childhood to adulthood: The question of phenotype definition. *Int J Law Psychiatry*. 2009;32(4):224-34. Epub 2009/05/12.
59. Lilienfeld SO, Waldman ID. The relation between childhood attention-deficit hyperactivity disorder and adult antisocial behavior reexamined: the problem of heterogeneity. *Clin Psychol Rev*. 1990;10.
60. Walters GD, Knight RA, Grann M, Dahle KP. Incremental validity of the Psychopathy Checklist facet scores: predicting release outcome in six samples. *J Abnorm Psychol*. 2008;117(2):396-405. Epub 2008/05/21.
61. Bonta J, Law M, Hanson K. The prediction of criminal and violent recidivism among mentally disordered offenders: a meta-analysis. *Psychol Bull*. 1998;123(2):123-42. Epub 1998/04/02.
62. Coid J, Yang M, Ullrich S, Tianqiang Z, Sizmur S, Farrington D, et al. Most items in structured risk assessment instruments do not predict violence. *The Journal of Forensic Psychiatry & Psychology*. 2011;22(1).
63. Large MM, Nielssen O. Violence in first-episode psychosis: a systematic review and meta-analysis. *Schizophr Res*. 2011;125(2-3):209-20. Epub 2011/01/07.
64. Chang Z, Larsson H, Lichtenstein P, Fazel S. Psychiatric disorders and violent reoffending: a national cohort study of convicted prisoners in Sweden. *Lancet Psychiatry*. 2015;2(10):891-900. Epub 2015/09/08.
65. Fazel S, Zetterqvist J, Larsson H, Langstrom N, Lichtenstein P. Antipsychotics, mood stabilisers, and risk of violent crime. *Lancet*. 2014;384(9949):1206-14. Epub 2014/05/13.
66. Singh JP, Grann M, Fazel S. A comparative study of violence risk assessment tools: a systematic review and metaregression analysis of 68 studies involving 25,980 participants. *Clin Psychol Rev*. 2011;31(3):499-513. Epub 2011/01/25.
67. Anckarsater H, Nilsson T, Saury JM, Rastam M, Gillberg C. Autism spectrum disorders in institutionalized subjects. *Nordic journal of psychiatry*. 2008;62(2):160-7. Epub 2008/06/24.
68. Boer D. Ecological validity and risk assessment: the importance of assessing context for intellectually disabled sexual offenders. *The British Journal of Forensic Practice*. 2009;11(2):4-9.

## **7. Acknowledgments and Disclosure of Interest**

This work was supported by *Skane county council's research and development foundation*, the *county council of Kronoberg* and government grants under the *ALF agreement*.

The authors thank Åse Holl, Anders Yngvesson Rastenberger, Kjell Tidäng, Anna-Kari Sjödin and Anita Larsson at the research group for Forensic Psychiatry in Lund and Gothenburg for their help with the preparation of this manuscript and administrative assistance. We also thank Rebecca Rylance at the R&D Centre Skåne, Medical Statistics and Epidemiology, Skåne University Hospital, Lund.

None of the authors has interests pertaining to the results of this study.

**Table 1. Background characteristics of the cohort; comparisons between total cohort and subgroups**

Variables	Total Cohort <i>n</i> =125 <i>n</i> (%)	Relapse in general crime <i>n</i> =30, 24% <i>n</i> (%)	Phi	Relapse in violent crime <i>n</i> =16, 13% <i>n</i> (%)	Phi
<b>Background characteristics:</b>					
Sentence with SCS	84 (67)	12 (40)***	-0.326	7 (44)*	-0.191
Male sex	101 (81)	24 (80)	-0.011	15 (94) <sup>a</sup>	0.126
Migration background	64 (51)	16 (53)	0.024	8 (50)	-0.009
Mental disorder in 1st degree relative	36 (29)	11 (37)	0.098	8 (50)*	0.179
Previous contact with Child and Adolescent Psychiatry, (n=107)	34 (32)	8 (27)	0.006	4(25) <sup>a</sup>	-0.006
Custody, foster home or institutional care before age of 18, (n=105)	24 (23)	7 (23)	0.082	4 (25) <sup>a</sup>	0.071
Low educational attainment, (n=117)	12 (10)	8 (27) <sup>a***</sup>	-0.339	5 (31) <sup>a**</sup>	-0.309
No occupation, (n=123)	115 (94)	28 (93) <sup>a</sup>	0.069	15 (94) <sup>a</sup>	0.098
Poor financial situation (large debts or no monthly income), (n=118)	27 (23)	11 (37)*	0.205	6 (38)	0.156
No permanent housing, (n=123)	64 (52)	15 (50)	-0.023	9 (56)	0.033
Marital status single, (n=121)	91 (75)	24 (80)	0.064	11 (69) <sup>a</sup>	-0.058
Any previous sentences, (n=120)	78 (65)	22 (73)	0.129	10 (63) <sup>a</sup>	0.013
Previous violent criminality, (n=122)	41 (34)	12 (40)	0.107	6 (38)	0.051

Abbreviations: SCS = Special Court Supervision. <sup>a</sup>= Fisher's Exact test. \*\*\* p<0.001, \*\* p<0.01, \* p<0.05

**Table 2. Clinical characteristics of the cohort; comparisons between total cohort and subgroups**

Variables	Total Cohort	Relapse in general crime	Phi	Relapse in violent crime	Phi
	<i>n</i> =125 <i>n</i> (%)	<i>n</i> =30, 24% <i>n</i> (%)		<i>n</i> =16, 13% <i>n</i> (%)	
Age at FPI/FPSR, median, <i>range</i>	38, (17-79)	38, (22-48) <sup>b</sup>		36, (22-48) <sup>b</sup>	
Age at first sentenced crime, (n=112), median, <i>range</i>	28, (15-78)	24, (15-48) <sup>b</sup>		25, (16-28) <sup>b</sup>	
<b>Diagnosis according to DSM-IV (30)</b>					
Substance use disorder	60 (48)	17 (57)	0.097	10 (63)	0.111
Psychotic disorder	91 (73)	20 (67)	-0.077	10 (63)	-0.089
Mood disorder	15 (12)	4 (13) <sup>a</sup>	0.023	3 (19) <sup>a</sup>	0.080
Anxiety disorder or OCD	13 (10)	5 (17) <sup>a</sup>	0.115	1 (6) <sup>a</sup>	-0.052
Neurodevelopmental disorder	11 (9)	3 (10) <sup>a</sup>	0.024	1 (6) <sup>a</sup>	-0.034
Personality disorder, any	34 (27)	13 (43)*	0.204	8 (50)*	0.196
Personality disorder Cluster A	6 (5)	2 (7) <sup>a</sup>	0.049	2 (13) <sup>a</sup>	0.138
Personality disorder Cluster B	20 (16)	10 (33)**	0.266	6 (38)*	0.225
Personality disorder Cluster C	2 (2)	0 (0) <sup>a</sup>	-0.072	0 (0) <sup>a</sup>	-0.049
Personality disorder NOS	9 (7)	3 (10) <sup>a</sup>	0.061	2 (13) <sup>a</sup>	0.079
IQ, (n=58), Median, <i>range</i>	100, (38-137)	100, (60-127) <sup>b</sup>		100, (60-127) <sup>b</sup>	
GAF at the time of the FPI / FPSR, (n=124), median, <i>range</i>	35, (10-65)	35, (10-51) <sup>b</sup>		33, (10-40) <sup>b</sup>	
PCL:SV(37), (n=96), Total score, Median, <i>range</i>	11, (0-22)	12, (0-22) <sup>b</sup>		12, (0-20) <sup>b</sup>	
HCR-20(36), (n=95), Total score, Median, <i>range</i>	18, (0-28)	20, (0-28) <sup>b</sup>		20, (0-26) <sup>b</sup>	
HCR-20, Historical variables, (n=95), Median, <i>range</i>	12, (0-19)	14, (0-18) <sup>b</sup>		14, (0-17) <sup>b</sup>	
HCR-20, Clinical variables, (n=96), Median, <i>range</i>	7, (0-9)	7, (0-10) <sup>b</sup>		6, (0-9) <sup>b</sup>	

Abbreviations: FPI = Forensic Psychiatric Investigation. FPSR = Forensic Psychiatric Survey Report. OCD = Obsessive Compulsive Disorder. NOS = Not otherwise specified. IQ = Intelligence Quota. GAF = Global Assessment Scale. PCL:SV = The Hare Psychopathy Checklist: Screening Version. HCR-20 = Historical-Clinical-Risk Management-20. <sup>a</sup>= Fisher's Exact test. <sup>b</sup>= Mann Whitney-U test. \*\*\* p<0.001, \*\* p<0.01, \* p<0.05.



**Table 3. Cox regression analysis of predictors of crime in general and violent crime.**

Variables	Relapse in general crime				Relapse in violent crime			
	Univariate association	Cox regression			Univariate association	Cox regression		
	<i>p</i>	B	Hazard ratio (95% CI)	<i>p</i>	<i>p</i>	B	Hazard ratio (95% CI)	<i>p</i>
<i>Background variables</i>								
SCS	0.000	-2.573	0.076 (0.028-0.209)	0.000	0.032	-1.339	0.262 (0.083-0.824)	0.022
Male sex	0.898				0.305			
Low educational attainment	0.001	2.213	0.109 (0.040-0.297)	0.000	0.006	-1.250	0.287 (0.0837-0.989)	0.048
Poor financial situation	0.026				0.072			
Age at first sentenced crime	0.083	-0.076	0.927 (0.885-0.970)	0.001	0.408			
Mental disorder in first degree relative	0.275	1.052	2.863 (1.172-6.994)	0.021	0.045			
Previous sentences	0.159							
Previous violent criminality	0.238							
<i>Clinical variables</i>								
Substance use disorder	0.276				0.214			
Anxiety disorder / OCD	0.300				1.000			
Personality disorder, cluster B	0.003				0.012	1.151	3.161 (0.972-10.280)	0.056
GAF at the time of the FPI/FPSR	0.097				0.079	-0.105	0.901 (0.8335-0.974)	0.009
<i>Risk assessment variables</i>								
PCL:SV, Total score	0.168				0.131			
HCR-20, Historical variables	0.284				0.666			

Abbreviations: SCS = Special Court Supervision. OCD = Obsessive Compulsive Disorder. GAF = Global Assessment Scale. FPI = Forensic Psychiatric Investigation. FPSR = Forensic Psychiatric Survey Report.

PCL:SV = The Hare Psychopathy Checklist: Screening Version. HCR-20 = Historical-Clinical-Risk Management-20

