

Review article

Patient outcomes following discharge from secure psychiatric hospitals: systematic review and meta-analysis

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Background

Secure hospitals are a high-cost, low-volume service consuming around a fifth of the overall mental health budget in England and Wales.

Aims

A systematic review and meta-analysis of adverse outcomes after discharge along with a comparison with rates in other clinical and forensic groups in order to inform public health and policy.

Method

We searched for primary studies that followed patients discharged from a secure hospital, and reported mortality, readmissions or reconvictions. We determined crude rates for all adverse outcomes.

Results

In total, 35 studies from 10 countries were included, involving 12056 patients out of which 53% were violent offenders. The crude death rate for all-cause mortality was 1538 per 100000 person-years (95% CI 1175–1901). For suicide, the crude

death rate was 325 per 100000 person-years (95% CI 235–415). The readmission rate was 7208 per 100000 person-years (95% CI 5916–8500). Crude reoffending rates were 4484 per 100000 person-years (95% CI 3679–5287), with lower rates in more recent studies.

Conclusions

There is some evidence that patients discharged from forensic psychiatric services have lower offending outcomes than many comparative groups. Services could consider improving interventions aimed at reducing premature mortality, particularly suicide, in discharged patients.

Declaration of interest

None.

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Over the past two decades, there have been large increases in the numbers of secure psychiatric hospital beds, which some have argued amounts to a reinstitutionalisation of psychiatric patients.¹ Costs per patient are substantially more in such hospitals, with some estimates of £152 000 per year per patient in the UK at low secure institutions and £273 000 in high secure hospitals² and an estimated overall budget of over £1 billion.³ In England, this is equivalent to 19% of the overall mental health budget and represents its largest single component. However, the evidence for patient benefit in such hospitals is limited. Single studies have followed cohorts of discharged patients in a number of countries, and there is a need to synthesise these reports, present information on all adverse outcomes and provide some comparative information for public health and policy to contextualise these findings. Therefore, we have conducted a systematic review of studies that have tracked patients after secure hospital discharge for criminal behaviour, readmission to psychiatric hospital and mortality.

Method

We searched for studies that described long-term outcomes of forensic psychiatric patients in 11 computer-based literature indexes: PubMed, Google Scholar, PsycINFO, JSTOR, Global Health, Medline, Web of Knowledge, DART-Europe, E-thesis portal, Networked Digital Library of Thesis and Dissertations, and ProQuest Dissertations and Theses (the latter four for theses and dissertations). To supplement this, we scanned the reference lists from each of the articles, and followed-up on citations of the papers identified. Non-English articles were translated. No

language or country restrictions were imposed. The search was performed from the start of the database until 13 March 2013. For the database search, we used combinations of keywords relating to patients (patient, forensic, mental disord*, mental illness, psychiatric disord*, psych*, felon*), institutions (low, high, medium, secur*, special, hosp*) and outcome (outcome, mort*, rehosp*, death, readm*, reconvict*, reoffend*, recidi*, rearrest, repeated offend*). For reporting of the meta-analysis, PRISMA guidelines were followed (as many of the studies were evaluating services).⁴ For assessing the quality of studies included, we used the Newcastle–Ottawa Quality Assessment Scale for Cohort Studies.⁵

For inclusion in the systematic review, studies had to meet the following criteria: (a) primary studies; (b) investigations that followed up patients discharged from any secure hospital, including low-, medium- or high-security institutions; and (c) reported on outcomes for death, suicide, repeat offending (including violent behaviour, contact with police, rearrests or reconvictions) or readmission to hospital (including returning to the same institution or admission to another psychiatric hospital).

Studies were excluded if they met the following criteria: (a) a validation study for a risk assessment tool; (b) evaluation of an intervention; and (c) did not provide data that would allow for calculation of rates. We excluded studies of risk assessment and interventions, as those are conducted on a select group of patients who give consent to participate in a study, and could yield a biased sample. Our review focused exclusively on observational studies. In the case of duplicate publications, we selected the publication with the most information. Where needed, authors were contacted for clarification. Data extraction was performed independently by

Z.F. and C.C., any discrepancies were resolved by discussion, and when consensus could not be reached, the differences were resolved by the project supervisor S.F. We extracted data on background characteristics of the samples in order to study factors associated with heterogeneity: 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 (which involves two main categories: mental illness and a legal category of psychopathic disorder (that is practice equates to severe personality disorder). The updated version of the Act in 2007 removed the legal classification of psychopathic disorder), admission duration, time in the community and mean follow-up period. If studies reported different causes of death, we extracted all data.

We calculated crude rates (CRs) for all-cause mortality, suicides, readmissions and reoffending by using number of events (N_e) and person-years at risk (PY_{total}), following the methods outlined in a recent meta-analysis of released prisoners:⁶

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

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

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

We used the Wilson's method to calculate 95% confidence intervals around those estimates because the asymptotic method produces intervals that can extend below zero.⁷

We performed random-effects meta-analyses on crude rates to calculate pooled estimates for all-cause mortality, suicides, readmissions and reoffending. Random-effects models incorporate an estimate of between-study heterogeneity into the calculation of the common effect and give relatively similar weights to all studies.⁸ We assessed heterogeneity by using I^2 , which describes the percentage of variation across studies that is because of heterogeneity rather than chance, and does not inherently depend on the number of studies considered.⁹ Values 25%, 50% and 75% are taken to indicate low, moderate and high levels of heterogeneity respectively.⁹ Potential sources of heterogeneity were investigated by arranging groups of studies according to potentially relevant characteristics, and by meta-regression analysis. Factors examined were geographical location (England and Wales *v.* other countries, as 9684, or 80% of the participants were based in England and Wales), 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 and national crime rate. Categorical variables explored were region (England and Wales *v.* other countries), age (≤ 35 *v.* > 35 years), mental illness ($\leq 80\%$ *v.* $> 80\%$), psychopathic disorder ($\leq 10\%$ *v.* $> 10\%$), previous convictions ($\leq 60\%$ *v.* $> 60\%$), violent offence ($\leq 30\%$ *v.* $> 30\%$) and sexual offences ($\leq 9\%$ *v.* $> 9\%$). Cut-off scores were chosen to ensure that the groups were approximately even. If there were less than ten studies, meta-regression was not conducted as statistical power was limited.¹⁰ All analyses were performed in Stata statistical software package, version 12 using the commands `metan` (for random effects meta-analysis), and `metareg` (for meta-regression).

We conducted an additional analysis that compared the estimated reoffending rates in released prisoners (nominator) with reoffending rates in forensic patients (denominator) to calculate rate ratios and 95% confidence intervals. We used where possible

released prisoners from a similar age band to the forensic patients. Information about reoffending rates of prisoners was obtained from the Ministry of Justice or equivalent of each country.^{11–13}

Comparisons

A number of clinical and forensic populations were considered as possible comparisons in this study, for example community psychiatric patients, prisoners and mentally disordered offenders sentenced to community-based interventions (i.e. not in-patient treatment). Four computer-based databases were searched to identify eligible studies: PubMed, Google Scholar, Global Health, and Web of Knowledge. We used key words relating to study participants (disor*, offend*, pris*, felon*, patient*, community), mental illness (schizo*, psych*, mental ill*, psychiatric ill*) and outcomes (mortality, suicide, readm*, rehosp*, reoff*, rearrest*, reconv*).

Results

We identified 35 relevant studies published between 1982 and 2013 (online Fig. DS1 and online Table DS1).^{14–44} The total sample included 12 056 patients (75% male), with a mean age of 34.5 years, and of which 53% were violent offenders, and 18% had a previous conviction (the latter being based on 10 reports). The average length of admission was 3 years. Overall, 18 investigations were from England and Wales ($n=9684$), 4 from the USA ($n=428$), 3 from Sweden ($n=297$), 2 from Australia ($n=222$), 2 from New Zealand ($n=240$), 2 from Italy ($n=209$), 2 from Canada ($n=362$), and 1 each from Japan ($n=489$) and Norway ($n=125$). All but nine studies reported average age, but not uniformly with average age at admission, discharge, start of follow-up or at index offence being reported. Average follow-up ranged from 1.5 to 13.6 years for mortality, 1.8 to 9.4 years for readmissions and 1.5 to 13.6 years for reoffending. Studies used a variety of sources to collect follow-up information on patients, including hospital records, coroners' records, and regional and national databases.

All-cause mortality and suicide

All-cause mortality

There were eight publications reporting on mortality in nine cohorts ($n=2226$).^{15–21,40} Two additional studies reported solely suicides ($n=4502$).^{14,44} The total number of deaths was 368, of which 143 (39%) were suicides.

All-cause crude death rates (CDRs) ranged from 789 to 2828 per 100 000 person-years (online Table DS2). The pooled estimate for all-cause CDR was 1538 (95% CI 1175–1901) per 100 000 person-years ($I^2=71\%$, 95% CI 41–85%). Subgroup analysis revealed some influence of location on all-cause death rates, with studies based in England and Wales reporting lower mortality (CDR = 1240, 95% CI 932–1548) compared with those from other countries (CDR = 2332, 95% CI 1739–2925) (Fig. 1). Meta-regression was not conducted because of a limited number of samples. As a result of insufficient information in the included studies, standardised mortality ratios (SMRs) were not reported.

Suicide

Six studies reported suicide outcomes.^{14,15,17,19,40,44} The CDR was 325 (95% CI 235–415) per 100 000 person-years ($I^2=19\%$, 95% CI 0–64%) (Table DS2). Meta-regression was not conducted because of the limited number of samples.

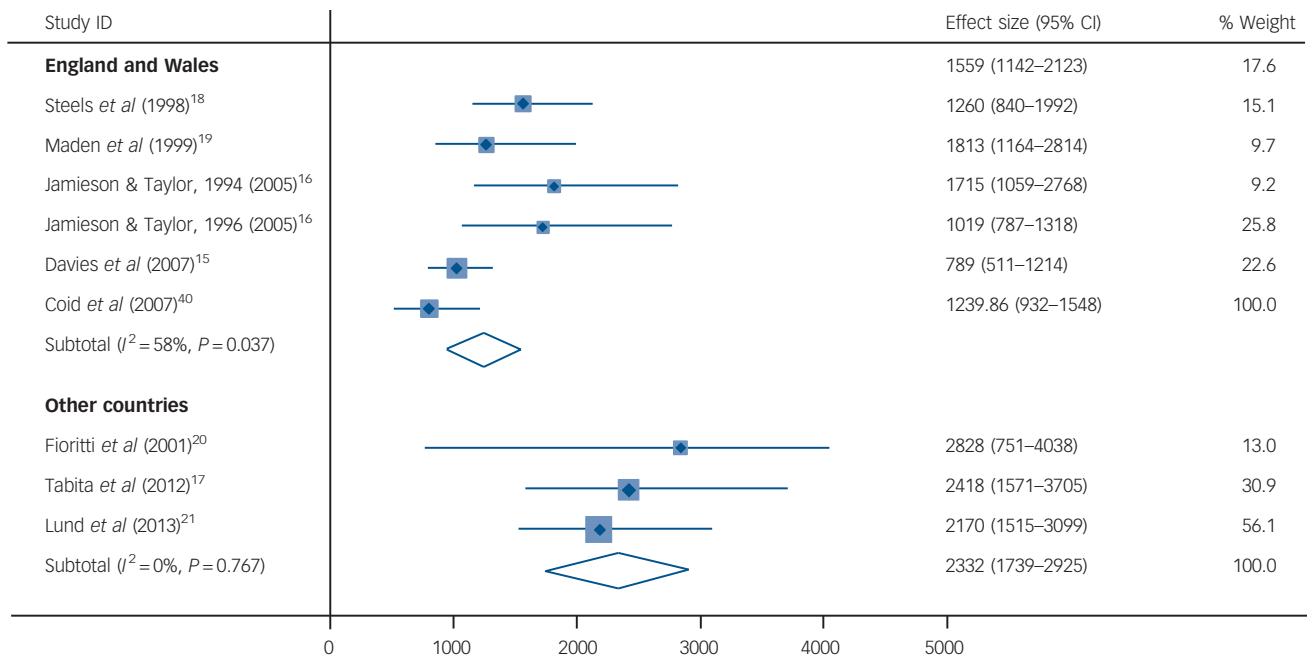


Fig. 1 Crude mortality rates of discharged forensic psychiatry patients for all-cause mortality in England and Wales compared with other countries.

Rates are per 100 000 person-years. Weights are from random-effects analysis.

Comparisons

Six studies reporting on mortality in comparative groups were identified: released prisoners, mentally disordered offenders and community psychiatric patients ($n = 7\,667\,645$) (Table 1).^{6,21,45–50} Rates ranged from 850 to 3344 per 100 000 person-years for all-cause mortality, and from 155 to 561 per 100 000 person-years for suicide. The highest all-cause mortality rate was reported in mentally disordered offenders sentenced to non-custodial sanctions,²¹ and for suicide, it was all people with criminal justice history.⁵⁰

Readmissions

In total, 20 studies reported on hospital readmissions in 21 cohorts ($n = 3522$).^{15,16,19,22–24,26–30,32–35,40,44,52–54} The total number of patients readmitted was 1171. Crude readmissions rates (CRARs) ranged from 2926 to 16 461 readmissions per 100 000 person-years (online Table DS3 and Fig. 2). The pooled estimate for CRAR was 7208 (95% CI 5916–8500) per 100 000 person years, with substantial heterogeneity ($I^2 = 92\%$, 95% CI 89–94%). In individual variable meta-regression analyses, studies with a greater proportion of patients classified under the Mental Health Act as having a mental illness reported a higher readmission rate ($\beta = 108.6$, $s.e.(\beta) = 54.9$, $P = 0.070$), whereas the reverse was found for psychopathic disorder ($\beta = -181.4$, $s.e.(\beta) = 90.6$, $P = 0.070$). In addition, patients who had a longer admission were more likely to be readmitted, although this association did not reach statistical significance ($\beta = 90.9$, $s.e.(\beta) = 46.4$, $P = 0.076$). In models combining combinations of these factors, none of them retained statistical significance. None of the other characteristics (including age, type of index offence or previous convictions) significantly explained heterogeneity.

Comparisons

Five studies reporting on readmissions of community patients, mentally disordered veterans and offenders with mental disorders

(not guilty by reason of insanity) treated in an out-patient programme were identified ($n = 36\,317$) (online Table DS4).^{55–59} Rates ranged from 3838 to 55 555 per 100 000 person-years, with the highest readmission rate reported for offenders with mental disorders treated in an out-patient programme.⁵⁹

Reoffending

In total, 30 papers reported on criminal outcomes.^{15–18,20,21,23,24,26–34,36–40,42–45,52–53,60,61} Crude reoffending rates ranged from 0 to 24 244 per 100 000 person-years (online Table DS5). The pooled estimate was 4484 per 100 000 person-years (95% CI 3679–5287), with very high heterogeneity ($I^2 = 95\%$, 95% CI 94–96%) (Fig. 3), partially explained by the higher rates in studies conducted earlier ($\beta = -101.1$, $s.e.(\beta) = 43.3$, $P = 0.026$). Neither age, geographical region, type of index offence, duration of admission, Mental Health Act category or history of in-patient psychiatric treatment reached statistical significance.

Comparisons

Ten studies reporting on repeat offending in different samples were identified: released prisoners, offenders with personality disorders, mentally disordered offenders and offenders with mental illness ($n = 696\,757$) (Table 2).^{12,13,21,25,62–64} Rates ranged from 4535 to 36 964 per 100 000 person-years, with the highest reoffending rate reported for prisoners released on probation.

Violent reoffending

Fifteen studies reported violent reoffending in forensic patients as outcome (online Table DS6).^{15,17,19,21,27,28,32,34–37,41,42,44,61} Crude reoffending rates ranged from 273 per 100 000 person-years to 8403 per 100 000 person-years. Pooled estimate was 3902 (95% CI 2671–5187) with substantial heterogeneity ($I^2 = 97\%$, 95% CI 96–98%) (Fig. 4). Neither age, diagnosis, geographical region, type

Table 1 Mortality rates for populations comparative with forensic psychiatric patients

Study	Country	Patient population	Crude all-cause mortality rate per 100 000 (95% CI)	Suicide rate per 100 000 (95% CI)
Pratt <i>et al</i> (2006) ⁴⁷	UK	Released prisoners	–	155 (140–171)
Kariminia <i>et al</i> ^a (2007) ⁴⁹	Australia	Recently released prisoners admitted to the prison psychiatric hospital	–	300 (61–538)
Brown <i>et al</i> (2010) ⁴⁵	UK	Schizophrenia	1772 (1523–2063)	–
Dutta <i>et al</i> (2012) ⁴⁶	UK	Psychosis	1417 (1292–1554)	–
Kinner <i>et al</i> (2011) ⁴⁸	Australia	Prisoners	874 (818–934)	156 (141–172)
Webb <i>et al</i> (2011) ⁵⁰	Denmark	All people with criminal justice history	–	561 (549–574)
Zlodre & Fazel (2012) ⁶	Seven countries	Recently released prisoners (meta-analysis)	850 (815–884)	169 (123–214)
Webb <i>et al</i> (2012) ⁵¹	Denmark	Violent and sexual criminal offenders	–	163 (136–191)
Lund <i>et al</i> (2013) ²¹	Sweden	Mentally disordered offenders sentenced to prison	1274 (746–2168)	300 (138–648)
Lund <i>et al</i> (2013) ²¹	Sweden	Mentally disordered offenders sentenced to non-custodial sanctions	3344 (1923–5754)	–
Current review	England/Wales	Forensic patients	1240 (932–1548)	–
Current review	Non-England/Wales	Forensic patients	2332 (1739–2925)	–
Current review	Overall estimate	Forensic patients	1538 (1175–1901)	325 (235–415)

a. Kariminia study has a 6 month follow-up.

of index offence, duration of admission, history of in-patient psychiatric treatment, nor year of publication reached statistical significance.

Reoffending rates compared with prisoners

We calculated the ratio of reoffending rate in prisoners with the reoffending rate in discharged forensic psychiatric patients using the same country and similar year for a comparative prisoner population of the same gender and, where possible, using similar

age bands (ages 30–34) (Fig. 5). Prevalence ratios were one or above indicating that rates of prisoner reoffending were higher than in forensic psychiatric patients. The prevalence ratios ranged from 1.4 to 7.7 in UK studies, 1.9 to 4.1 in the USA and 2.7 to 5.0 in Sweden.

Discussion

This review of 35 studies investigated rates of three adverse outcomes for psychiatric patients discharged from secure hospitals,

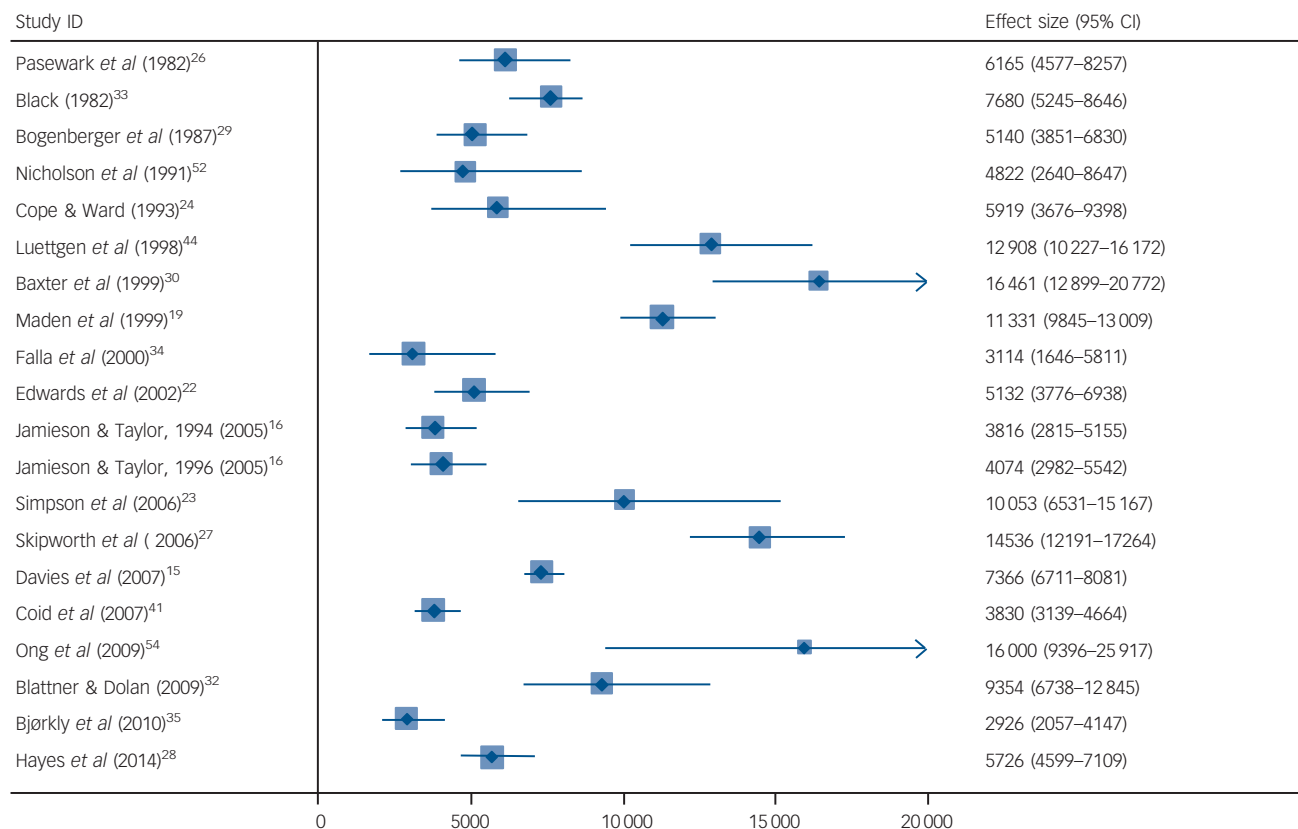


Fig. 2 Psychiatric hospital readmission rates for discharged forensic psychiatric patients per 100 000 person-years.

Weights are from random-effects analysis.

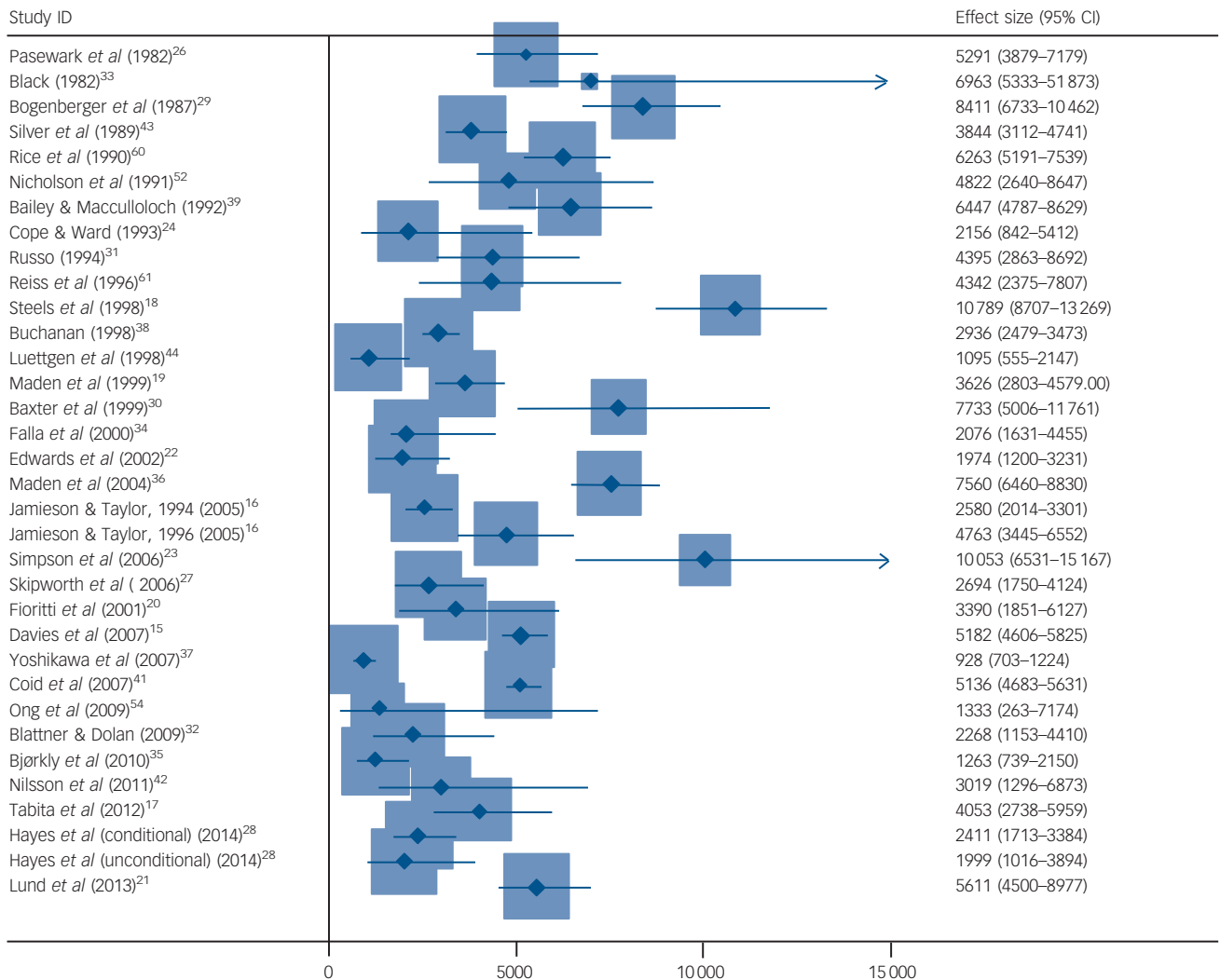


Fig. 3 Repeat offending rates for discharged forensic patients per 100 000 person-years.

Weights are from random-effects analysis. The two outliers (combined no. reoffenders = 6) are not shown.

namely mortality, readmission to hospital and repeat offending. The last of these is arguably the most important measure of benefit because risk of reoffending and violent behaviour had determined hospital admission in secure settings. We therefore calculated how these rates compare with repeat offending rates among prisoners from the same countries as made up the individual studies. Finally, we have provided a range of other comparisons for all these outcomes in order to contextualise the results.

Mortality rates

Our main findings are that first, mortality rates among discharged forensic patients are high in both absolute and relative terms, with rates between 789 and 2828 per 100 000 patient-years. This compares, for example, with a rate of 850 in a recent review of all released prisoner studies,⁶ but is similar to studies of patients with predominantly schizophrenia-spectrum disorder (CDR = 1417).⁴⁶ The latter suggests that it is the mental illness component of being in secure care, rather than anything specific to the forensic setting, that contributes to the increased mortality risk.

The possible reasons for this increased mortality risk are likely to be the same as those described in general psychiatric populations. These include increased prevalence of unhealthy

lifestyle behaviours,⁶⁵ such as physical inactivity, poor diet and importantly high rates of smoking and substance use.⁶⁶ Side-effects of some psychotropic medications are relevant as they are associated with weight gain and type 2 diabetes.⁶⁷ Another series of factors that contributes to the high levels of physical illness is the poor access to such services for psychiatric patients that may be related to poor insight from patients about the need for care but also stigma by certain health professionals. To address the increased mortality risk, a number of behavioural interventions are currently being trialed,⁶⁸ and have been shown to reduce weight, although their effects on mortality are currently unknown. Further, anti-smoking treatments should be introduced including smoking-free hospitals and nicotine replacement therapies. The judicious use of psychotropic medication will be part of this, avoiding high doses where possible and polypharmacy.⁶⁹

Interestingly, subgroup analysis found lower mortality rates in studies conducted in the English and Welsh samples compared with the rest of the world (which were made up mainly of studies from the USA, Sweden and other high-income countries). A possible explanation is there are better developed aspects of service provision (for example more community forensic psychiatry) in England and Wales, such as liaison with primary care. The possibility that services are more effective in England and Wales needs further research, as identifying the components in forensic

Table 2 Reoffending rates for populations comparative with forensic patients

Study	Country	Population	Crude reoffending rate (95%CI)
Home Office (2003) ⁶⁴	England and Wales	Released prisoners with original sentence of 1–4 years	27 003 (26 303–27 703)
Home Office (2003) ⁶⁴	England and Wales	Released prisoners with original sentence of 5–10 years	17 987 (15 964–19 768)
Langan & Levin (2002) ¹³	USA	Released prisoners	15 627 (15 548–15 706)
Swedish National Council for Crime Prevention (2011) ¹¹	Sweden	Released prisoners (21–39 years)	15 176 (14 944–15 408)
Fazel & Yu (2011) ⁶³	Eight countries	Offenders with psychosis (meta-analysis)	4535 (4269–4801)
Yu et al (2012) ²⁵	Seven countries	Offenders with personality disorder (meta-analysis)	7954 (7651–8258)
Lund et al (2013) ²¹	Sweden	Mentally disordered offenders sentenced to non-custodial sanctions	7246 (4992–10 405)
Lund et al (2013) ²¹	Sweden	Mentally disordered offenders sentenced to prison	5426 (4202–6981)
Ministry of Justice (2013) ¹²	England and Wales	Offenders (mean age 30–34) (violent and non-violent offenders)	27 217 (26 891–27 544)
Ministry of Justice (2013) ¹²	England and Wales	Prisoners released on probation	36 964 (36 401–37 530)
Current review	Eight countries	Forensic patients	4484 (3679–5287)

services that reduce mortality risk will have wider implications. Nevertheless, absolute rates of suicide and mortality were high and secure hospitals should review all preventable deaths among their patients. Furthermore, death by suicide, where available, did not include open verdicts and are likely to be underestimates.

Readmission rates

A second finding was that rates of readmission to hospital varied markedly from 2926 to 16 641 per 100 000 patient-years. We were not able to identify many comparative observational studies that reported on readmission rates for psychiatric patients, and therefore any conclusions about how these rates compare with general psychiatric services in the same countries are difficult. One potentially relevant explanation for the high rates of variation between the studies related to the relative proportions of mental illness and personality disorder (the latter identified using the legal category of ‘psychopathic disorder’, which usually equates to severe personality disorder) in the samples – the higher the rate of mental illness, the higher the rate of readmission. Another explanation is that in certain countries, mental health legislation facilitates compulsory recall to hospital following discharge and is at the discretion of the supervising physician. Readmission to hospital, however, is a specific outcome, and research reporting on other markers of function and quality of life in discharged forensic patients, including supported employment rates and symptom scores, is necessary. In addition, the studies reported in this review do not indicate whether readmission was to a forensic or a general hospital, and future research should separate these outcomes.

Reoffending rates

Finally, we investigated repeat offending rates. This was the outcome where the most information was available, and we found rates varied between 0 and 24 244 per 100 000 patient-years. We were unable to find explanations for the heterogeneity between studies. This was expected as the determinants of reoffending are likely to be complex, many of which are unmeasured and interact. However, we did show that compared with reoffending rates for general prisoners matched by age, forensic patients had lower rates of repeat offending. In addition, we provided a range of other comparison groups, and the rates reported in this study were lower than these. Many of these comparisons are problematic as patients admitted to secure hospitals have committed more

serious offences, and stay in hospital longer than equivalent groups. Therefore, we compared reoffending in individuals with violent index offences, and with prisoners with longer sentences as comparators, and we also investigated rates of violent reoffending and compared such rates with prisoners (online Table DS7). The latter is arguably more clinically important. Even with these comparisons, rates of repeat offending were lower in forensic patients.

Explanations for these differences in repeat offending may lie in the following. First, patients admitted to a secure hospital are highly selected and clinical staff in some jurisdictions have discretion on the basis of probable response to treatment. In contrast, prisons must accept all offenders sentenced by the courts. Thus, when considering the lower reoffending rates among discharged patients, it is important to consider the contrasting characteristics of prisoner populations in terms of their criminal careers, psychopathology, and both intensity and length of surveillance and social support following release into the community. Admission to a secure hospital in most countries follows serious violent and sexual offending, including homicide. This represents a very small proportion of all offenders processed by the criminal justice system. Serious offenders have lower rates of reoffending than those convicted of acquisitive, drug and minor violent offences, the latter characterising the majority of sentenced prisoners. Criminal careers research also shows that the latter subgroup have the highest rates of recidivism and specialism.⁷⁰ Furthermore, the number of violent offences correspond to the number of acquisitive offences observed over the criminal career.⁷⁰ This means that discharged patients with similar characteristics, including early-onset persistent offending, may be at similar risk of recidivism. However, for those with late-onset offending, with few previous convictions, those whose violence is exclusively against family members and where offending is temporarily associated with acute symptoms of severe mental illness, the probability of reoffending is low. These factors are characteristic of many patients in secure hospitals. The probability is further reduced by ongoing treatment and provision of supportive aftercare, particularly when mandated by mental health legislation.

Implications

In conclusion, two main implications follow from our findings. First, there is some evidence that patients discharged from forensic psychiatric services have lower rates of repeat offending than many comparative groups. Second, such services could consider improving

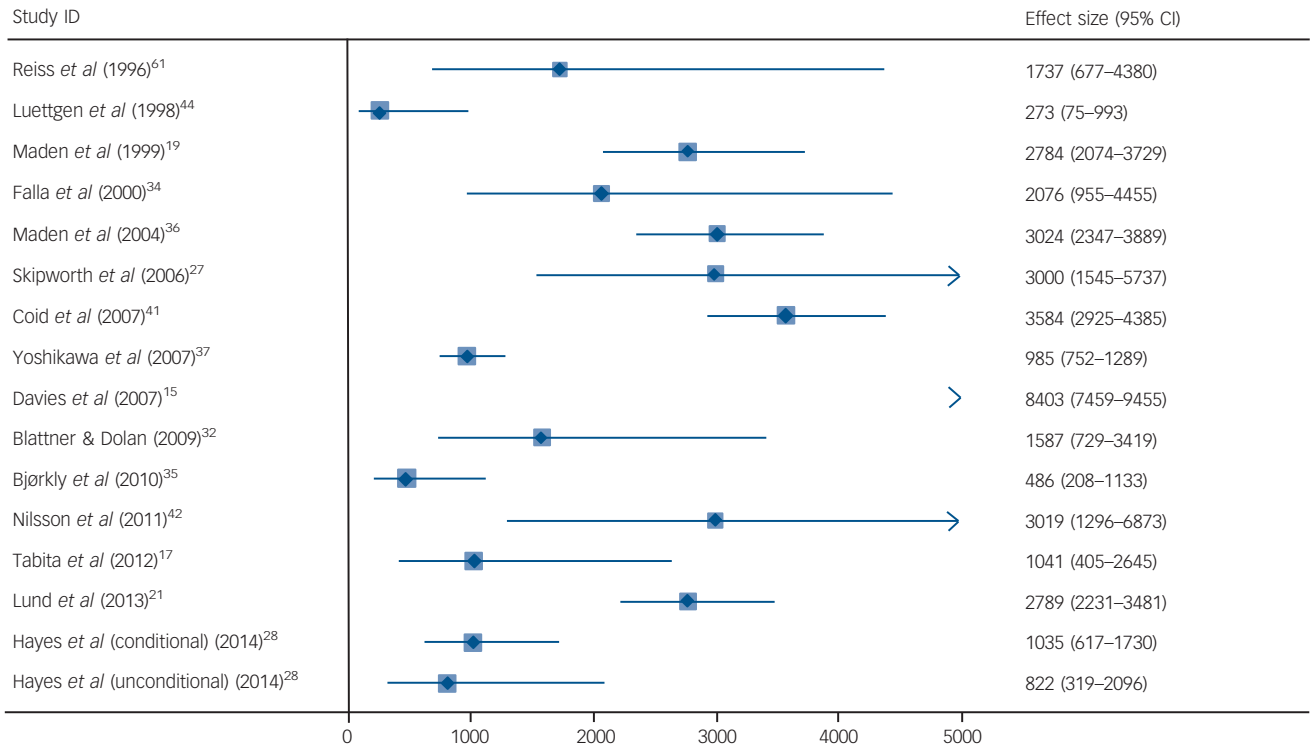


Fig. 4 Repeat violent offending rates for discharged forensic patients per 100 000 person-years. Weights are from random-effects analysis.

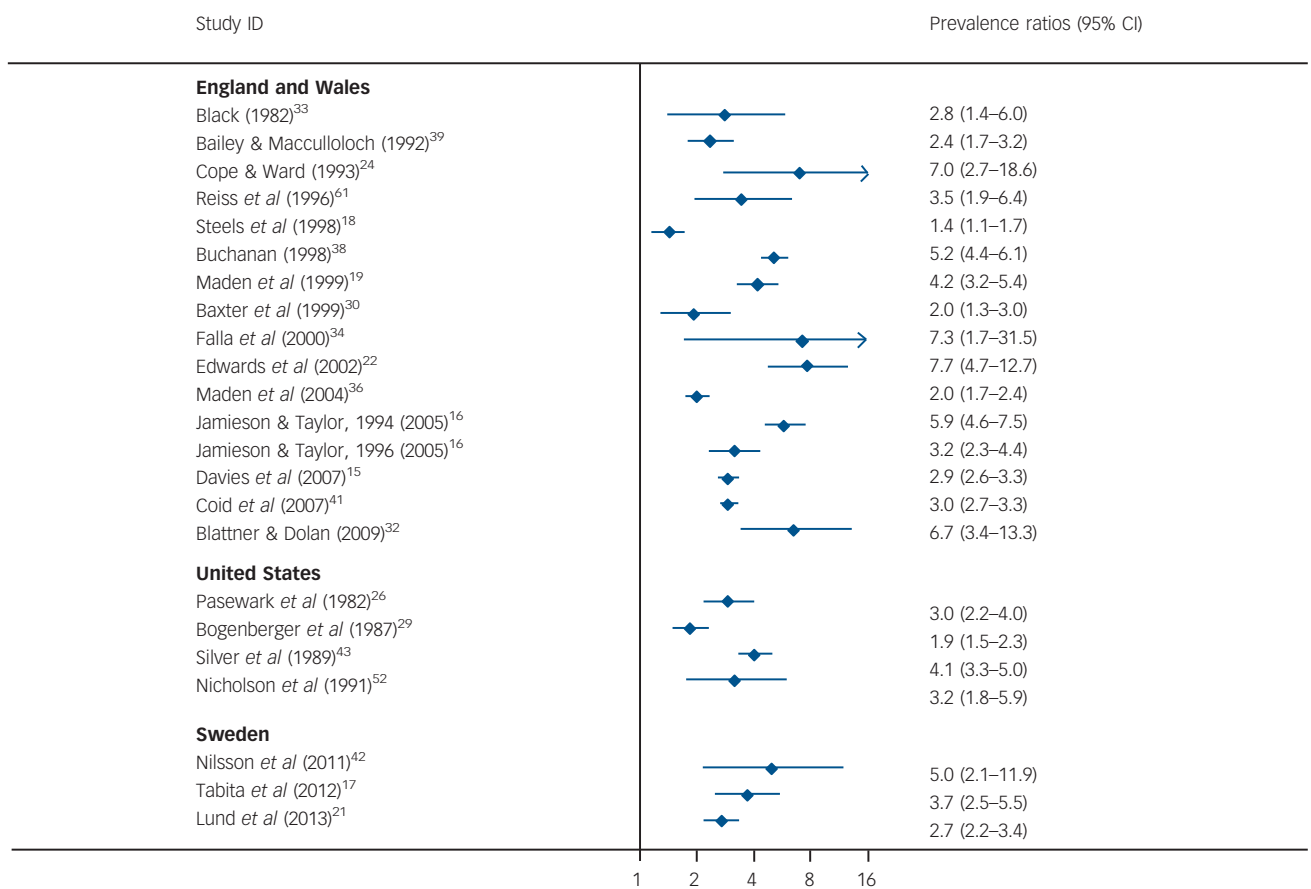


Fig. 5 Prevalence ratios comparing reoffending rates of released prisoners with forensic psychiatric patients. Weights are from random-effects analysis. Prevalence ratios above 1 mean that rates of reoffending are higher in prisoners than in forensic psychiatric patients matched by age-band where possible.

interventions that would reduce premature mortality in their discharged patients. These could take the form of follow-up care and better organised and coordinated services that comprehensively address the complex causes of mortality (including accidental deaths) instead of focusing on a single cause.⁵⁰

Limitations

Our study has a number of limitations. First, source of admission (court *v.* community) was not reported in most studies. The composition of a sample might have accounted for some of the heterogeneity between studies, but this could not be explored. Second, patients came from a range of institutions, which will have different admission criteria, and offer various treatments. Additionally, since the studies included in this review are from 1982 to 2013, admission criteria and available treatments will likely have changed over time, thus making comparisons between cohorts difficult. Third, most included studies did not report patient location at discharge, so ascertaining what proportion of the patients in each study reached the community is not straightforward. If patients are transferred to other hospitals, then reoffending rates are likely to be underestimated. Fourth, patients unconditionally discharged are difficult to trace, therefore some were lost to follow-up, meaning that some of the adverse events might have gone unreported and are underestimated. Fifth, we excluded studies of solely risk assessment instruments. Based on a recent review of the use of these tools,⁷¹ these studies are very heterogeneous in design, and, in research contexts, such tools constitute an intervention and may alter outcomes. Sixth, although effort has been made to ensure that patients are not double counted (for example studies with duplicate samples were excluded, and data were extracted from the studies that provided most information), there was an overlap between some studies coming from the UK.^{15,36,41} The overall number of patients who were double counted was approximately 180 (or 1.5% of the total review sample). Finally, there are some limitations associated with the quality of the studies included. The majority were retrospective, and used information on risk factors from case notes and outcomes from various official databases. Although a retrospective study has certain advantages over a prospective one including duration of follow-up, the quality and breath of patient information depends entirely on the quality and accuracy of clinical records kept. Moreover, official sources, such as the Offenders Index, used by all of the studies based in England and Wales, have their own limitations (Table DS1). First, the Offenders Index has a 2-year lag between charges and convictions; second, it is estimated that 9% of criminal records are missing from the Offenders Index,³⁹ so the offending estimates are underestimates.

In summary, we have provided a systematic review and meta-analysis of outcomes of patients discharged from forensic psychiatric services. As such services have increased their patient numbers and costs in recent years, these findings should assist in their development in the UK and other countries.

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First received 14 Apr 2014, final revision 18 Dec 2014, accepted 25 Feb 2015

Funding

S.F. is funded by a Wellcome Trust Senior Research Fellowship in Clinical Science (095806).

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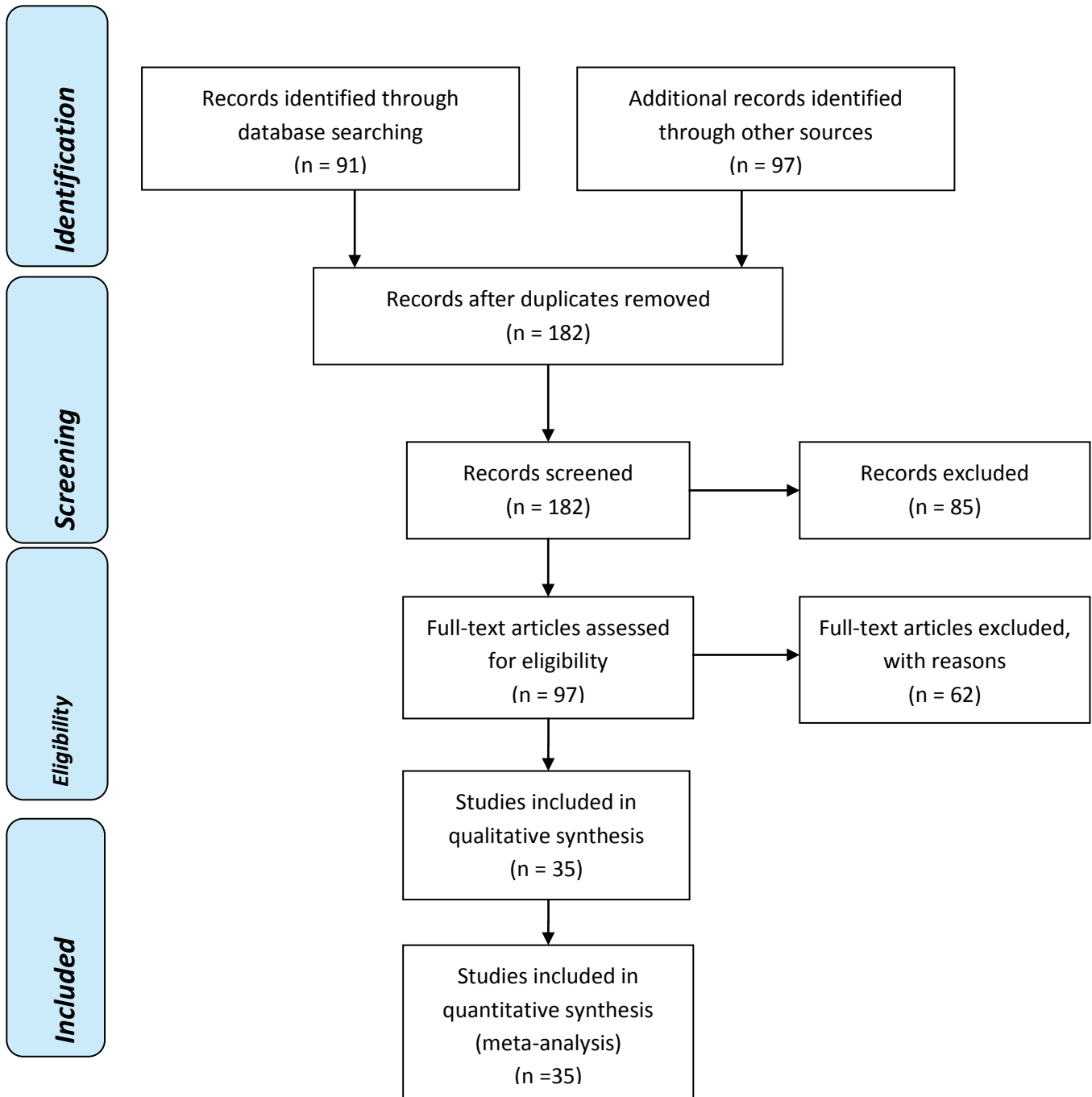


Fig. DS1. PRISMA Flow Diagram showing the flow of information through the different phases of a systematic review. It maps out the number of records identified, included, and excluded.

Table DS1. Study characteristics including sources of data, and study rating (using the Newcastle-Ottawa Quality Assessment Scale for Cohort Studies). Studies are rated out of maximum of six.

Author	Year	Country	Region/Unit/ Hospital	Sample size	% male	Sources of data mortality	Sources of data for readmissions	Sources of data for reconvictions	Study Quality Score (max. 6)
Jones ¹	2011	UK	Broadmoor, Ashworth, Rampton	4393	81.0	Special Hospital Case Register	n/a	n/a	6
Davies ²	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 ³	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 ⁴	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 ⁵	1998	UK	Broadmoor, Ashworth, Rampton	184	78.0	Special Hospital Case Register	Special Hospital Case Register	Special Hospital Case Register, Home Office	6

Maden⁶	1999	UK	Denis Hill Unit, Bethlem Royal Hospital	243	85.0	Medical records	Medical records, NHS Central Record	Offenders' Index, Prison Service Records	6
Fioritti⁷	2006	Italy	No information	No information	No information	No information	n/a	No information	5
Lund⁸	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
Edwards⁹	2002	UK	Three Bridges	152	85.3	n/a	Home Office Mental Health Unit Medical Records	Offenders' Index, cross-referenced with case-notes	6
Simpson¹⁰	2006	New Zealand	Auckland	105	88.0	n/a	Medical Records	Medical Records	6
Cope¹¹	1993	UK	West Midlands	51	74.5	n/a	Case notes	Case notes	6
Ong¹²	2009	Australia	Victoria	25	76.0	n/a	Forensic Mental Health Clinical Records	Forensic Mental Health Clinical Records	6
Pasewark¹³	1982	US	New York State	133	83.0	n/a	No data	No data	5

Skipworth ¹⁴	2006	New Zealand	National cohort	135	83.0	n/a	New Zealand Health Information Service Database	The Justice Warehouse Database	6
Nicholson ¹⁵	1991	US	Oklahoma	61	91.8	n/a	Hospital Records	Court Records, Oklahoma State Bureau of Investigation Records	6
Hayes ¹⁶	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 ¹⁷	1987	US	Hawaii	107	93.0	n/a	Central Register of the Division of Mental Health	Crime Data Center	6
Baxter ¹⁸	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 ¹⁹	2009	UK	Edenfield	72	87.0	n/a	Case notes	Case notes	6

			Centre						
Black ²⁰	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 ²¹	2000	UK	Trevor Gibbens Unit	85	No information	n/a	No information	Police and Home Office records compared with offences known to the multidisciplinary community care team.	6
Bjorkly ²²	2010	Norway	National cohort	125	87.0	The Central Register of Deaths and Causes of Death	Self-reports	Official Crime Register	5.5
Maden ²³	2004	UK	National cohort	959	88.0	n/a	n/a	Offenders' Index	6
Yoshikawa ²⁴	2007	Japan	National cohort	489	84.0	n/a	n/a	Japanese Ministry of Justice Database	6

Buchanan ²⁵	1998	UK	Broadmoor, Ashworth, Rampton	425	82.0	n/a	n/a	Offenders' Index	6
Bailey ²⁶	1992	UK	Park Lane	106	100	n/a	n/a	Home Office	6
Coid ²⁷	2007	UK	7 medium secure units in England	1344	86.6	n/a	n/a	Mental Health Unit at the Home Office	6
Nilsson ²⁸	2011	Sweden	Stockholm	46	89.0	n/a	n/a	Structured research protocol applied to records from Forensic Psychiatric Investigation and Interviews	6
Rice ²⁹	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
Russo ³¹	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	6

								structures, family, priests, voluntary workers. For main towns: penal certificates, subjects during their imprisonment.	
Luetngen ³²	1998	Canada	No data	125	No data	No data	No data	No data	2
Silver ³³	1989	US	Maryland	127	No information	n/a	n/a	FBI Arrest Records	6
Akande ³⁴	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 ³⁵	2002	UK	Redford Lodge	49	80.0	n/a	Structured telephone questionnaires	Structured telephone questionnaires	5

Table DS2 Crude death rates (CDRs) for all-cause mortality and suicides in discharged forensic 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)
Luetzgen, 1998³²	-	3	730	-	410 (380-1201)
Steels, 1998⁵	39	-	2,502	1,559 (1,142-2,123)	-
Maden, 1999⁶	20	8	1,544	1,260 (840-1,992)	518 (263-1,019)
Jamieson1, 2005³	19	5	1,048	1,813 (1,164-2,814)	-
Jamieson2, 2005³	16	1	933	1,715 (1,059-2,768)	-
Fioritti, 2006⁷	5	-	177	2,825 (751-4,038)	-
Davies, 2007²	57	26	5,593	1,019 (787-1,318)	321 (317-680)
Coid, 2007³⁶	20	10	2535	789 (511-1214)	394 (213-724)
Jones, 2011¹	-	140	50,520	-	277 (238-332)
Tabita, 2012⁴	20	8	827	2,418 (1,571-3,705)	967 (491-1,898)
Lund, 2013⁸	29	-	1,337	2,170 (1,515-3,099)	-

Online Table DS3 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, 1982²⁰	48	625	7,680 (6,245-8646)
Pasewark, 1982¹³	41	665	6,165 (4,577-8,257)
Bogenberger, 1987¹⁷	44	856	5,140 (3,851-6,830)
Nicholson, 1991¹⁵	10	207	4,822 (2,640-8,647)
Cope, 1993¹¹	16	270	5,919 (3,676-9,398)
Luetggen, 1998³²	64	496	12,908 (10,227-16,172)
Baxter, 1999¹⁸	56	340	16,461 (12,899-20,772)
Maden, 1999⁶	175	1,544	11,331 (9,845-13,009)
Falla, 2000²¹	9	289	3,114 (1,646-5,811)
Edwards, 2002⁹	39	760	5,132 (3,776-6,938)
Jamieson1, 2005³	40	1,048	3,816 (2,815-5,155)
Jamieson2, 2005³	38	932	4,074 (2,982-5,542)
Simpson, 2006¹⁰	19	189	10,583 (6,531-15,167)

Skipworth, 2006¹⁴	108	742	14,546 (12,191-17,264)
Davies, 2007²	412	5,593	7,366 (6,711-8,081)
Coid, 2007a³⁶	94	2,454	3,830 (3,139-4,664)
Akande, 2007	5	118	4,232 (3,130-30,920)
Blattner, 2009¹⁹	33	352	9,353 (6,737-12,845)
Ong, 2009¹²	12	75	16,000 (9,396-25,917)
Bjørkly, 2010²²	30	1,025	2,926 (2,057-4,147)
Hayes, 2013³⁷	76	1,327	5,726 (4,599-7,108)

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

Table DS4 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, 1997³⁸	US	Community patients	35,294 (26,998-43,589)
Kravitz, 1999³⁹	US	Offenders with mental disorders (NGRIs) treated in an outpatient programme	55,555 (39,323-71,787)
Bernardo, 2001⁴⁰	Canada	Community patients	14,666 (11,835-17,497)
Irmiter, 2007⁴¹	US	mentally disordered veterans	12,230 (12,102-12,359)
Zhang, 2011⁴²	Australia	community patients	3,838 (3,024-4,653)
Current review	Various	forensic patients	7,208 (5,916-8,500)

Table DS5 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, 1982²⁰	50	937	6,963 (5,333-51,873)
Pasewark, 1982¹³	38	718	5,291 (3,878-7,178)
Bogenberger, 1987¹⁷	72	856	8,411 (6,733-10,462)
Silver, 1989³³	83	2,159	3,844 (3,112-4,741)
Rice, 1990²⁹	103	1,645	6,263 (5,191-7,539)
Nicholson, 1991¹⁵	10	207	4,822 (2,640-8,647)
Bailey, 1992²⁶	41	636	6,447 (4,787-8,629)
Cope, 1993¹¹	4	186	2,156 (842-5,412)
Russo, 1994³¹	20	455	4,395 (2,836-6,692)
Reiss, 1996⁴³	10	230	4,342 (2,375-7,807)
Steels, 1998⁵	76	704	10,789 (8,707-13,269)
Luettgen, 1998³²	8	730	1,095 (555-2,147)
Buchanan, 1998²⁵	131	4,462	2,936 (2,479-3,473)

Baxter, 1999¹⁸	19	246	7,733 (5,006-11,761)
Maden, 1999⁶	56	1,544	3,626 (2,803-4,679)
Falla, 2000²¹	6	289	2,076 (1,631-4,455)
Edwards, 2002⁹	15	760	1,974 (1,200-3,230)
Castro, 2002³⁵	6	24	24,244 (17,089-24,489)
Maden, 2004²³	145	1,918	7,560 (6,460-8,830)
Jamieson1, 2005³	61	2,364	2,580 (2,014-3,300)
Jamieson2, 2005³	35	735	4,763 (3,444-6,552)
Simpson, 2006¹⁰	19	189	10,053 (6,530-15,166)
Skipworth, 2006¹⁴	20	742	2,694 (1,750-4,123)
Fioritti, 2006⁷	10	295	3,390 (1,851-6,127)
Coid, 2007²⁷	428	8,332	5,136 (4,682-5,631)
Davies, 2007²	264	5,095	5,182 (4,606-5,825)
Yoshikawa, 2007²⁴	49	5,281	928 (702-1,224)
Akande 2007³⁴	0	126	0 (0-10,427)
Blattner, 2009¹⁹	8	353	2,268 (1,153-4,410)

Ong, 2009¹²	1	75	1,333 (363-7,174)
Bjorkly, 2010²²	13	1,028	1,263 (739-2,150)
Nilsson, 2011²⁸	5	165	3,019 (1,296-6,872)
Tabita, 2012⁴	24	592	4,053 (2,738-5,959)
Hayes, 2013 (conditional)³⁷	32	1,327	2,411 (1,713-3,384)
Hayes, 2013 (unconditional)³⁷	8	400	1,999 (1,016-3,894)
Lund, 2013⁸	75	1,337	5,611 (4,500-6,977)

Table DS6 Crude violent reoffending rates of discharged forensic patients.

Author, year	Number of violent reoffenders	Number of person-years	Crude violent reoffending rate (95% CI)
Reiss, 1996⁴³	5	230	1,737 (677-4,380)
Luetzgen, 1998³²	2	730	273 (75-993)
Maden, 1999⁶	43	1,544	2,784 (2,074-3,729)
Falla, 2000²¹	6	289	2,076 (955-4,455)
Maden, 2004²³	58	1,918	3,024 (2,347-3,889)
Skipworth, 2006¹⁴	8	270	3,000 (1,545-5,736)
Coid, 2007²⁷	90	2,511	3,584 (2,925-4,385)
Davies, 2007²	53	2,975	8,403 (7,459-9,455)
Yoshikawa, 2007²⁴	52	5,281	985 (752-1,289)
Blattner, 2009¹⁹	6	378	1,589 (729-3,419)
Bjorkly, 2010²²	5	1,028	486 (208-1,133)
Nilsson, 2011²⁸	20	165	3,019 (1,296-6,873)
Tabita, 2012⁴	4	384	1,041 (405-2,645)
Lund, 2013⁸	75	1.320	2,788 (2,231-3,481)
Hayes, 2013³⁷ (conditional sample)	14	1352	1,035 (617-1,730)
Hayes, 2013³⁷ (unconditional sample)	4	486	822 (319-2,096)

Table DS7 Violent reoffending of populations comparable with forensic patients.

Study	Country	Population	CROR violent (95%CI)
Langan, 2002⁴⁵	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)

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Seena Fazel, Zuzanna Fiminska, Christopher Cocks and Jeremy Coid
BJP 2016, 208:17-25.

Access the most recent version at DOI: [10.1192/bjp.bp.114.149997](https://doi.org/10.1192/bjp.bp.114.149997)

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