PATIENT OUTCOMES FOLLOWING DISCHARGE FROM SECURE HOSPITALS

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GENERAL ABSTRACT

Title: Patient outcomes following discharge from secure hospitals
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Abstract:

Background: Despite limited evidence for service benefit, the demand for forensic psychiatric beds is growing. Some studies have reported rates of serious adverse outcomes post-discharge, however, the role of psychiatric diagnosis as a determinant of these outcomes needs to be clarified to ensure patients are managed in the most appropriate way.

Aims: The first aim of this thesis is to summarize evidence on key adverse outcomes, and to provide comparative information for public health and policy. The second aim of this thesis is to elucidate the role of diagnosis and comorbidity in the risk of some adverse outcomes.

Methods: The first study is a systematic review and a meta-analysis of investigations that followed patients discharged from secure hospitals, and reported data on key adverse outcomes after discharge. The second is a historical cohort study of forensic patients discharged from Swedish secure hospitals between 1972 and 2009, which examines the role of psychiatric diagnosis in risk of some adverse outcomes.

Results: Thirty-six studies from 10 countries were included. Mortality rates were lower in studies from England and Wales (crude rate=1,239, 95% CI 932-1,547) compared to other countries (2,331; 1,738-2,925). Readmission rates were higher in samples with a bigger proportion of patients with a diagnosis of mental illness (β=105.57, [se(β)]=54.90, p=0.070) as opposed to personality disorder (β=-181.45, [se(β)]=90.59, p=0.070). Reoffending rates were lower in more recent studies (β=-101.15, [se(β)]=43.34, p=0.026). Compared with different cohorts of discharged prisoners matched on gender, age, and type of offence, reoffending rates were lower for the forensic psychiatric samples (UK prevalence ratios 1.4-7.7 in UK studies)

In the Swedish study, substance use was associated with increased risk of death (HR=1.783, 95% CI=1.556-2.044, p<.000) and violent offending (HR=1.980, 95% CI=1.740-2.254, p<.000). Schizophrenia increased the risk of readmission. Bipolar disorder (HR=1.461, 95% CI=1.196-1.785, p<.000 and personality disorder (HR=1.496, 95% CI=1.345-1.663, p<.000) were associated with increased risk of violent offending.

Conclusions: Treatment and post-discharge support strategies should take into account primary and comorbid diagnosis. Services should provide better overall care to improve patients' general health aiming to reduce premature mortality. Better health could also improve social functioning of these patients reducing readmissions and post-discharge offending in the long-term.

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PUBLICATIONS ARISING FROM THIS THESIS

Chapter II: Fazel, S., Fimińska Z., Cocks C., & Coid J. Patient outcomes following discharge from secure hospitals: A systematic review and a meta-analysis. (in press). *British Journal of Psychiatry.*

DISCLAIMER

The work included in this thesis is my own work except where indicated otherwise.

Signature: _____Zuzanna Fimińska___ _____
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CHAPTER 1: INTRODUCTION

1.1. Secure hospitals

Secure psychiatric hospitals house individuals with severe mental health problems (as defined by one of the major classifications – International Classification of Disease 10th edition (ICD-10) or Diagnostic and Statistical Manual of Mental Disorder 4th edition (DMS-IV)) who pose a threat to themselves or the public.[1] Also known as forensic psychiatric hospitals, they deal with three types of persons. First, mentally disordered prisoners who cannot receive appropriate care from prison medical services. Second, mentally disordered individuals who have committed an offence and are admitted directly to hospital from court under the mental health legislation. Third, psychiatric patients who cannot be managed in general wards due to violence and suicidal behaviour.[1] During their stay, patients are supposed to be placed in the lowest level of security that will guarantee safety to the affected person and their surroundings.[2] Most frequently, patients in secure settings are diagnosed with schizophrenia and related disorders, while affective disorders, such as bipolar disorder and depression, are uncommon.[2]

Patients in secure care stay in hospital for a long time, with a median length of stay just under six years across England and Wales.[1, 2] There are fewer discharges than admissions, which has raised concerns about the increasing number of patients residing in these hospitals.[1] The demand for forensic beds is high and transfers from prison can take a long time, even if prisoners are acutely unwell. Ninety percent of the prison population have a mental illness, personality disorder, or addiction, while 70% have two or more such problems.[1]

Since the 1950s, there has been a general trend toward deinstitutionalization of patients throughout Western Europe with a tendency toward establishing mental

health services in the community.[3] While the number of beds in general services has fallen, the last two decades saw a significant increase in forensic provisions,[4, 5] with more beds introduced into secure hospitals, as well as more places being provided in supervised and supported housing.[5]

Patients cost substantially more in secure care compared to general wards. In England and Wales, for example, annual cost per patient is estimated at £152,000 (€190,000) in low secure institutions, up to £273,000 (€340,000) at high secure hospitals.[1] With 8,000 secure beds across those countries in 2011, most in medium and low secure hospitals, the overall budget for forensic psychiatric care was in excess of £1 billion (€1.2 billion).[6] In England alone, this accounts for 19% of the overall mental health budget, representing its biggest single component, serving 1% of all patients who come in contact with mental health services.[7]

In addition, the spending continues to increase in England. Between 2002/03 and 2009/10 the amount of money invested in forensic care grew at a rate of 13.4% a year, which is equivalent to an overall increase of 141%, taking into account general inflation.[1] During the same period, the amount of money dedicated to general adult health services rose by 5.9%.[1] Although some countries within the European Union have well-developed forensic services, comparable data on investment in those countries is limited. For example, in Sweden, where approximately a 1,000 people were inpatients in forensic psychiatric hospitals in 2000, the annual spend is estimated at £194,215 (€258,935) per patient in 2014 prices.[8]

1.2. Outcomes after discharge

Despite a significant and continually increasing investment, little is known about how patients perform after leaving the hospital, particularly relative to comparative forensic and clinical populations. Although research on outcomes after discharge has

been published for around three decades, there are discrepancies in data reported, and there is a need to summarize the findings and to put them in context for public health and policy. For example, a UK-based study that followed 1,344 patients over an average period of 6.2 years recorded an 18% reconviction rate in men,[9] while a Sweden-based investigation of 88 forensic patients over a mean of 9.4 years showed a reoffending rate of 38%.[10] An enquiry into long-term outcomes reported up to a half of former patients being reconvicted.[1]

Post-discharge rates of premature all-cause mortality appear high in forensic patients. For example, one study reported mortality rate of 17% in patients followed up for 16.5 years after discharge,[11] while another recorded 23% of the cohort dead 9.4 years after discharge.[10] Readmission rates are also considerable. In a study of 595 first admissions over a 20-year period, where 550 discharged cases were followed-up, 38% of patients were readmitted to secure care.[12] In another study of 135 patients from New Zealand, the reported readmission rate was 80%[13].

Given the variation in reports to date, it is important to systematically review relevant studies to clarify patient performance post-discharge. Furthermore, considering that those rates appear relatively high, it is important to understand what determines adverse outcomes in this population, so that interventions can be tailored and services improved.

1.3. Determinants of outcomes

While some reports on post-discharge outcomes have been published, there is less information about the determinants of these outcomes. Age, gender, and previous offence have been identified as risk factors for reoffending,[14] but it remains unclear whether psychiatric variables contribute to an increase in risk for recidivism.

Evidence from the general population suggests that psychoses increase the risk of violent crime, even after adjustment for socio-demographic factors (e.g. age, gender, ethnicity, familial history of mental health problems, etc) and comorbid substance abuse.[15] However, findings from the general population are not generalizable to forensic samples and more research needs to be done to establish the role of diagnosis and comorbidities in the risk of adverse outcomes in these people.[16]

Some evidence links primary[17-19] and comorbid[20] personality disorder and substance use disorders with increased risk of violent outcomes. One study in particular found that mentally disordered offenders with personality disorder and comorbid substance use disorder had a two-fold higher risk of general recidivism than a group of offenders with personality disorder, but without co-occurring substance use problem.[21] Nevertheless, the same study noted that while general recidivism was highest in a group with a comorbidity, repeat violent offending was particularly prevalent in the group with only personality disorder.[21] Furthermore, a study of recidivism among prisoners with serious mental illness, coming out of New York State, discovered that offenders were more likely to be rearrested if they had a history of substance use disorder.[22] Notwithstanding, the same study revealed that an individual's psychiatric history, other than substance use disorder, did not add to the prediction of re-arrest.

This inconsistency of findings shows that there is a pressing need for more research into the complex relationships between psychiatric diagnoses and reoffending.[15] This need is further supported by the fact that despite the lack of clarity surrounding the association between psychiatric diagnoses and risk of violence, major mental illness, personality disorder, and substance use disorder are featured in popular risk assessment tools, e.g. Historical Clinical Risk Management-20 (HCR-20).[23]

Examining the role of psychiatric diagnoses in the risk of reoffending in forensic populations is particularly pressing as new findings from a group of prisoners have shown that the usefulness of risk assessment tools varies between diagnostic categories. Coid and colleagues[24] have shown that while risk assessment tools perform relatively well in patients treated by community mental health services, they have limited utility in settings with high prevalence of personality disorder, like forensic units and prisons. In fact, the authors report, their level of accuracy with an individual with a personality disorder is "no better than flipping a coin." This suggests that a careful diagnostic interview should be carried out before assessment of risk as structured risk assessment tools have a different predictive accuracy in people with psychopathy compared to people affected by mental disorders.[24]

While evidence for the relationship between psychiatric diagnoses and violence is inconsistent, even less is known about the contribution of diagnoses to the risk of early mortality and relapse. Hoang and colleagues[25] showed a large mortality gap between people with schizophrenia and bipolar disorder compared to the general population. A study out of Finland demonstrated that depression and substance use increase the risk of mortality, compared with chronic somatic conditions, which could not be entirely explained by socio-demographic, somatic health status, or poor health behaviour risk factors.[26] These findings, however, apply to the general population and do not provide insight into how the risk of mortality differs between diagnostic groups within a clinical population. Fok[27] and Chang[28] provided some information reporting on the contribution of substance use disorder to premature mortality in psychiatric patients.

Similarly, evidence for risk factors associated with relapse or rehospitalization is limited. Hoffman[29] has shown a relationship between rehospitalization, age, and

substance use disorder in patients with primary diagnosis of schizophrenia. Similar relationships have been demonstrated in psychosis[30], and bipolar disorder.[31] More research is needed to confirm these findings and to verify whether they apply to forensic psychiatric patients.

Two studies follow. The first one, a systematic review and a meta-analysis summarizes the evidence on rates for certain key adverse outcomes (mortality, readmissions, reoffending, and violent reoffending), and provides comparative information for public health policy and to contextualize these findings. The second one examines the role of diagnosis and comorbidity in some of determining these outcomes by conducting a primary study of a cohort of all patients discharged from forensic psychiatric hospitals in Sweden between 1972 and 2009.

CHAPTER 2: PATIENT OUTCOMES FOLLOWING DISCHARGE FROM SECURE HOSPITALS: A SYSTEMATIC REVIEW AND A META-ANALYSIS

2.1. Introduction

Despite high cost and limited evidence for patient benefit, the number of beds available in secure care has risen in the last 20 years.[5] Some reports are available regarding post-discharge outcomes of forensic patients, but a comprehensive review of evidence has not been done to date. To acquire a better understanding of the effectiveness of secure services, there is a need to synthesize existing reports on mortality, readmission, reoffending, and violent reoffending, present this data, and provide some comparative information for public health and policy to put these findings in context.

A systematic review and a meta-analysis were conducted to achieve these aims. A systematic review is a method that allows for an impartial assessment of evidence because of a systematic approach that minimizes biases and systematic errors; a meta-analysis is a statistical method that derives a weighted estimate of the mean effect by combining estimates of the effect size in individual studies.[33] Systematic reviews and meta-analyses are both used in evidence-based medicine as they summarize existing knowledge and guide treatment decisions.[33]

Developed by Chalmers and Altman, and first appearing in the 1990s, the systematic review emerged as an alternative to traditional narrative review and was defined in the *Cochrane Handbook* as a review that "attempts to collate all empirical evidence that fits prescribed eligibility criteria to answer a specific research question. It uses explicit, systematic methods that are selected with a view of minimizing bias, thus providing reliable findings from which conclusions can be drawn and decisions made."[34] Systematic reviews are at the top of the hierarchy of evidence, and are held

in high regard by researchers as evidenced by the fact that they are cited more frequently than individual studies.[35]

All meta-analyses require a systematic review, but pooling data is not always appropriate.[35] For observational research in particular, Egger and colleagues suggest that while statistical combination of studies is acceptable, it should not be a "prominent component" of a review.[36] Therefore the focus of this study was placed as much on the pooled estimate as it was on exploring the sources of heterogeneity.

2.2. Methods

Eleven computer-based databases were searched for studies on post-discharge outcomes of forensic psychiatric patients. Those included:

- PubMed
- Google Scholar
- PsycINFO
- JSTOR
- Global Health (for international literature)
- Medline
- Web of Knowledge
- DART-Europe
- E-thesis portal
- Networked Digital Library of Thesis and Dissertations
- ProQuest Dissertations and Theses.

In addition, reference lists were scanned for papers with relevant key words in their titles, and citations of papers identified were followed-up. Authors were contacted with enquiries about whether the list of studies included was, to the best of their knowledge, complete and if they knew about any unpublished data. Papers from

all countries published in all languages were eligible for inclusion. Studies, which were not written in English were translated by graduate students fluent in the language. The search was performed from the start of the databases until March 2013. For the database search, a combination of search terms were used relating to:

- patients (patient, forensic, mental disord*, mental illness, psychiatric disord*, psych*, felon*)
- institutions: (low, high, medium, secur*, special, hosp*)
- outcome (outcome, mort*, rehosp*, death, readm*, reconvict*, reoffend*, recidi*, rearrest, repeated offend*).

Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed (Figure 1, Appendix A).[37] For assessment of quality of studies included, the Newcastle-Ottawa Quality Assessment Scale for Cohort Studies was used.[38]

PRISMA guidelines are an update on the guidance developed in the QUOROM Statement (Quality of Reporting of Meta-analyses) published in 1996.[37] The PRISMA Statement consists of a 27-item checklist and a four-phase flow diagram, which support authors in the reporting of systematic reviews and meta-analyses. Although originally developed with the focus on randomized trials, PRISMA can also be used as a basis for other types of reviews. While other types of guidelines exist (e.g. MOOSE, which guides the reporting and conduct of epidemiologic reviews),[39] 83% of published reviews refer to PRISMA,[40] making it not only the most up-to-date resource, but also the most popular guidelines to follow.

The Newcastle-Ottawa Quality Assessment Scale for Cohort Studies[38] is a product of joint efforts of the University of Newcastle, Australia, and Ottawa, Canada. It was developed to “assess the quality of nonrandomized studies with its

design, content and ease of use directed to the task of incorporating the quality assessments in the interpretation of meta-analytic results." It is a "star system" that appraises the study in three categories: the selection of the study groups, the comparability of the groups, and the ascertainment of outcome. (Appendix B). The scale was modified for the purpose of this review. The comparability part of the scoring system was not taken into account, as it is not applicable to prevalence studies included in the review. The maximum score a study could receive was therefore six, not eight stars. For the reader's convenience, the scores are presented as numbers.

To be included in the review, a study had to:

- be a primary study
- have followed up patients discharged from any secure hospital, including low, medium or high security institutions
- report data that would allow calculations of rates for at least one of the following
    - death,
    - suicide,
    - repeat offending (including violent behavior, contact with police, rearrests, or reconvictions), or
    - rehospitalization (including returning to the same institution, or admission to another psychiatric hospital).

A study was excluded when it:

- was a validation study for risk assessment tool
- was an evaluation of an intervention
- did not provide data that would allow for calculation of rates.

Studies of risk assessment tools and interventions were kept out of the review because such studies are done on a non-random group of patients who agree to take part in a research project, and therefore could produce a biased sample. In addition, such studies are conducted on cohorts that include participants from sources other than forensic psychiatric hospitals, which puts them outside the scope of this project. This review focused exclusively on observational studies of discharged forensic patients. In the case of duplicate publications, the publication with the largest amount of information was selected for inclusion. Where needed, authors were contacted for clarification.

Two people extracted the data, which allowed to check for human errors. Where discrepancies occurred, they were resolved by discussion. Where agreement could not be reached, the decision was made by the project supervisor. Based on literature review, information on a number of background characteristics of the sample was gathered in order to investigate the sources of heterogeneity. Those were:

- year of publication
- geographical location
- sample size
- percentage male
- age
- percentage with convictions
- index offence
- percentage violent
- legal category according to the English and Welsh Mental Health Act 1983 (out of those, two main categories were considered: mental illness and psychopathic disorder. Psychopathic disorder is a legal term describing in

practice severe personality disorder. The updated version of the Mental Health Act removed the legal classification of personality disorder)[2]

- admission duration
- time in the community
- mean follow-up period.

If studies reported different causes of death, all data was extracted.

Crude rates (CR) were obtained for each outcome by using the methods described in a recent meta-analysis of released prisoners,[41] by employing the number of events (N_e) and person-years at risk (PY_{total}):

$$CR = N_e/PY_{total}$$

The number of person-years at risk was calculated based on the number of patients (N_p) and median period of patient follow-up (FU_{med}):

$$PY_{total}=N_p*FU_{med}$$

Because the traditional asymptotic method of calculating confidence intervals can generate values that extend below zero, which would not be appropriate in the case of rates, an alternative method was used (Wilson's method).[42] Wilson's method allows for a calculation of confidence intervals for binominal parameters, and works fairly well for large samples.[42]

To calculate pooled estimates for each outcome (all-cause mortality, suicides, readmissions, reoffending, and violent reoffending), random-effects meta-analyses were performed. Random effects models assign similar weights to all studies included in the meta-analysis irrespective of the sample size, as well as account for an approximation of between-study heterogeneity. [32] Considering clinical differences between the studies (samples from different

countries and time periods), it was expected that statistical heterogeneity would be high, therefore random effects model was used as a more conservative approach.

Heterogeneity was assessed by using I^2, which describes the percentage of variation across studies that is due to heterogeneity rather than chance, and is independent of the number of studies included in the analysis.[43] It is an intuitive measure and as such is preferred over Q (which is the weighted sum of squares on a standardized scale, and depends strongly on the number of studies included in the analysis), and tau-squared (which is the variance of true effects, also used to assign weights under the random-effects model). Values 25%, 50% and 75% are taken to indicate low, moderate, and high levels of heterogeneity, respectively.[43]

Sub-group analysis and meta-regression were used to explore sources of heterogeneity. Sub-group analysis allows to elucidate the relationship between belonging to a particular subgroup and the effect size, according to potentially relevant characteristics (similar to analysis of variance in a primary study), for example country (England and Wales *vs*. other countries).[32] Meta-regression can be used to explore the relationship between covariates and effect size (similar to regression analysis in primary studies).[32]

Factors examined were:

- geographical location
- age
- admission duration
- proportion with mental illness
- proportion with personality disorder
- proportion with prior convictions

- proportion whose index offence was violent (homicide/attempted homicide, non-fatal violence, sexual offence)
- year of publication of the report
- national crime rate.

Categorical variables explored were:

- region (England and Wales vs. other countries)
- age (≤35 vs. >35 years)
- mental illness (≤80% vs. >80%)
- psychopathic disorder (≤10% vs. >10%)
- previous convictions (≤60% vs. >60%)
- violent offence (≤30% vs. >30%)
- sexual offences (≤9% vs. >9%).

The decision to dichotomize the variables was a pragmatic one and aimed to test the sensitivity of any findings to a different approach to analysis. Cut-off scores were chosen to ensure that the groups were approximately even. This was because no guidance on dichotomizing data on proportion of patients with a particular characteristic could be identified; it also allowed for the consistency of the approach across variables. If there were fewer than 10 studies, meta-regression was not conducted as statistical power was limited.[44] All analyses were performed in Stata statistical software package, version 12 (Statacorp, 2011) using the commands *metan* (for random effects meta-analysis), and *metareg* (for meta-regression).

Finally, the repeat offending rates of prisoners discharged from prison (nominator) were compared with reoffending rates of forensic psychiatric patients released from hospital (denominator). Rate ratios and corresponding 95% CIs were calculated. Prisoners and forensic patients were matched on age, gender, type of

offense, and country, where possible. The Ministry of Justice or equivalent institution provided information about reoffending rates of prisoners in each country considered.[45-47]

2.2.1. Comparisons

To provide some context for this study, a variety of comparative populations were chosen. Among them there were community psychiatric patients, prisoners, and mentally disordered offenders sentenced to community-based interventions (i.e. not inpatient treatment). A study was included as a comparison if it reported on any of the relevant outcomes. Primary studies and systematic reviews and meta-analyses were eligible for inclusion. This is because the search for comparisons aimed to identify studies that could provide context for the results from the main meta-analysis rather than to provide a pooled estimate. Using combined results of multiple studies of a particular population allowed to present an overview of that population, which, where available, could be more informative than a set of individual studies.

Search for eligible studies was performed in four databases:

- PubMed
- Google Scholar
- Global Health
- Web of Knowledge.

Key words used related to:

- study participants (disor*, offend*, pris*, felon*, patient*, community)
- mental illness (schizo*, psych*, mental ill*, psychiatric ill*)
- outcomes (outcome, mortality, suicide, readm*, rehosp*, reoff*, rearrest*, reconv*)

The search was performed from the start of the databases until May 2013.

2.4. Results

The search identified 182 studies, all of which were screened for eligibility through title and abstract reading. At this stage, 83 records were excluded. The number of full-texts articles assessed for eligibility was 99. Of those, 36 studies were included in qualitative and quantitative synthesis (Figure 1).[2, 9-13, 48-76]

The studies identified as eligible were published between 1982 and 2013. They included 12,366 patients (73.8% male), with a mean age of 35.01 years. 3,332 (51%) of patients were violent offenders, and 2,193 (17%) had been convicted prior to hospital admission (the latter statistic is based on 10 reports). On average, patients remained at hospital for three years. Studies originated in 10 countries:

- 17 investigations from England and Wales (n=9,684; 78.3%)
- four were from the US (n=428; 3.4%)
- four were from Sweden (n=297; 2.4%)
- two were from Australia (n=222; 1.7%)
- two were from New Zealand (n=240; 1.9%)
- two were from Italy (n=209; 1.7%)
- two were from Canada (n=362; 2.9%)
- one was from Japan (n=489; 3.9%)
- one was from Norway (n=125; 1.0%)
- one was from Finland (n=310; 2.5%).

With the exception of eight studies, all reports recorded average age of the followed-up cohort, but this was not uniform, as some authors reported age at admission, others at discharge, yet others at index offence. Mean follow-up ranged from 1.5 to 13.6 years for mortality, 1.75 to 9.4 years for readmissions, and 1.5 to 13.6 years for reoffending. Follow-up data provided by the reports was collected from

various sources, including hospital records, coroners' records, and regional and national databases. (Appendix B).

2.4.1. All-cause mortality

Eight publications reported on mortality outcomes for nine cohorts (n=2,226).[2, 10-12, 57, 60, 64, 73] (Appendix C). Two studies reported exclusively suicides (n=4,502).[74,72] The total number of deaths was 225, of which 201 (89.3%) were suicides.

All-cause crude death rates (CDR) ranged from 789 to 2,825 per 100,000 person-years (Appendix C). The pooled estimate for all-cause CDR was 1,538 (95% CI 1,175-1,901) per 100,000 person-years (I^2=70.5%, 95% CI 41%-85%). There was some influence of geographical location on all-cause death rates. Reports coming out of England and Wales (where data on 78.3% of the sample came from) recorded a lower mortality rate (CDR=1,239; 932-1,548) compared to those from other countries (CDR=2,331; 1,739-2,925) (Figure 2). Meta-regression was not conducted due to limited number of samples. Because of lack of data in the studies included in the review, standardized mortality ratios were not reported.

2.4.2. Suicide

Six studies reported suicide outcomes (Appendix C).[10, 12, 60, 72-74] The CDR was 320 (95% CI 230-410) per 100,000 person-years (I^2=27.8%, 95% CI 0%-72%). Since there were fewer than 10 studies, meta-regression was not conducted.

2.4.3. Comparisons I

Six studies were found reporting on mortality in groups comparative with forensic patients: released prisoners, mentally disordered offenders, and community psychiatric patients (n=7,667,645) (Table 1).[11, 41, 77-82] Rates ranged from 850 to 3,344 per 100,000 person-years for all-cause mortality, and from 155 to 561 per 100,000 person-years for suicide. Mentally disordered offenders sentenced to non-custodial sanctions presented with the highest all-cause mortality rate (3,344; 1,923-5,754).[11]

People with criminal justice history suffered the highest rate of suicide (561; 549-574).[82]

2.4.4. Readmissions

There were 20 papers that provided data on readmissions for a total number of 21 cohorts (n=3,522) (Appendix D).[2, 12, 13, 48-53, 55, 63, 66, 67, 69, 71-73, 75, 76] There were 1,171 patients readmitted. Crude readmission rates (CRAR) were between 3,816 and 16,461 readmissions per 100,000 person-years (Figure 3). The pooled estimate for CRAR was 7,208 (95% CI 5,916-8,500) per 100,000 person years. Heterogeneity was high (I^2=92.5%, 95% CI 89%-94%). Univariate meta-regression revealed that where studies reported a higher readmission rate, there was a greater proportion of patients classified as having a mental illness under the Mental Health Act in the sample (β=105.57, [se(β)]=54.90, p=.070). By contrast, where there were more patients falling under the category of psychopathic disorder, readmission rate was lower (β=-181.45, [se(β)]=90.59, p=.070). Additionally, there was a positive association between duration of index admission and the likelihood of being readmitted, whereby people with longer admissions were more likely to return to hospital (β=90.94, [se(β)]=46.45, p=.076).

Those factors were subsequently combined into one model: duration of admission and mental illness; as well as duration of admission and personality disorder (mental illness and personality disorder were not combined due to collinearity). In the model that included mental illness neither variable was statistically significant (admission duration β=61.34, [se(β)]=47.91, p=.229; mental illness β=96.59, [se(β)]=61.62, p=.148). In the model that included personality disorder neither variable was statistically significant (admission duration β=67.50, [se(β)]=47.09, p=.182; personality disorder β=-136.78, [se(β)]=91.65, p=.166).

2.4.5. Comparisons II

There were five studies that provided possible comparisons on readmissions (Appendix E).[83-87] Those papers reported on community patients, mentally disordered veterans, and offenders with mental disorders (not guilty by reason of insanity – NGRIs), who were sentenced to treatment in an outpatient program (n=36,317). Rates ranged from 3,838 to 55,555 per 100,000 person-years, with the highest readmission rate reported for the offenders with mental disorders sentenced to treatment in an outpatient program.

2.4.6. Reoffending

There were 34 reports on reoffending among forensic patients (Appendix F).[2, 9-13, 48-59, 61-67, 69-73, 75, 76, 88, 89] Crude reoffending rate ranged from 0 to 24,244 per 100,000 person-years. The pooled estimate was 4,487 per 100,000 person-years (95% CI 3,627-5,303), with very high heterogeneity (I^2=95%, 95% CI 94%-96%) (Figure 4). Single variable meta-regression revealed that there was a higher rate of reoffending in studies conducted earlier (β=-101.15, [se(β)]=43.34, p=.026).

2.4.7. Comparisons III

Ten studies reporting on repeat offending in different samples were identified: released prisoners (with varying length of the original sentence), released prisoners matched on age, offenders with psychosis, offenders with personality disorders, disordered offenders sentenced to a variety of sanctions, general offenders, and prisoners released on probation (n=696,757) (Table 2).[11, 17, 46, 47, 90-92] Rates ranged from 4,535 to 36,964 per 100,000 person-years, with the highest reoffending rate reported for prisoners released on probation.[47]

2.4.8. Violent reoffending

Fifteen studies reported violent reoffending in forensic patients as outcome (Appendix F).[9-13, 54, 56, 61, 66, 69, 71-73, 88, 93] Crude reoffending rates ranged from 273 per 100,000

person-years to 8403 per 100,000 person-years. Pooled estimate was 3,902 (95% CI 2,671-5,187) with high heterogeneity (I^2=97%, 95% CI 96%-98%) (Figure 5). Neither age, diagnosis, geographical region, type of index offence, duration of admission, history of inpatient psychiatric treatment, nor year of publication reached statistical significance in univariate meta-regression analysis.

2.4.9. Reoffending rates compared with prisoners

For additional comparison, the reoffending rate ratio between prisoners and discharged forensic patients was calculated. To make the comparison relevant, where possible, offenders were sampled from the same country, and matched on gender and age (age band 30-34) (Figure 6). Prevalence ratios were one or greater indicating forensic psychiatric patients reoffended at a lower rate than prisoners. The prevalence ratios ranged from 1.4 to 7.7 in UK studies, 1.9 to 4.1 in US, and 2.7 to 5.0 in Sweden.

2.5. Results summary

Thirty-six studies reporting on adverse, post-discharge outcomes of 12,366 forensic patients were included in the systematic review.

Mortality rates were high for forensic psychiatric patients, but lower in England and Wales than in other countries that provided data for this review. Suicide rates were also higher for discharged forensic patients.

Readmission rates were higher in samples with greater proportion of patients classified as having mental illness. Readmission rates were lower in samples with greater proportion of patients classified as having a personality disorder. In addition, the risk of readmission increased with the amount of time spent in hospital.

Reoffending rates were lower for forensic psychiatric patients compared to other populations with criminal justice and or psychiatric history. Studies conducted earlier reported a higher rate of reoffending.

Violent reoffending rates were lower for forensic psychiatric patients compared to other samples with criminal justice and psychiatric history.

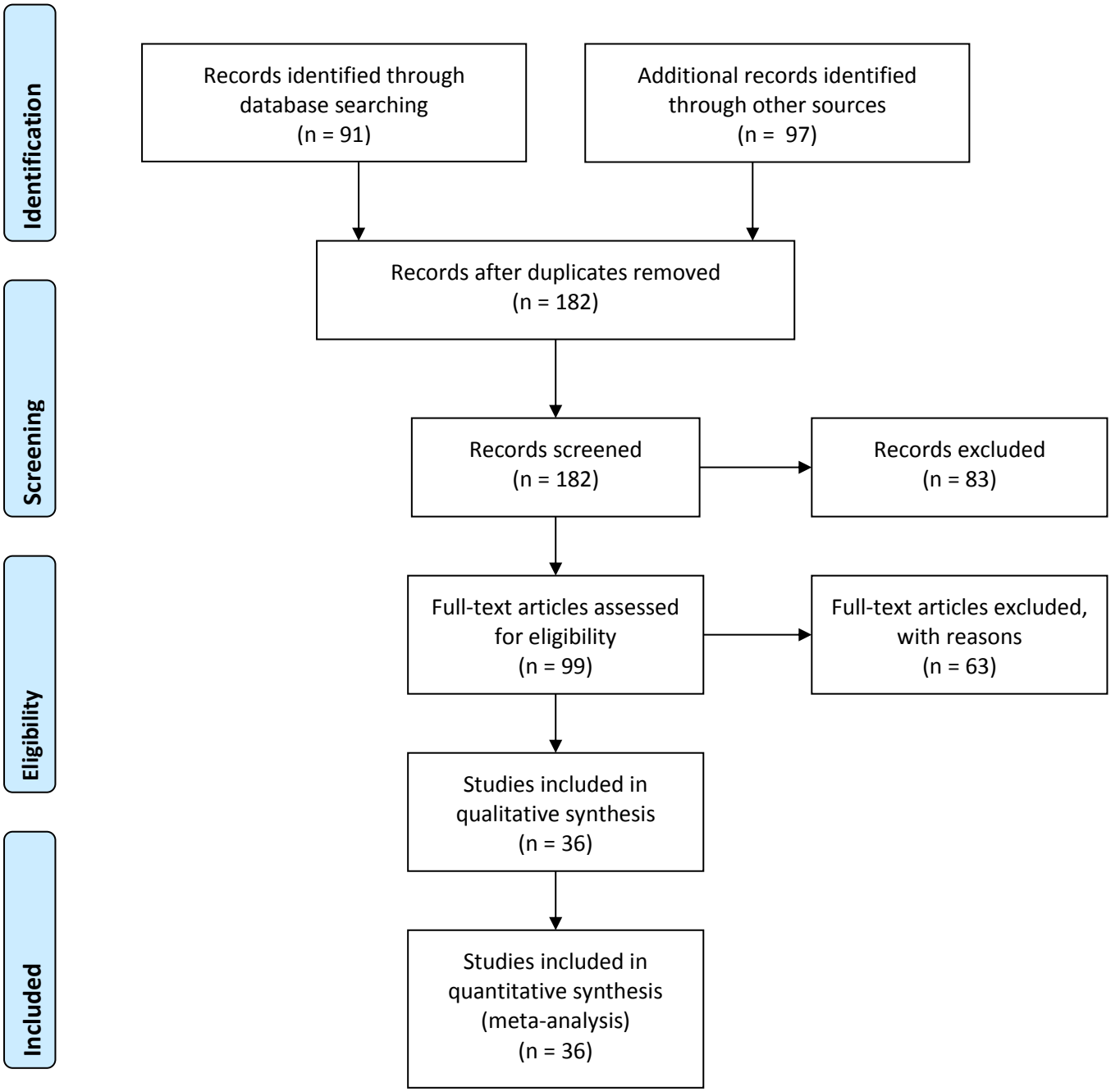

Figure 1 PRISMA flow diagram 2009

Table 1 Mortality rates for some comparative populations to forensic psychiatric patients

Author, year	Country	Patient population	Crude all-cause mortality rate per 100,000 (95%CI)	Suicide rate per 100,000 (95%CI)
Pratt, 2006[79]	UK	released prisoners	-	155 (140-171)
Kariminia, 2007[81]	Australia	recently released prisoners admitted to the prison psychiatric hospital	-	300 (61-538)
Brown, 2010[77]	UK	schizophrenia	1,772 (1,523-2,063)	-
Dutta, 2011[78]	UK	psychosis	1,417 (1,292-1,554)	-
Kinner, 2011[80]	Australia	prisoners	874 (818-934)	156 (141-172)
Webb, 2011[82]	Denmark	All people with criminal justice history	-	561 (549-574)
Zlodre, 2011[41]	Seven countries	recently released prisoners (meta-analysis)	850 (815-884)	169 (123-214)
Webb, 2012[82]	Denmark	Violent and sexual criminal offenders	-	163 (136-191)
Lund, 2013[11]	Sweden	mentally disordered offenders sentenced to prison	1,274 (746-2,168)	300 (138-648)
Lund, 2013[11]	Sweden	mentally disordered offenders sentenced to non-custodial sanctions	3,344 (1,923-5,754)	-
Current review	UK	forensic patients	1,239 (932-1,547)	-
Current review	Non-UK	forensic patients	2,331 (1,738-2,925)	-
Current review	**overall estimate**	**forensic patients**	**1,538 (1,175-1,901)**	**325 (235-415)**

Notes: Kariminia study has a 6 month follow-up

Table 2 Reoffending rates for populations comparative with forensic patients

Study	Country	Population	Crude reoffending rate (95%CI)
Prison Statistics 2002[92]	England and Wales	released prisoners with original sentence of 1-4 years	27,003 (26,303-27,703)
Prison Statistics 2002[92]	England and Wales	released prisoners with original sentence of 5-10 years	17,987 (15,964-19,768)
Langan, 2002 (reconvictions) (US Department of Justice) [46]	US	released prisoners	15,627 (15,548-15,706)
Swedish National Council for Crime Prevention, 2011	Sweden	released prisoners (21-39 years)	15,176 (14,944-15,408)
Fazel, 2011[91]	Eight countries	offenders with psychosis (meta-analysis)	4,535 (4,269-4,801)
Yu, 2012[17]	Seven countries	offenders with personality disorders (meta-analysis)	7,954 (7,651-8,258)
Lund, 2013[11]	Sweden	disordered offenders sentenced to non-custodial sanctions	7,246 (4,992-10,405)
Lund, 2013[11]	Sweden	disordered offenders sentenced to prison	5,426 (4,202-6,981)
UK Ministry of Justice Statistics Bulletin 2013[47]	England and Wales	offenders (mean age 30-34) (violent and non-violent offenders)	27,217 (26,891-27,544)
UK Ministry of Justice Statistics Bulletin 2013[47]	England and Wales	prisoners released on probation	36,964 (36,401-37,530)
Current review	**Eight countries**	**forensic patients**	**4,487 (3,672-5,303)**

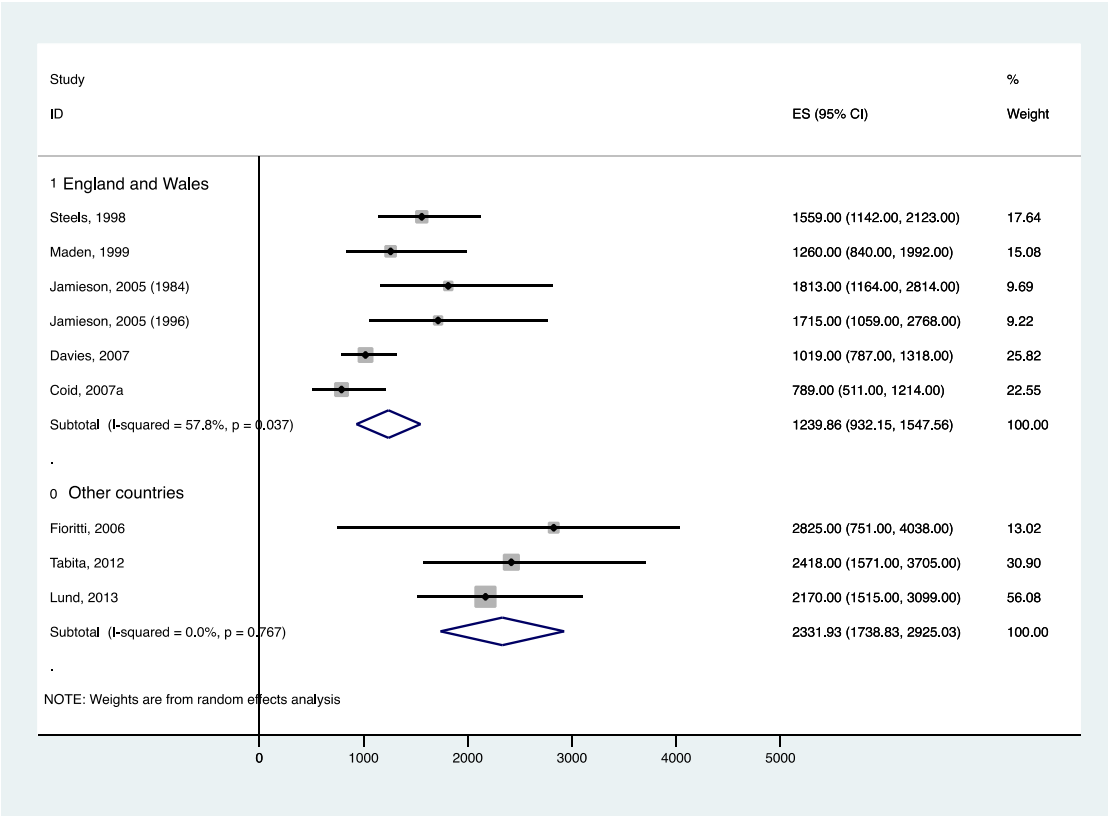

Figure 2 Forest-plot of crude mortality rates of discharged forensic psychiatric patients for all-cause mortality in England and Wales compared with other countries. Rates are per 100,000 person-years.

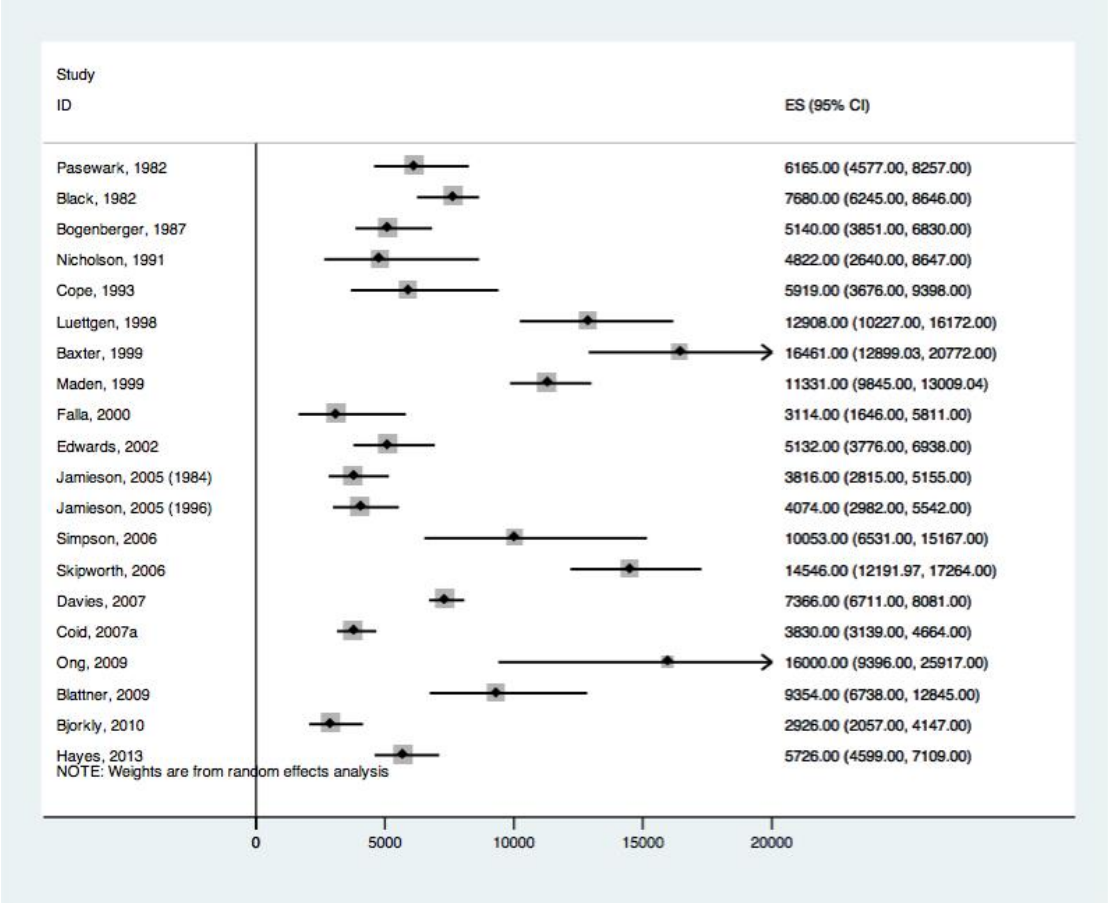

Figure 3 Forest-plot of psychiatric hospital readmission rates for discharged forensic psychiatric patients per 100,000 person-years.

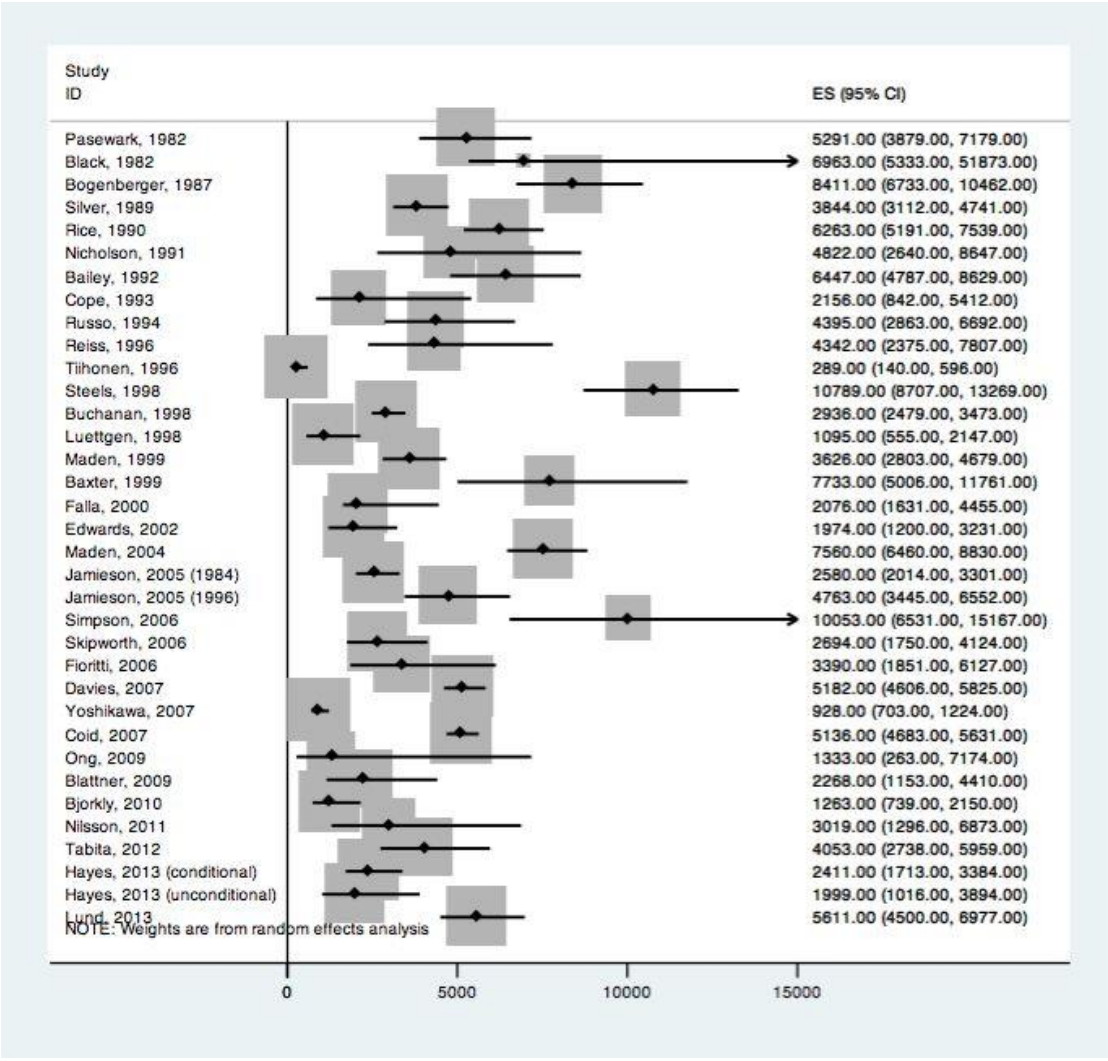

Figure 4 Forest-plot of any repeat offending rates for discharged forensic psychiatric patients per 100,000 person-years.

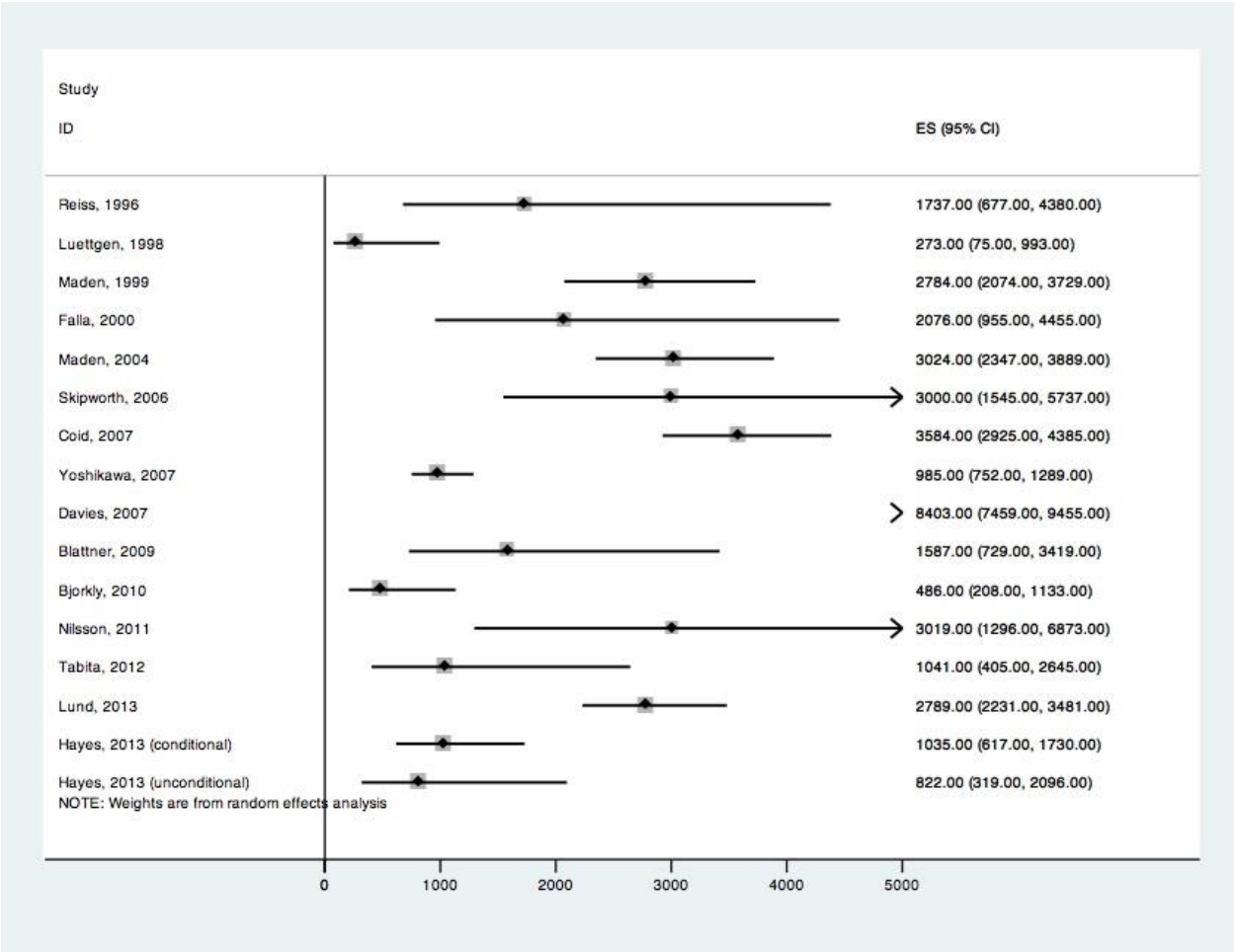

Figure 5 Forest-plot of repeat violent offending rates for discharged forensic patients per 100,000 person-years.

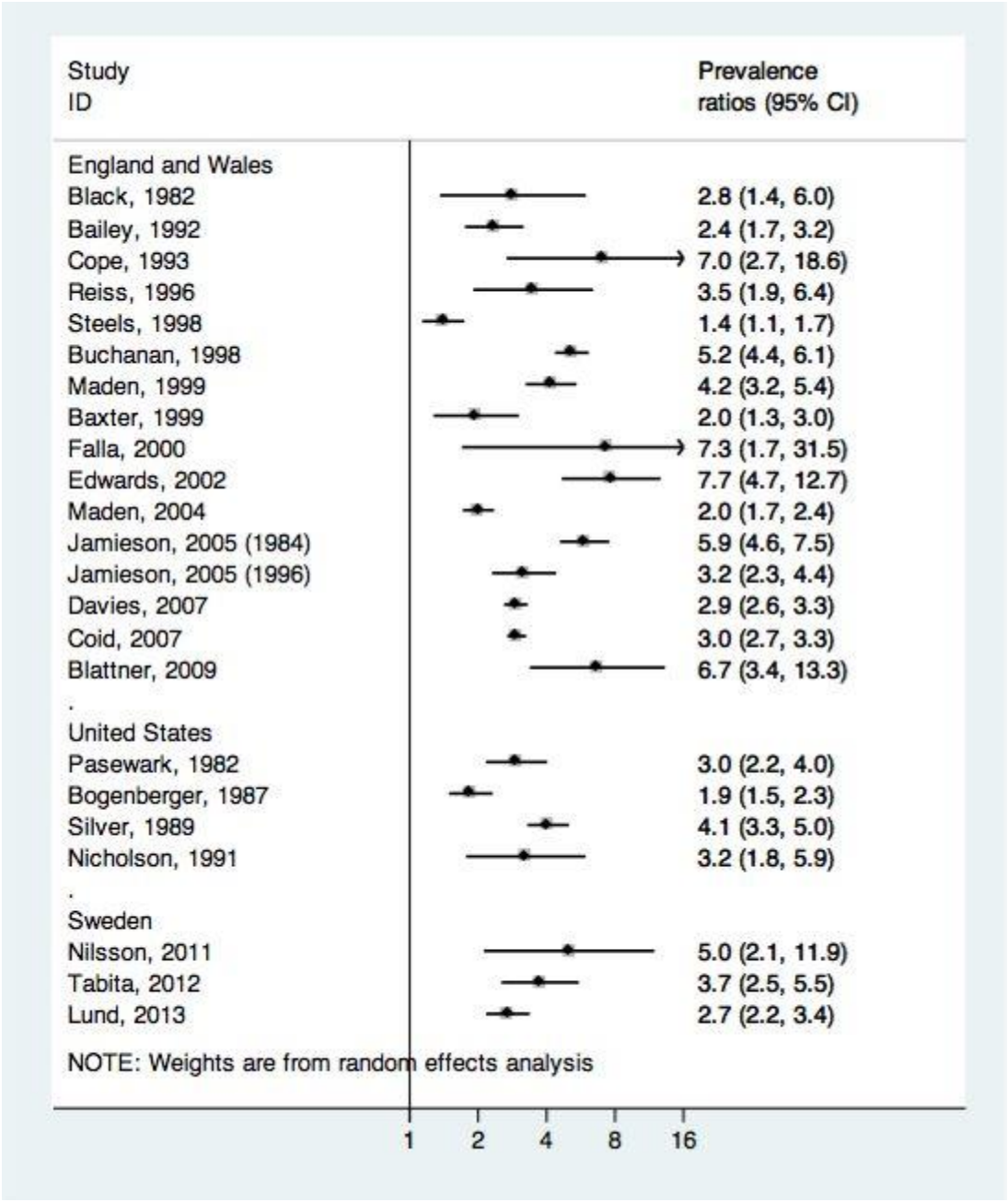

Figure 6 Prevalence ratios comparing reoffending rates of released prisoners to forensic psychiatric patients matched on age.

CHAPTER 3: SERIOUS ADVERSE OUTCOMES IN PATIENTS DISCHARGED FROM FORENSIC PSYCHIATRY: RATES, RISK FACTORS, AND PREDICTION.

3.1. Introduction

This study examined rates of and risk factors for adverse outcomes (mortality, rehospitalization, and violent crime) in a large national cohort of all patients discharged from secure hospitals between 1972 and 2009 in Sweden. The role of psychiatric diagnoses and comorbidity was of particular interest. Previous research has provided some indications suggesting the relevance of primary diagnosis in determining adverse outcome, even when controlling for demographic confounders,[16] and substance use,[15] but evidence is inconsistent.[22] In addition, work done in general psychiatric settings[16, 94] suggested the role of comorbidity, particularly substance use[20, 95] and personality disorder,[96] but it might not be generalizable to forensic samples.

3.2 Methods

Longitudinal Swedish population registers were linked: the Swedish National Inpatient Register (also known as Hospital Discharge Register, providing information on hospital discharges and rehospitalizations, as well as diagnoses at discharge),[97] the Cause-of-Death Register (which relies on death certificates, and classifies causes of death according to ICD codes),[98] and Crime Register (which provides conviction data on individuals aged 15 and older). In Sweden, all citizens, even immigrants, are assigned a distinct identification number that allows for data to be linked across registers. The National Tax Board has been issuing a ten-digit personal identity number (PIN) since 1991, although PINs have been assigned since 1947, initially by local parishes, which kept small-scale population registers. According to Ludvigsson

and colleagues,[99] there has been an estimated 13,500,000 PINs issued until 31 Dec 2007, while the total population of Sweden at the same time was 9,182,927. Once assigned PINs can only be changed under special circumstances, e.g. following a sex change. Although originally used as a means of identifying an individual, currently PIN is employed in medical research, allowing to connect data between various registers. Comparable systems are used in other Nordic countries, e.g. Finland, Denmark, Norway, and Iceland. Swedish database was chosen for this research, as it is a large, high-quality resource that is a part of an on-going research project.

The patient register contains diagnoses of all individuals who are admitted to any general, psychiatric, or secure hospital for assessment or treatment. It started in 1964, when the National Board of Health and Welfare began collecting data on somatic inpatient care in six Swedish counties, and has included psychiatric diagnosis since 1972[100] while complete coverage began in 1987.[101] Currently 99% of all discharges are registered. All patients are given a clinical diagnosis on discharge according to ICD-9 (until 1996) and ICD-10 (from 1997). Although primary diagnosis is missing in 3.1% of all psychiatric care patients, this register is valid and reliable for psychiatric diagnoses, including schizophrenia, other psychoses, bipolar disorder, and personality disorders, as well as for comorbid substance abuse and personality disorder.[101]

Data was extracted from patient register on 7,948 individuals who were admitted to a forensic hospital between 1972 and 2009. The data was scrutinized for duplicates. Individuals who died during their hospital stay, or were transferred to another institution (secure or community psychiatric hospital, general hospital) were excluded from the analysis, giving the total sample of 6,525. Ethics approval was

obtained from the Regional Ethics Committee at Karolinska Institutet (2009/939-31/5).

Nine psychiatric diagnoses were investigated: schizophrenia and related disorders (295.0-295.X; 297.0-299.X; F20.0-29.9), bipolar disorder (296.10; 296.30; 296.88; 296.99; 296.A; 296C-X; F30.0-F31.9), depression (296.20; 296B; 300.40; 300.41; 311.00; F32.0-F34.1), anxiety disorders (300.00-301.90, except 300.40 and 300.41; 300A; 300B; 300D; 300X; F40.0-F42.9; F45.0), substance abuse (303.00-305X, except 305.98; F10.0-F19.9), personality disorders (301.00-301.99; 301A-301X; F60.0-F69.9), learning disability (310.00-319X; F70.0-F79.9), developmental disorders (F84.0-F95.2; Q35.9-Q99.2), and organic disorder (292.10-294.X; 309.10-309X; G10.9-G93.8; G30.1-G47.3).

Following other work, violent crime was defined as homicide, assault, robbery, arson, any sexual offense (rape, sexual coercion, child molestation, indecent exposure, or sexual harassment), illegal threats or intimidation[102] (hence burglary and other property offenses, traffic offenses, and drug offenses were excluded)[103]. In Sweden, as opposed to other jurisdictions, there is no possibility to be acquitted of a crime on account of mental illness. Conviction data was therefore used, as it includes individuals who received custodial and noncustodial sentences, and individuals transferred to forensic hospitals. Furthermore, conviction data included cases in which the prosecutor decided to caution or fine. In addition, plea bargaining is not permitted in Sweden; conviction data therefore accurately reflect the extent of officially resolved criminality. The crime register has excellent coverage; only 0.05% of crimes had incomplete personal identification numbers in 1988-2000.[102, 103]

Cox regression models were constructed for each diagnosis investigated. Hazard ratios, and corresponding 95% confidence intervals, were calculated. Cox

proportional hazards model is used in survival analysis to assess the importance of various covariates in the survival times of individuals through the hazard function. In addition, the quantitative impact of these variables on important lifetime variables of interest can be described. The proportional hazards assumption was investigated visually using the log(-log) plot. The plots were parallel, suggesting that the assumption was valid. This means that the hazard functions are proportional over time (i.e. the relative hazard is constant) for each group.

Five types of analysis were conducted. To start with, hazard ratios were calculated for four biggest diagnostic categories (bipolar, depression, substance abuse, and personality disorder) relative to the largest diagnostic group, which was used as the reference category. The hazard ratios presented are therefore calculated for each diagnosis relative to schizophrenia. Hazard ratios were consecutively adjusted for age (at first discharge) and sex, index violent crime, and secondary diagnoses (substance abuse and personality disorder). The variables entered into the model were set *a priori* based on previous research on recidivism in mentally disordered offenders.[104] The analysis was performed using the command *stcox* in Stata 12.1 by entering time at risk for a particular binary outcome, e.g. mortality, the outcome as a binary variable, and above-mentioned covariates.

Second, the sample was stratified according to two main comorbidities (personality disorder and substance abuse), and analyzed for adverse outcomes (mortality, psychiatric readmission, post-discharge violent offending). In order to do that, patients with one of the top five diagnostic categories were selected, and, after adjustment for socio-demographic variables, secondary diagnoses were included as covariates, allowing for comparison between patient groups with and without a

comorbidity within a particular diagnostic group, e.g. schizophrenia plus personality disorder *vs.* schizophrenia minus personality disorder.

Third, to calculate the discriminative values of predictive models, Harrell's *c* was estimated to understand whether adding diagnostic factors to a model that already included demographic and criminal history variables improved the model's ability to differentiate between those who will and will not have the outcome.[105] For Harrell's *c*, a value of 0.5 indicates that the ability of the model to distinguish between participants in terms of the risk of outcome is as good as chance; a value of 1 indicates perfect differentiation; a value of less than 0.5 indicates that the model predicts the opposite outcome.[105] Harrell's *c* considers comparisons between survival times and censoring times rather than just employing binary information, and therefore is a measure in cohort studies favored over the area under the receiver-operating-characteristic-curve (AUC) value.[105] This analysis was performed using the post-estimation command *estat* in Stata 12.1.

Fourth, to test calibration the change in likelihood function was calculated. Calibration examines goodness of fit, i.e. whether the "estimated risk is appropriate or systematically off target."[106] This analysis was performed using the command *lrtest* in Stata 12.1.

Fifth, to test reclassification, which indicates whether the addition of a diagnostic factor improves the proportion of variance explained by the model, Royston's R^2 was used.[107]

3.3. Results

6,525 patients were included in the analysis (89.1% male). On average, at first discharge, they were 36.1 years of age (S.D. 11.5, range 15.0-83.0). 1,625 (24.9%)

were non-Swedish citizens, and 3,827 (58.6%) had been convicted of a violent offense immediately prior to their admission to the forensic hospital. The five largest diagnostic categories were: schizophrenia and related disorders (33.3%), bipolar disorder (4.8%), depression (3.7%), substance use disorder (15.6%), personality disorders (26.1%) (Table 3).

3.3.1. Mortality

On average, 14.6 (S.D. 10.2, range 0.0-36.0) years passed between first discharge and death. During the follow-up time there were 1,515 deaths (23.2%), giving the overall rate of 2,053 deaths/100,000 person-years. 453 (6.9%) people died within five years of discharge; 852 (13.1%) died within ten years of discharge. Average age at death was 52.12 years (S.D. 14.15, range 21.00-96.00).

Relative to schizophrenia (reference diagnostic category), substance use disorder increased the risk of mortality after adjusting for age and sex, previous violent offense, index violent offense, and co-morbid personality disorder (HR=1.783, 95% CI=1.556-2.044, p<.000). Personality disorder increased the risk of mortality after adjustment for the first three covariates (HR=1.167, 95% CI=1.023-1.331, p=.021) (Table 4). Secondary substance use also increased the risk of mortality (Figure 8), but the increase of risk for secondary personality disorder did not reach statistical significance (Figure 8).

The *c* index for baseline model (sex, age at first discharge, previous violent offense, index violent offense) was 0.641. Including primary diagnosis of substance abuse increased the *c* index to 0.652, and improved calibration (LR $\chi^2(1)=67.25$, p<.001, with $\Delta R^2=12.3\%$ from baseline). Including primary diagnosis of personality disorder in a separate model did not change the *c* index, and did not improve calibration (LR $\chi^2(1)=1.86$, p=.172). Including comorbid substance use disorder in a

separate model increased the *c* index to 0.648 and improved calibration (LR χ^2 (1)=29.12, p<.001, with ΔR^2=5% from baseline).

3.3.2. Rehospitalization

On average, it took 13.9 years (S.D 10.4, range 0.0-36.6) from discharge to subsequent hospitalization. During the follow-up, there were 4,889 (74%) rehospitalizations, giving an overall rate of 6,959 readmissions/100,000 person-years.

Compared to other diagnostic categories, schizophrenia and associated psychoses were found to increase the risk of repeat hospitalization. Depression decreased the risk by 30% (HR=0.705, 95% CI=0.611-0.813, p<.000), substance use by 25% (HR=0.761, 95% CI=0.702-0.826, p<.000), and personality disorder by 30% (HR=0.696, 95% CI=0.650-0.745, p<.000) (Table 5).

The effect of comorbidity on the risk of rehospitalization differed depending on the primary diagnosis. In schizophrenia secondary personality disorder decreased the risk of rehospitalization (Figure 8).

The *c* index for baseline model (sex, age at first discharge, previous violent offense, index violent offense) was 0.609. Including primary diagnosis of schizophrenia increased the *c* index to 0.618, and improved calibration to LR χ^2 (1)=92.24, p<.001, with ΔR^2=14.5% from baseline. Adding secondary personality disorder to this model increased the *c* index to 0.621, and improved calibration to LR χ^2 (1)=16.93, p<.001, with ΔR^2=2.5% from the previous model.

3.3.3. Post discharge violent offending

Average follow-up time for post-discharge violent offending was 6.1 years (S.D. 7.9, range 0.0-36.2). 3,644 (55.78%) discharged patients violently offended post-discharge Moreover, 2,977 (45.6%) discharged patients

committed a new violent offense within five years of discharge; 3,443 (52.7%) committed a new violent offense within a decade of discharge.

Compared to the diagnostic category of schizophrenia and related psychoses, only depression decreased the risk of post-discharge violent offending (HR=0.893, 95% CI=0.689-1.157, p=.394) (Table 6). Comorbid substance use increased the risk of violent offending in patients with primary diagnoses of personality disorder, depression, and schizophrenia (Figure 7). Comorbid personality disorder increased the risk of offending in schizophrenia (Figure 8).

The *c* index for baseline model (sex, age at first discharge, previous violent offense, index violent offense) was 0.619. Including primary diagnosis of schizophrenia increased the *c* index to 0.637, and it improved calibration to LR χ^2 (1)=73.84, p<.001, with ΔR^2=23.8% from baseline. Adding secondary personality disorder or secondary substance use disorder in a separate model did not improve discrimination (although calibration did improve).

3.3.4. Results summary

The impact of diagnosis on the occurrence of death, readmission, and violent offending differed between each of the adverse outcomes. The risk of mortality was most markedly increased in the case of primary substance abuse. The risk of repeat hospital admission was most strongly associated with schizophrenia. Compared with the reference category of schizophrenia and related psychoses, other diagnostic categories (bipolar disorder, personality disorder, and substance abuse) increased the risk of post-discharge violent offending.

The effect of comorbidity also differed between primary diagnoses and outcomes. Secondary diagnosis of substance use disorder and personality disorder

increased the risk of mortality and violent offending, but links with rehospitalisation were not uniform.

Table 3 Clinical and criminal history characteristics of 6,525 adults released from Swedish forensic psychiatric hospitals between 1972 and 2009.

Primary diagnosis at first discharge	Schizophrenia and other psychoses	2,177 (33.3%)
	Personality disorders	1,706 (26.1%)
	Substance use disorder	1,022 (15.6%)
	Bipolar disorder	311 (4.8%)
	Depression	240 (3.7%)
	Anxiety	194 (3.0%)
	Mental retardation	186 (2.8%)
	Organic disorder	151 (2.3%)
	Developmental disorder	61 (0.9%)
	Other	484 (7.4%)
Secondary diagnosis at first discharge	Substance use disorder	1,399 (44.9%)
	Personality disorder	473 (15.2%)
	Other	1,241 (39.9%)
Cause of death	Suicide	384 (14.8%)
	Accidents	45 (1.7%)
	Homicide	31 (1.2%)
	Other	997 (64.5%)
Type of index offence	Homicide and attempted homicide	860 (11.0%)
	Robbery	107 (1.4%)
	Threat	554 (7.1%)
	Sex crime against a child	89 (1.1%)
	Arson	72 (0.9%)
	Rape	55 (0.7%)
	Other violent crime	2,823 (36%)
	No offense	3,290 (41.9%)

Table 4 Hazard ratios (95% CI) of psychiatric risk factors for mortality in a cohort of forensic patients, adjusted cumulatively for age and sex, previous violent offense, index violent offense, secondary substance abuse (SA), and secondary personality disorder (PD). All values are presented relative to patients with schizophrenia.

	Age (per 5-year increase) & sex	**p-value**	**Previous violent offense**	**p-value**	**Index violent offense**	**p-value**	**Secondary SA**	**p-value**	**Secondary PD**	**p-value**
Schizophrenia	1	-	1	-	1	-	1	-	1	-
Bipolar	0.946 (0.730-1.224)	.674	.927 (.716-1.200)	.566	0.938 (.721-1.222)	.639	.938 (.720-1.221)	.637	.938 (.720-1.221)	.636
Depression	1.164 (0.913-1.484)	.219	1.161 (.910-1.481)	.227	1.203 (.942-1.537)	.138	1.201 (.940-1.535)	.142	1.200 (.939-1.534)	.144
SA	1.811 (1.588-2.065)	.000	1.777 (1.559-2.027)	.000	1.773 (1.552-2.026)	.000	-	-	1.783 (1.556-2.044)	.000
PD	1.151 (1.011-1.311)	.033	1.161 (1.019-1.323)	.024	1.167 (1.023-1.331)	.021	1,121 (.982-1.288)	.090	-	-

Table 5 Hazar ratios (95% CI) of psychiatric risk factors for rehospitalization in a cohort of forensic patients, adjusted cumulatively for age and sex, previous violent offense, index violent offense, secondary substance abuse (SA), and secondary personality disorder (PD). All values are presented relative to patients with schizophrenia.

	Age & sex	**p-value**	**Previous violent offense**	**p-value**	**Index violent offense**	**p-value**	**Secondary SA**	**p-value**	**Secondary PD**	**p-value**
Schizophrenia	1	-	1	-	1	-	1	-	1	-
Bipolar	0.946 (0.834-1.072)	.385	.953 (.841-1.080)	.457	.965 (.850-1.095)	.585	.966 (.850-1.069)	.594	.697 (.852-1.098)	.610
Depression	0.696 (0.604-0.801)	.000	.696 (.604-.802)	.000	.697 (.604-.805)	.000	.698 (.605-.805)	.000	.705 (.611-.813)	.000
SA	0.727 (0.672-0.786)	.000	.731 (.676-.791)	.000	.731 (.675-.792)	.000	-	-	.761 (.702-826)	.000
PD	0.700 (0.655-0.749)	.000	.697 (.652-.746)	.000	.700 (.654-.749)	.000	.696 (.650-.745)	.000	-	-

Table 6 Hazard ratios (95% CI) of psychiatric risk factors for violent offending in a cohort of forensic patients, adjusted cumulatively for age and sex, previous violent offense, index violent offense, secondary substance abuse (SA), and secondary personality disorder (PD). All values are presented relative to patients with schizophrenia.

	Age & sex	**p-value**	**Previous violent offense**	**p-value**	**Index violent offense**	**p-value**	**Secondary SA**	**p-value**	**Secondary PD**	**p-value**
Schizophrenia	1	-	1	-	1	-	1	-	1	-
Bipolar	1.433 (1.174-1.750)	.000	1.464 (1.198-1.788)	.000	1.451 (1.188-1.772)	.000	1.463 (1.197-1.786)	.000	1.461 (1.196-1.785)	.000
Depression	0.890 (0.687-1.152)	.378	.896 (.692-1.160)	.406	.901 (.696-1.167)	.433	.905 (.699-1.172)	.453	.893 (.689-1.157)	.394
SA	1.928 (1.701-2.185)	.000	1.963 (1.732-2.226)	.000	2.002 (1.766-2.269)	.000	-	-	1.980 (1.740-2.254)	.000
PD	1.574 (1.415-1.750)	.000	1.563 (1.405-1.737)	.000	1.539 (1.384-1.711)	.000	1.496 (1.345-1.663)	.000	-	-

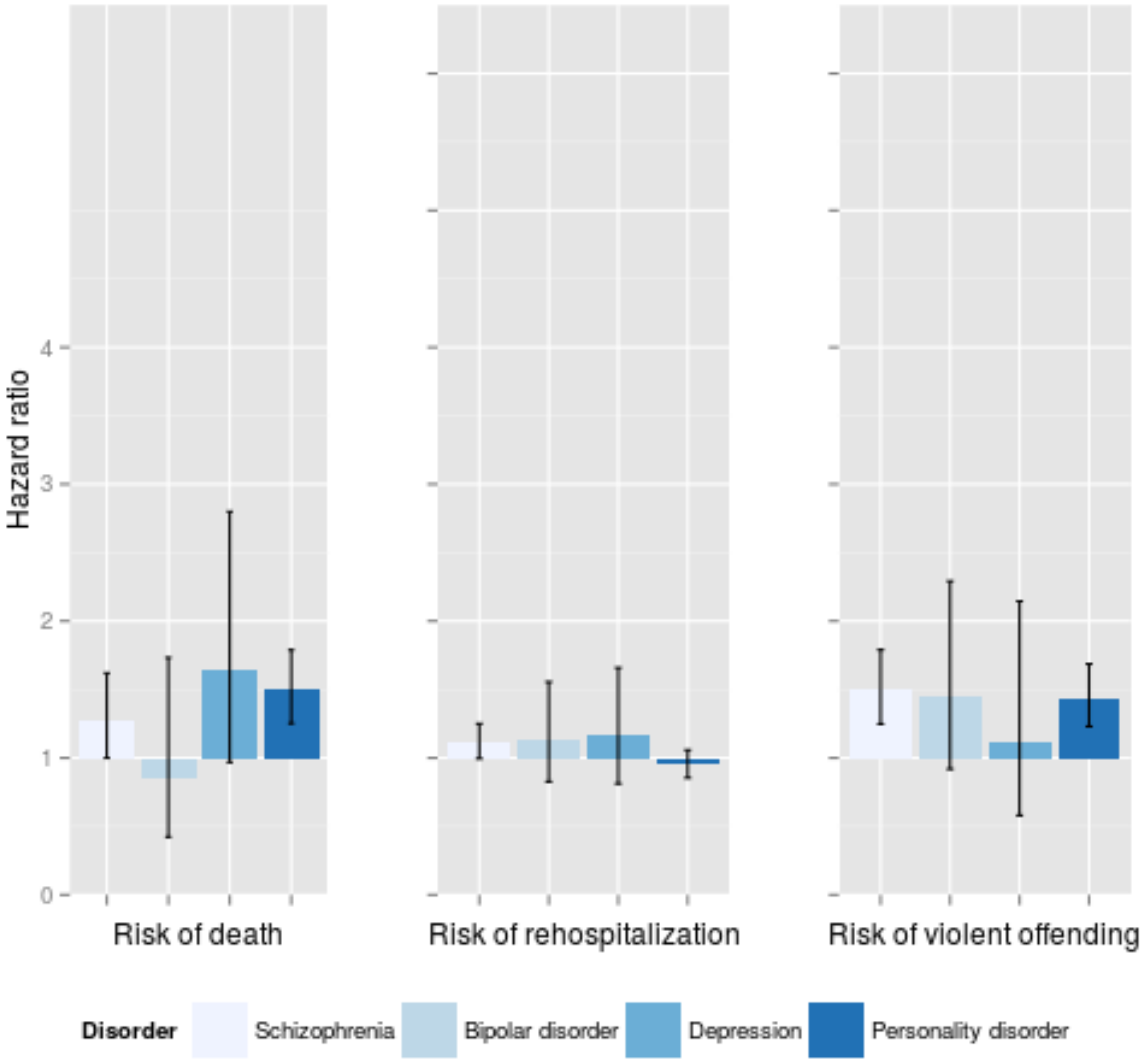

Figure 7 The effect of comorbid substance abuse on the risk of death, rehospitalization, and violent offending in a cohort of forensic patients. Hazard ratios are age- and gender-adjusted.

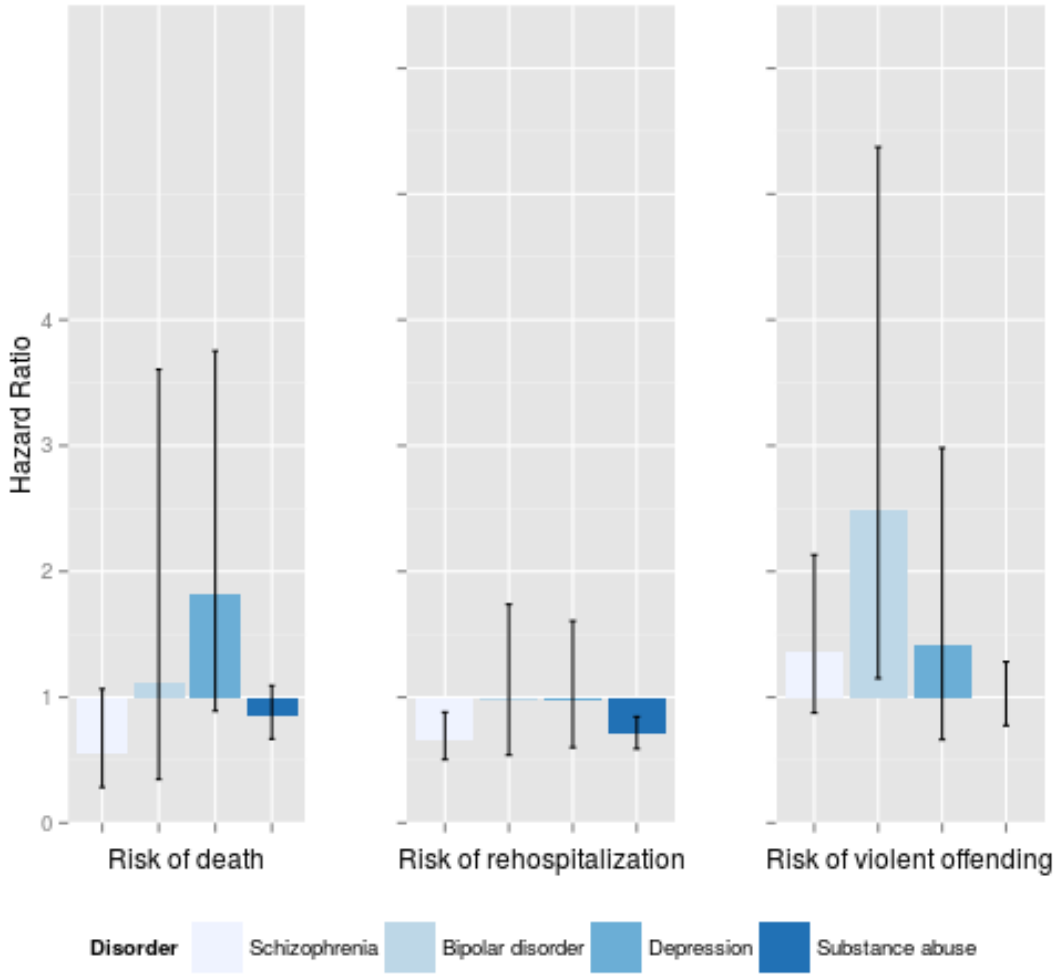

Figure 8 The effect of comorbid personality disorder on the risk of death, rehospitalization, and violent offending in a cohort of forensic patients. Hazard ratios are age- and gender-adjusted.

CHAPTER 4: DISCUSSION

4.1. Introduction

This final chapter reviews the aims of the research described in this thesis, discusses the findings, and assesses the results in light of their limitations and strengths. The implications of the work and directions for future research are also considered.

4.2. Summary of the aims

This thesis had two broad aims. First, to synthesize research on post-discharge outcomes of forensic patients, present information on important adverse outcomes (mortality, readmission, reoffending, and violent reoffending), and provide some comparative information for public health and policy to contextualize these findings. Second, to examine whether any psychiatric diagnoses including comorbidities increased risk of premature mortality, readmission, or post-discharge violent offending.

4.3. Principal findings

The investigation comprised of two studies. The first was a systematic review and a meta-analysis of 36 studies from 10 countries involving 12,366 patients (73.8% male, mean age 35.01%), out of which 51% were violent offenders, while 17% had a conviction prior to index hospitalization. Mortality rates were lower for studies from England and Wales compared to other countries included in the review. Suicide rates were higher for forensic psychiatric patients compared to similar forensic and clinical samples e.g. recently released prisoners. Readmission rates were higher in samples with greater proportion of patients diagnosed with mental illness, as opposed to personality disorders. Crude reoffending rates were lower in more recent studies.

Compared with discharged prisoners matched on age, gender, and type of offense, suicide rates were typically higher but reoffending lower for the forensic psychiatric samples.

The second study was a historical cohort study conducted in Sweden on a sample of 6,525 (89.1% male) forensic patients discharged from secure hospitals between 1972 and 2009. The effect of diagnosis and comorbidity differed by outcome and primary diagnosis. Compared to schizophrenia, substance use disorder was associated with highest risk of mortality and violent offending, and bipolar disorder and personality disorder significantly increased risk of violent crime. Schizophrenia had the highest risk of rehospitalization. The effects of comorbid substance use and personality disorder differed by diagnosis and outcome.

4.4. Discussion

4.4.1. First Study

First, mortality rates among discharged forensic patients are high, with rates between 789 and 2,825 per 100,000 person-years. To compare, a review of all studies on released prisoners reported a death rate of 850 per 100,000 person-years.[41] Nevertheless, a study of individuals diagnosed with schizophrenia and related disorders reported a similar mortality rate (CDR=1,417)[78] to that of forensic patients, suggesting that it might be the diagnosis of mental health problems and related treatment that contributes to premature mortality in these patients, rather than any particular features of the forensic setting.[78]

Subgroup analysis revealed lower mortality rate in studies conducted in England and Wales, compared to other high-income countries, e.g. Sweden. There is a possibility that in England and Wales there are better-developed post-discharge

services, e.g. community services, or cooperation with primary care. It is also possible that hospitals in these countries are better prepared to reduce mortality risk. This explanation, however, requires further research to establish whether services in those countries are indeed better at managing mortality risk and how they accomplish it. Notwithstanding, given the high rates of deaths and suicide, forensic hospitals should work toward reducing preventable deaths. It should be noted that suicide deaths, where available in the papers included in this review, typically included only definitive verdicts of suicide rather than consider open verdicts as well, and as such they are likely to be underestimates.

One possible pathway toward reducing premature mortality among forensic psychiatric patients is to follow the steps recommended for general psychiatric populations and consider their somatic health more carefully. The prevalence of physical disorders is higher in patients with severe mental illness than in the general population.[108] This is mostly due to unhealthy lifestyle behaviours,[109] e.g. smoking, which is more common among individuals with schizophrenia than in the general population.[110] However, negative health consequences can also result from taking psychiatric medication over a long period of time. Antipsychotics in particular have been shown to be associated with increased prevalence of metabolic syndrome, which is a risk factor for developing diabetes and cardiovascular disorders (CVD).[111] Overall, psychiatric patients are more likely than mentally healthy controls to suffer from obesity, diabetes, and symptoms of CVD, which are often poorly managed by their physicians.[108] Potential interventions that would aim at reducing premature mortality in forensic psychiatric patients should take those factors into account. De Hert and colleagues[108] suggest interventions at the level of treating physician who should monitor treatment actions of their patients. They further suggest that

psychiatrists should educate individuals with mental illness about how to address their "suboptimal lifestyle."

Regarding other interventions, some researchers have suggested exercise as an adjunct therapy in patients with mental illness. A Cochrane Review demonstrated the benefits of exercise on general as well as mental health in psychiatric patients, particularly negative symptoms, although it did not have a significant effect on their weight/BMI.[112] The latter, however, could be addressed by health behavioral interventions, including weight management counseling and group exercise.[113]

Second, there were big differences in rehospitalization rates from around 3,816 to 16,640 per 100,000 person-years. Only a few comparative studies were identified, so any inferences regarding how those rates relate to outcomes form the general psychiatric setting should be drawn with caution. The only variable that explained the variation between studies was the proportion of individuals classified under the Mental Health Act 1983 as having mental illness, or personality disorder. Rates were higher in samples with a greater proportion of patients diagnosed with mental illness. By contrast, where samples had a greater proportion of patients with personality disorders, the rates of readmission were lower. This might be explained by the fact that in certain countries mental health legislation requires people with mental illness to present at the hospital depending on the opinion of the physician in charge of a given case, which could inflate the readmission rate for this group. Nevertheless, although widely used in service assessment, rehospitalization might not be the best indicator of the effectiveness of treatment provided by (secure) hospitals. Social outcomes, such as paid employment, and clinical indicators, such as symptom scores might be more informative about the wellbeing of a patient once discharged. Additional research into such markers of function is necessary. Moreover, the studies

reported in this review often failed to report whether patients returned to a general or a secure psychiatric hospital. Future investigations should look at those outcomes individually.

Third, repeat offending and repeat violent offending rates were examined. This was the outcome where the most information was available, and rates varied between 0 and 24,244 per 100,000 person-years. Despite these differences, explanations for the heterogeneity were not found. This might be due to the fact that factors that lead to reoffending are complex, difficult to account for, and interact. A more important finding, however, is that compared to reoffending rates for general prisoners matched on gender and age, forensic patients had lower rates of repeat offending.

In addition, a range of comparison groups was provided. Rates reported in this study were lower than these of comparative groups. Nevertheless, these comparisons are not straightforward, as patients admitted to secure hospitals usually have committed a violent offence, and are hospitalized longer than comparable offenders are imprisoned. Therefore, reoffending rates of forensic psychiatric patients were compared to reoffending rates of individuals with violent index offences and prisoners with longer sentences; in addition, rates of violent reoffending were also investigated and compared with such rates in prisoners. Even with these comparisons, rates of repeat offending were lower in forensic patients.

There are a number of factors that might explain the differences in repeat offending rates between forensic patients and prisoners. First, forensic psychiatric patients have a distinct criminal and mental health profiles compared to prisoners and are highly selected. This is because, unlike prisons, which have to admit everyone with a court sentence, at secure hospitals it is possible for staff to make recommendations regarding admission based on the chances that the patient will

respond to treatment. In addition, as opposed to prisoners, forensic patients are subject to longer and more intense supervision during their admission and after discharge, and in contrast to prisoners, they meet with greater social support following release into community. Those are factors that can potentially have a protective effect against reoffending.

4.4.2. Second study

The analysis provided some evidence that diagnosis and comorbidities contribute to the risk of adverse outcomes. For example, primary and secondary substance use disorder increased the risk of mortality, which was expected based on previous research.[114, 115] Furthermore, comorbid substance use disorder and comorbid personality disorder increased the risk of violent reoffending, which was also expected based on previous findings.[103, 116] Based on these findings, forensic psychiatric services should increase the resources dedicated to prevention, diagnosis, and management of substance use disorder, even though effective treatment of substance use disorders presents one of the biggest challenges to the services.[117] However, one should recognize that substance use exists in a complex network of factors that determine patient's wellbeing. It is plausible that drug and alcohol dependence influences adherence to medication (and its effectiveness)[117], as well as participation in other forms of therapy, which might indirectly impact the likelihood of death and crime. Future research should look into the impact of those two factors on the occurrence of adverse outcomes in forensic psychiatric population before recommendations can be made.

Principal diagnosis and comorbidity had differing effects on the risk of hospital readmission. In particular, this analysis has shown that patients with schizophrenia and related disorders are at an increased risk of readmission, compared to other diagnostic groups. This finding is partially in keeping with previous investigations into rehospitalizations of psychiatric patients,[30] and suggests that services should adhere to the guidelines from the National Institute of Health and Care Excellence (NICE), which have been shown to prevent relapse in schizophrenia.[118] The role of other interventions, e.g. Community Treatment Orders (CTO), and equivalent legal instruments, and their relevance for forensic outpatients will need to be elucidated. In the UK, for example, patients who have been detained in hospital under the Mental Health Act, can be released into supervised treatment in the

community for up to six months, during which they can be recalled by the supervising physician at any time. Whether CTOs can prevent readmission in forensic patients remains unclear and more research is needed.

Comorbid personality disorder decreased the risk of readmission in certain patient groups (schizophrenia and substance abuse). This finding was inconsistent with literature, as this phenomenon has not been detected in general psychiatry so far.[30] This might be explained by the fact that institutions have a higher threshold for readmission for people with personality disorders. On the one hand, it is plausible that patients with personality disorders respond better to treatment, or that they have a milder form of the disorder,[119] which does not require a readmission and can be treated in the community. On the other hand, however, it is also possible that patients with a severe form of personality disorder (psychopathy) do not respond to treatment at all, and as such as diverted to the criminal justice system.

It should be noted, however, that while diagnostic information increased the risk of certain outcomes, the model that included that information was only marginally better than a model that included only demographic and criminal history factors. At first, it might appear surprising that although particular diagnoses increased the risk of an outcome, they did not contribute substantially to the prediction of an outcome, as evidenced by a minimal increase of the *c* index when diagnostic variables were added. This can be explained by the fact that when a factor increases the risk, it does not mean that knowing this factor is sufficient to predict a future occurrence of an event.[104] Hlatky and colleagues[120] note that one of the limitations of the *c* index is that it is rather "insensitive to change and might not increase appreciably even when a new [factor] is statistically significant and independently associated with risk." Similarly, Harrell and colleagues[105] point out that although rank indexes such as *c* are "widely applicable and easily interpretable, they are not sensitive for detecting small differences in discrimination ability between two models." This study illustrated this

phenomenon well. Although certain diagnostic information was significantly associated with increased risk of premature mortality, readmission, and violent offending, the *c* index increased modestly when that information was added into a model which already included the major established risk factors.[104]

4.5. Strengths

4.5.1. First study

To the best of my knowledge, this is the first systematic review and meta-analysis summarizing reports on adverse outcomes of discharged forensic patients. Its strengths include the use of transparent and reproducible methodology outlined in a protocol prepared before the study commenced. The protocol was not altered during the study, analyses were conducted using validated and appropriate statistical techniques, and the findings were reported transparently.

Although I have tried to include all published studies on post-discharge outcomes of forensic patients, it is possible that some studies have been omitted. To address that problem, key authors were contacted by email enquiring about whether the list of papers included in this meta-analysis was exhaustive to the best of their knowledge. In a follow-up, they were also asked about whether they were aware of any relevant reports (either their own or their colleagues) that had not been published by March 2013. This did not yield any results. Nevertheless, the missing studies are most likely a random subset of all relevant studies, and failure to include those results in less information, wider confidence intervals, and less powerful meta-regression tests, but may have no material impact on the rates reported.[32]

In addition to providing pooled estimates of the rates of each of the post-discharge, adverse outcome, this study examined the sources of heterogeneity between studies, following best practice guidance on performing systematic reviews and meta-analyses of observational studies.

Finally, the study provided a range of comparisons to contextualize the findings. In addition to reporting rates of adverse outcomes for comparable clinical and forensic populations, prevalence ratios were calculated. Derived based on data from individuals that matched on age, gender, type of offense and country of data origin, the ratios provided an easy to understand statistic that summarized the differences in offending rates between forensic psychiatric patients after discharged and prisoners after release.

4.5.2. Second study

In addition, this is the first study to look comprehensively at the effect of diagnosis on the risk of important adverse outcomes in forensic patients. Strengths include a large sample, and that the data comes from a high quality patient register, with high diagnostic specificity.[101] The validity of diagnoses has also been demonstrated.[121] A random sample of patients was selected and their records scrutinized in accordance to DMS-IV criteria by an experienced psychiatrist. Eighty-six percent of the diagnoses were found to be valid. In addition, schizophrenia diagnoses in particular, concord well with diagnoses obtained by a suite of computer programs that allows data entry and generates diagnoses according to 12 operational diagnostic systems (OPCRIT) record review and interview.[122]

Moreover, the crime register is also highly reliable.[18]

Specificity of outcome is another strength of this study, particularly regarding readmissions. Many papers reporting on forensic psychiatric patients returning to psychiatric hospital after discharge fail to distinguish between general psychiatric and forensic psychiatric wards. The data set used in this study provided information about return to a forensic institution.

Data on violent post-discharge offending is another strength of this study. Although this is a specific and important outcome, it is scarcely reported. Only 15 studies included in the systematic review provided data on post-discharge violent offending.

Finally, the study provided information on discrimination, calibration and reclassification allowing to assess the impact on the overall model of the increase in risk associated with a psychiatric diagnosis.

4.6. Limitations

4.6.1. First study

This study should be considered in the light of a number of limitations. First, most of the studies included in the systematic review and meta-analysis did not report the source of admission (court vs. community), which might have explained some of the heterogeneity between studies. Second, patients included in this study had been discharged from a variety of institutions located in different countries. It is reasonable to expect that each of those institutions has distinct admission criteria, and offers slightly different treatment, which might impact the overall outcome of the patients. In addition, the studies included in the review have been published over the time span of 21 years (1982-2013); threshold for admission, and available treatments is likely to have changed over time, making direct comparisons between cohorts difficult.

The exclusion of risk assessment studies is another limitation of this review. This is a considerable limitation, as some data was lost from the analysis. Moreover, although efforts were undertaken to ensure that included samples were unique and there was no overlap between studies, there might have been some overlap between three studies coming from the UK.[9, 12, 73] Approximately 180 patients (8%) were counted twice in the analysis.

Finally, there are some limitations connected with the nature of studies included in the review. Most of the studies considered were retrospective, and conducted with the help of case notes and information gathered with the help of various official databases. While conducting a retrospective study has several advantages, e.g. no need to wait for an

outcome to occur over a follow-up period, the quality of the study depends entirely on the reliability of the records kept. Moreover, some official sources, e.g. Offenders' Index, used by studies originating from England and Wales, have a 2-year time lag between charges and conviction. In addition, according to some estimates, 9% of criminal records are missing from the Index, meaning that the rates reported by studies which used it are likely to be underestimates.[58]

Additionally, one should consider statistical limitations (power) associated with meta-regression and sub-group analysis. Statistical power is the likelihood that a test of significance will reject the null hypothesis. It depends on the effect size and the precision of the estimate. For sub-group analysis, the larger the difference between studies, or the smaller the standard error within studies, or both, the greater the power. For meta-regression, the greater the relationship between the covariate and the effect size, or the greater the precision of the estimate, or both, the greater the power.[32] In both cases, the precision of the estimate depends on the number of individuals across studies and (for random effects) the total number of studies.[32]

Borenstein and colleagues[32] caution that while there is a "general perception that power for testing main effect is consistently high in meta-analysis, this perception is not correct and does not extend to tests of subgroup differences or meta-regression." It can mean two things when sub-group analysis or meta-regression fail to yield statistically significant p-values. First, it is possible that the effect, if it exists, is quite small. Second, it is also possible that the power to detect the effect was insufficient. In the case of this research, even though relationships between various variables were not found, it does not mean that they do not exist. The relationships might simply be too small, or the power, in this case, might have been inadequate to detect those relationships.

4.6.2. Second study

This study has some important limitations. First, information was only available on primary and secondary diagnoses, without the possibility to explore other clinical factors that might have been relevant in determining the risk of an adverse outcome in forensic psychiatric patients, e.g. compliance with medication,[116] specific symptoms,[95] different types of substance use, sub-threshold substance use problems (such as binge drinking), and personality traits,[123] all of which, as noted by Grann and colleagues, may be of particular relevance to offenders with mental illness.[104] Second, the true prevalence of violence and antisocial behaviour was underestimated by using only violent convictions. This, however, should not detract from the importance of those findings, as offences that receive a violent conviction are most likely severe types of antisocial behaviour. At the same time, this underestimate is unlikely to alter the risk estimates reported because the outcomes are compared within the cohort. Finally, there is a major advantage to using conviction data as it prevents the occurrence of reporting biases associated with self-report and informant questionnaires for crime and potentially allows for comparisons between countries.[94]

There are some additional limitations associated with the use of patient registers. Although Swedish registers are high quality databases with good diagnostic reliability and national coverage of criminal activities in the country, there are some problems related to using them for research purposes. First, prevalences of drug and alcohol use disorders might have been underestimated.[94] Second, there are some difficulties associated with the use of personal identification numbers (PIN) in linking databases. Occasionally there can be an incorrect or a re-used PIN among Swedish residents. As Ludvigsson cautions: “matching between large datasets where individuals with identical PIN occur more than twice in both datasets will result in mismatching with risk of incorrect data. Unawareness of the fact that medical events in one individual may have been attached to two of three different PINs will result in underestimation of morbidity.”[99] To avoid that the dataset was scrutinized for

duplicated, but none were detected. Third, the study was conducted in one country and it might not be generalizable.[94] However, the prevalence of schizophrenia[124] and violence[125] in Sweden is similar to those in other high income countries,[126] making the study generalizable to high income countries.

4.7. Implications

Forensic psychiatric care is a low-volume, high-cost service with a growing demand. The findings presented in this thesis outlined what benefits and risks might be relevant to patients discharged from secure settings. They could be used to consider service developments in the future.

4.7.1. Mortality

Forensic hospitals should consider identifying all preventable deaths among their patients and invest resources into diminishing death rates by paying better attention to overall health of patients – not just mental health. Furthermore, one possible approach to reducing post-discharge mortality, especially suicide, would be to improve community services, which would offer a "bridge" between in-patient care and independent living. Moving from secure care into community is a big step in the patient journey that can cause anxiety, which is a risk factor for suicide.[127, 128] Furthermore, to decrease the rate of premature mortality, the treatment of substance abuse disorder (either as primary or as secondary diagnosis) should be improved.

4.7.2. Readmissions

Further research is needed to establish what kind of interventions could lower the rate of rehospitalization in discharged forensic patients. Those could include improved community treatment for people with mental illness; multidisciplinary team working; liaison with GPs and community nurses; improved social care and support in getting employment; regular follow-up, and monitoring of mental state and concordance with medication.

4.7.3. Violent reoffending

In the systematic review, I have demonstrated that patients discharged from forensic psychiatric services have better reoffending outcomes than many comparative groups. The cohort study revealed the role of diagnostic factors in the risk of reoffending. Overall, the findings suggest target management of high-risk groups, however, the situation is more complex. It seems counterintuitive to say diagnosis is linked to reoffending statistically, but yields little predictive value in risk prediction. The explanation is that other factors are already very strong predictors, and any other new factor would have to be very strong to increase predictive value. Diagnosis does not appear to be such a factor.

4.8. Directions for further research

Future research should seek to answer a number of questions that follow from the findings presented in this thesis.

First, a comparative investigation should be conducted into differences between English and other European forensic services to establish what aspects of available provisions account for the observed differences in post-discharge mortality rates. Given the association between substance use and mortality risk in discharged forensic patients presented in this thesis, exploring the differences in substance use management between the two regions appears to be one potential avenue for further research. An investigation aiming to compare and contrast inpatient but also community treatment for substance use offered to forensic patients would be worthwhile.

Such study would first have to establish whether there are any differences in the prevalence of substance use diagnosis at discharge between forensic psychiatric patients based in England and Wales and those based in other relevant countries. If the number of patients with substance use problems is similar in both groups, further investigation into clinical characteristics of these patients should be undertaken. Although there is currently no consensus as to what constitutes recovery in substance use treatment,[129] measures of seven domains have been suggested (physical, biomarker, psychological, psychiatric, chemical dependency, family/social, and spiritual) and could be used in this study. Discharged patients should then be followed up for a specified period when their progress would be monitored. Continued access to and uptake of appropriate talk therapies (e.g. cognitive behavioral therapy) and medication should be recorded. Mortality rates would be used as outcome measure.

If there are differences in prevalence of substance abuse between these groups, investigations into causes underlying those differences should be undertaken. Such a study

should seek to understand why substance use is more common in some countries than in others, considering socio-demographic, cultural, legal as well as clinical factors.

Substance use was also found as a risk factor for repeat offending, but it was unknown whether the diagnosis makes a unique contribution to this outcome, or whether the risk is mediated by e.g. non-adherence to medication, failure to participate in psycho-social treatments. Although the impact of each of these factors might be difficult to separate, it could potentially be explored in a prospective study. Building on the study already described, data should be collected on treatment adherence, clinical scores (for any psychiatric diagnosis other than substance use as well as substance use), treatment adherence and offending. The analysis of data collected in such a study should aim to separate the effect of substance use from the effect of other covariates.

Regarding readmission rates, few comparative groups were identified in this thesis, which limited the utility of any conclusions about how rehospitalization rates compare between forensic psychiatric patients and other patient groups, such as general psychiatric patients. Services should be encouraged to make such data available for national cohorts of general psychiatric patients (excluding secure hospitals) to allow comparisons.

In addition, while there was substantial heterogeneity between studies of hospital readmissions, only two factors were identified as potential explanations (proportion of people with mental illness and proportion of people with personality disorders). Future research should examine factors contributing to readmissions more closely so interventions can be designed and return to hospital prevented.

Although the findings presented in this thesis provided some support for previously identified relationships between schizophrenia and related disorders and the risk of readmission, more evidence is needed to support this relationship. Furthermore, more detailed evidence is needed. Clinical (e.g. comorbidities, symptoms scores, medication compliance)

and social (e.g. employment and relationship or family status, educational attainment) data should be recorded on each admission to better understand the complex interactions between a patient's medical status and social context that results in readmission.

Social outcomes deserve particular attention. Readmission is a very specific outcome and is usually preceded by severe relapse (or criminal activity in the case of forensic psychiatry) and therefore is not very informative about the overall wellbeing of a person who has left a secure hospital. The success rate of these patients at integrating back into society should be considered to be a key outcome. Despite challenges such investigation would pose (e.g. requiring patient consent to be followed up, relying on self-reported data provided by the patients and informants, challenges associated with establishing how and what data should be collected, additional work for the admitting physician, to name a few) it would be an informative endeavor. Mental illness is a condition associated with a disorder in person's thoughts, mood and behaviours. Loss of ability to pursue social, occupational or recreational goals is a diagnostic criterion for many mental illnesses (e.g. substance use, depression). Presence of such ability, be it creation or restoration, should therefore be considered a goal of any psychiatric treatment. Mental health care and social care should make an orchestrated effort to support forensic psychiatric patients in rejoining society. A measure of success should be e.g. independent living, paid employment, ability to create and sustain a relationship, not just hospital readmission.

Further research should elucidate how best to support forensic psychiatric patients in achieving these goals. Access to and quality of training in independence and social skills, as well as to education and vocational courses during hospital stay should be reviewed to identify best practices. This would require a research project with long-term follow-up, but such effort is necessary to inform policy and funding decisions.

CHAPTER 5: CONCLUSIONS

Secure hospitals serve a small proportion of all users of mental health services. They require specialized facilities and specially trained staff; they take on difficult cases and usually house patients for much longer than do non-secure hospitals. The primary objective of these hospitals is to provide a therapeutic psychiatric service to individuals with a mental disorder. Their secondary aim is to reduce the risk of harm the individual poses to him- or herself and to the public.

Secure psychiatric hospitals are needed because prisons are bad for people with mental disorders. Overcrowding, violence, enforced solitude and inadequate health services are just some of the factors associated with prisons that were identified by the World Health Organization as detrimental to mental health. People with severe mental illness who have committed an offense should have access to appropriate, specialized care that can improve their wellbeing. Secure hospitals are currently the best place to provide such service.

As the number of forensic beds increases, assessment of effectiveness of these services becomes more important. Mortality, readmissions as well as post-discharge offending and violent offending rates have so far been employed as measures of benefit. The picture that emerges from these indicators is a complex one with some evidence to support the existence of the service in its current form.

For example, offending and reoffending rates that are lower among discharged forensic psychiatric patients compared to released prisoners that match a similar profile suggest that the service can claim some degree of success in managing risk to the public. This, however, is with a caveat that forensic psychiatric patients are a highly select population and it might be that factors that stop them offending after discharge are specific to them and the follow-up support they receive in the community, not to inpatient forensic care.

High mortality rates among discharged forensic psychiatric patients that are comparable to mortality rates reported for similar clinical populations (but higher than morality rates reported for released prisoners) suggest that care available to psychiatric patients in general, not just forensic provisions, needs to improve to increase life expectancy of people affected. However, given that the average length of admission in forensic hospitals is longer than in non-forensic setting, there is more opportunity to monitor and improve general health of inpatients treated in secure hospitals. There is also an opportunity for longer-term health education that could result in a sustainable behavioral change in patients. This would require a shift in emphasis from treating mental health problems to a more holistic approach to patient care. Improving symptoms of mental disorders should remain the goal of treatment, but the role of good somatic health in restoring mental wellbeing should receive more attention as the two outcomes cannot be separated.

Improving patients' general health might also enable them to become productive members of society after discharge. Mental and physical health are necessary elements of fitness for work. Employment is an important element of achieving a degree of independence, which is an important factor for long-term wellbeing of former psychiatric inpatients. Finding and maintaining a regular activity that could provide a source of income could also prevent reoffending.

It seems to emerge that to improve long-term outcomes of forensic psychiatric patients, secure hospitals might need to change the focus and standard of care they deliver. Improved treatment programs should be informed by each individual's primary and comorbid psychiatric diagnosis. Each diagnostic combination appears susceptible to a particular adverse outcome. Those relationships need to be identified and translated into effective care.

In conclusion, forensic psychiatric hospitals are a useful service that requires some improvement. Interventions should be tailored to patient's primary and secondary psychiatric

diagnosis and should aim to restore general health of each patient. Improved health can not only reduce premature mortality among forensic psychiatric patients, but it can also support them in steps necessary on the way to reentering society, e.g. securing employment, leading to reduction in readmissions and post-discharge offending.

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APPENDICES

Appendix A PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	7
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Pre-page
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	7-8
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	7
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	8
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	10
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	8, 11
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	8-9
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	16

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	11
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	11-12
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	9-10
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	12
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	13
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	-
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	13
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	16
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	76
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	-
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	24-27
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	17-20
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	76
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	17-20
DISCUSSION			

Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	20, 45-49, 57-58
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	54-55
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	59-64
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	-

Appendix B Study characteristics including sources of data, and study rating according to the Newcastle-Ottawa Quality Assessment Scale for Cohort Studies. Studies are rated out of maximum six. Where the table states n/a, the outcome is not applicable to a given study. Where it says no information, no information was provided within the paper.

Author	Year	Country	Unit	Sample size	% male	Sources of data mortality	Sources of data readmissions	Sources of data reconvictions	Study Quality Score (max. 6)
Jones[74]	2011	UK	Broadmoor, Ashworth, Rampton	4393	81.0	Special Hospital Case Register	n/a	n/a	6
Davies[12]	2007	UK	Arnold Lodge	595	84.4	The Office of National Statistics	Home Office Mental Health Unit, General Practitioner Registration Database	Offenders' Index, Police National Computer	6
Jamieson[2]	2005	UK	Broadmoor, Ashworth, Rampton	223	82.0	The Office of National Statistics	The Office of National Statistics	Offenders' Index, Police National Computer	6
Tabita[10]	2012	Sweden	Orebro County	88	90.9	National Cause of Death Register, Forensic Psychiatric Service Orebro	n/a	Swedish National Council for Crime Prevention	6
Steels[57]	1998	UK	Broadmoor, Ashworth, Rampton	184	78.0	Special Hospital Case Register	Special Hospital Case Register	Special Hospital Case Register, Home Office	6
Maden[73]	1999	UK	Denis Hill Unit, Bethlem Royal Hospital	243	85.0	Medical records	Medical records, NHS Central Record	Offenders' Index, Prison Service Records	6
Fioritti[64]	2006	Italy	No information	No information	No information	No information	n/a	No information	5
Lund[11]	2013	Sweden	Western Sweden	163	100.0	No information	n/a	National Council of Crime Prevention, Central Criminal Records of the National Police Board, National Prison and Probation Service	6
Edwards[48]	2002	UK	Three Bridges	152	85.3	n/a	Home Office	Offenders' Index, cross-	6

							Mental Health Unit Medical Records	referenced with case-notes	
Simpson[49]	2006	New Zealand	Auckland	105	88.0	n/a	Medical Records	Medical Records	6
Cope[50]	1993	UK	West Midlands	51	74.5	n/a	Case notes	Case notes	6
Ong[53]	2009	Australia	Victoria	25	76.0	n/a	Forensic Mental Health Clinical Records	Forensic Mental Health Clinical Records	6
Pasewark[55]	1982	US	New York State	133	83.0	n/a	No data	No data	5
Skipworth[13]	2006	New Zealand	National cohort	135	83.0	n/a	New Zealand Health Information Service Database	The Justice Warehouse Database	6
Nicholson[75]	1991	US	Oklahoma	61	91.8	n/a	Hospital Records	Court Records, Oklahoma State Bureau of Investigation Records	6
Hayes[93]	2014	Australia	New South Wales	197	85.0	n/a	Mental Health Review Tribunal Client Database	Mental Health Review Tribunal Client Database, NSW Bureau of Crime Statistics and Research Re-Offending Database	6
Bogenberger[51]	1987	US	Hawaii	107	93.0	n/a	Central Register of the Division of Mental Health	Crime Data Center	6
Baxter[52]	1999	UK	Bracton Clinic	63	75.0	n/a	Case notes from Bracton	Home Office Criminal Records Stats, Medical Notes at Local Psychiatric Services at Bracton Clinic	6
Blattner[66]	2009	UK	Edenfield Centre	72	87.0	n/a	Case notes	Case notes	6
Black[67]	1982	UK	Broadmoor	125	100	n/a	Broadmoor records, Special Hospitals Research Unit records, Mental Health Index of the Department of Health and Social Security.	Broadmoor records, Special Hospitals Research Unit records, Mental Health Index of the Department of Health and Social Security.	6
Falla[69]	2000	UK	Trevor Gibbens	85	No	n/a	No information	Police and Home Office	6

			Unit at Maidstone Hostpial		information			records compared with offences known to the multidisciplinary community care team.	
Bjorkly[71]	2010	Norway	National cohort	125	87.0	The Central Register of Deaths and Causes of Death	Self-reports	Official Crime Register	5.5
Maden[54]	2004	UK	National cohort	959	88.0	n/a	n/a	Offenders' Index	6
Yoshikawa[56]	2007	Japan	National cohort	489	84.0	n/a	n/a	Japanese Ministry of Justice Database	6
Buchanan[58]	1998	UK	Broadmoor, Ashworth, Rampton	425	82.0	n/a	n/a	Offenders' Index	6
Bailey[59]	1992	UK	Park Lane	106	100	n/a	n/a	Home Office	6
Coid[9]	2007	UK	Medium secure, 7 out of 14 units	1344	86.6	n/a	n/a	Mental Health Unit at the Home Office	6
Nilsson[61]	2011	Sweden	Stockholm	46	89.0	n/a	n/a	Structured research protocol applied to records from Forensic Psychiatric Investigation and Interviews	6
Rice[65]	1990	Canada	No information	253	No information	Coroner's Office	n/a	Lieutenant Governor's Review Board, The Royal Canadian Mountain Police, Parole Service	6
Tiihonen[68]	1995	Finland	Niuvannaniemi (high security)	310	90.0	n/a	n/a	Criminal register	6
Russo[70]	1994	Italy	Barcelona Hospital (high security)	91	100.0	n/a	n/a	For small towns: Records of municipal authorities, police force, social services, territorial psychiatric structures, family, priests, voluntary workers. For main towns: penal certificates, subjects during their	6

								imprisonment.	
Luettgen[72]	1998	Canada	No data	125	No data	No data	No data	No data	2
Silver[62]	1989	US	Maryland	127	No information	n/a	n/a	FBI Arrest Records	6
Akande[76]	2007	UK	Low security	33	76.0	n/a	Data collected by researchers from patients' designated key workers, who had known the patients for at least three months	Data collected by researchers from patients' designated key workers, who had known the patients for at least three months	2
Castro[130]	2002	UK	Redford Lodge	49	80.0	n/a	Structured telephone questionnaires	Structured telephone questionnaires	5

Appendix C Crude death rates (CDRs) for all-cause mortality and suicides in discharged forensic psychiatric patients. Rates are per 100,000 person-years.

Author, year	Number of deaths from all-causes	Number of suicides	Number of person-years	All-cause CDR (95%CI)	Suicide CDR (95%CI)
Luettgen, 1998[72]	-	3	730	-	410 (380-1201)
Steels, 1998[57]	39	-	2,502	1,559 (1,142-2,123)	-
Maden, 1999[73]	20	8	1,544	1,260 (840-1,992)	518 (263-1,019)
Jamieson1, 2005[2]	19	5	1,048	1,813 (1,164-2,814)	477 (204-1,112)
Jamieson2, 2005[2]	16	1	933	1,715 (1,059-2,768)	107 (19-605)
Fioritti, 2006[64]	5	-	177	2,825 (751-4,038)	-
Davies, 2007[12]	57	26	5,593	1,019 (787-1,318)	321 (317-680)
Coid, 2007[60]	20	10	2535	789 (511-1214)	394 (213-724)
Jones, 2011[74]	-	140	50,520	-	277 (238-332)
Tabita, 2012[10]	20	8	827	2,418 (1,571-3,705)	967 (491-1,898)
Lund, 2013[11]	29	-	1,337	2,170 (1,515-3,099)	-

Appendix D Crude readmission rates of discharged forensic psychiatric patients. Rates are per 100,000 person-years.

Author, year	Number of readmissions	Number of person-years	Crude readmission rate (per 100,000 patients) (95% CI)
Black, 1982[67]	48	625	7,680 (6,245-8646)
Pasewark, 1982[55]	41	665	6,165 (4,577-8,257)
Bogenberger, 1987[51]	44	856	5,140 (3,851-6,830)
Nicholson, 1991[75]	10	207	4,822 (2,640-8,647)
Cope, 1993[50]	16	270	5,919 (3,676-9,398)
Luettgen, 1998[72]	64	496	12,908 (10,227-16,172)
Baxter, 1999[52]	56	340	16,461 (12,899-20,772)
Maden, 1999[73]	175	1,544	11,331 (9,845-13,009)
Falla, 2000[69]	9	289	3,114 (1,646-5,811)
Edwards, 2002[48]	39	760	5,132 (3,776-6,938)
Jamieson1, 2005[2]	40	1,048	3,816 (2,815-5,155)
Jamieson2, 2005[2]	38	932	4,074 (2,982-5,542)
Simpson, 2006[49]	19	189	10,583 (6,531-15,167)
Skipworth, 2006[13]	108	742	14,546 (12,191-17,264)
Davies, 2007[12]	412	5,593	7,366 (6,711-8,081)
Coid, 2007a[60]	94	2,454	3,830 (3,139-4,664)
Akande, 2007[76]	5	118	4,232 (3,130-30,920)
Blattner, 2009[66]	33	352	9,353 (6,737-12,845)
Ong, 2009[53]	12	75	16,000 (9,396-25,917)
Bjørkly, 2010[71]	30	1,025	2,926 (2,057-4,147)
Hayes, 2013[63]	76	1,327	5,726 (4,599-7,108)

Notes: Jamieson1 refers to 1984 cohort and Jamieson2 refers to 1996 cohort.

Appendix E Readmission rates for populations comparative with forensic psychiatric patients. Rates are per 100,000 person-years.

Study	Country	Population	Crude readmission rate (95%CI)
Lyons, 1997[85]	US	Community patients	35,294 (26,998-43,589)
Kravitz, 1999[87]	US	Offenders with mental disorders (NGRIs) treated in an outpatient programme	55,555 (39,323-71787)
Bernardo, 2001[86]	Canada	Community patients	14,666 (11,835-17,497)
Irmiter, 2007[84]	US	mentally disordered veterans	12,230 (12,102-12,359)
Zhang, 2011[83]	Australia	community patients	3,838 (3,024-4,653)
Current review	**Various**	**forensic patients**	**7,740 (6,233-9,247)**

Appendix F Crude reoffending rates of discharged forensic psychiatric patients. Rates are per 100,000 person-years.

Author, year	Number of reoffenders	Number of person-years	Crude reoffending rate (per 100,000) (95% CI)
Black, 1982[67]	50	937	6,963 (5,333-51,873)
Pasewark, 1982[55]	38	718	5,291 (3,878-7,178)
Bogenberger, 1987[51]	72	856	8,411 (6,733-10,462)
Silver, 1989[62]	83	2,159	3,844 (3,112-4,741)
Rice, 1990[65]	103	1,645	6,263 (5,191-7,539)
Nicholson, 1991[75]	10	207	4,822 (2,640-8,647)
Bailey, 1992[59]	41	636	6,447 (4,787-8,629)
Cope, 1993[50]	4	186	2,156 (842-5,412)
Russo, 1994[70]	20	455	4,395 (2,836-6,692)
Tiihonen, 1996[89]	7	2418	289 (140-596)
Steels, 1998[57]	76	704	10,789 (8,707-13,269)
Luettgen, 1998[72]	8	730	1,095 (555-2,147)
Buchanan, 1998[58]	131	4,462	2,936 (2,479-3,473)
Baxter, 1999[52]	19	246	7,733 (5,006-11,761)
Maden, 1999[73]	56	1,544	3,626 (2,803-4,679)
Falla, 2000[69]	6	289	2,076 (1,631-4,455)
Edwards, 2002[48]	15	760	1,974 (1,200-3,230)
Castro, 2002	6	24	24,244 (17,089-24,489)
Maden, 2004[54]	145	1,918	7,560 (6,460-8,830)
Jamieson1, 2005[2]	61	2,364	2,580 (2,014-3,300)
Jamieson2, 2005[2]	35	735	4,763 (3,444-6,552)
Simpson, 2006[49]	19	189	10,053 (6,530-15,166)
Skipworth, 2006[13]	20	742	2,694 (1,750-4,123)
Fioritti, 2006[64]	10	295	3,390 (1,851-6,127)
Coid, 2007[9]	428	8,332	5,136 (4,682-5,631)
Davies, 2007[12]	264	5,095	5,182 (4,606-5,825)
Yoshikawa, 2007[56]	49	5,281	928 (702-1,224)

Akande 2007[76]	0	126	0 (0-10,427)
Blattner, 2009[66]	8	353	2,268 (1,153-4,410)
Ong, 2009[53]	1	75	1,333 (363-7,174)
Bjorkly, 2010[71]	13	1,028	1,263 (739-2,150)
Nilsson, 2011[61]	5	165	3,019 (1,296-6,872)
Tabita, 2012[10]	24	592	4,053 (2,738-5,959)
Hayes, 2013 (conditional)[63]	32	1,327	2,411 (1,713-3,384)
Hayes, 2013 (unconditional)[63]	8	400	1,999 (1,016-3,894)
Lund, 2013[11]	75	1,337	5,611 (4,500-6,977)

Appendix G Crude violent reoffending rates for discharged forensic patients.

Author, year	Number of violent reoffenders	Number of person-years	Crude violent reoffending rate (95% CI)
Luettgen, 1998[72]	2	730	273 (75-993)
Maden, 1999[73]	43	1,544	2,784 (2,074-3,729)
Falla, 2000[69]	6	289	2,076 (955-4,455)
Maden, 2004[54]	58	1,918	3,024 (2,347-3,889)
Skipworth, 2006[13]	8	270	3,000 (1,545-5,736)
Coid, 2007[9]	90	2,511	3,584 (2,925-4,385)
Davies, 2007[12]	53	2,975	8,403 (7,459-9,455)
Yoshikawa, 2007[56]	52	5,281	985 (752-1,289)
Blattner, 2009[66]	6	378	1,589 (729-3,419)
Bjorkly, 2010[71]	5	1,028	486 (208-1,133)
Nilsson, 2011[61]	20	165	3,019 (1,296-6,873)
Tabita, 2012[10]	4	384	1,041 (405-2,645)
Lund, 2013[11]	75	1.320	2,788 (2,231-3,481)
Hayes, 2013[63] (conditional sample)	14	1352	1,035 (617-1,730)
Hayes, 2013[63] (unconditional sample)	4	486	822 (319-2,096)

Appendix H Violent reoffending rates of populations comparable with forensic patients.

Study	Country	Population	CROR violent (95%CI)
Langan, 2002[46]	US	released prisoners who violently reoffended	7,200 (7,144-7,256)
Ministry of Justice Proven Reoffending Statistics, 2011	England and Wales	released prisoners who violently reoffended	25,494 (25,379- 25,609)
Peck, 2011 (UK Ministry of Justice Statistics Bulletin)	England and Wales	violent offenders qualified for MAPPA	19,896 (19,121-20,695)
Current review	**Various**	**forensic patients who violently reoffended**	**3,902 (2,671-5,187)**