Psychiatric disorders among older prisoners: A systematic review and comparison study against older people in the community.

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Abstract

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Objectives. Despite emerging evidence that older prisoners experience poor mental health, literature in this area is still limited. In the present systematic review and meta-analysis, we report on the prevalence of psychiatric disorders among older prisoners and compare our findings against community studies on older people.

Methods. We searched on Assia, PsycInfo, MedLine, Embase, Web of Science, Google and Gov.uk. We carried out bias assessments, rated studies for quality and ran a heterogeneity test. We meta-analysed prevalence rates of psychiatric disorders through an aggregate weighted mean and calculated Relative Risk and statistical significance against community studies. Sensitivity analyses were further performed.

Results. We reviewed nine studies and obtained the following prevalence: "Any psychiatric disorder" 38.4%, depression 28.3%, schizophrenia/psychoses 5.5%, bipolar disorder 4.5%, dementia 3.3%, cognitive impairment 11.8%, personality disorder 22.9%, alcohol abuse 15.9%, anxiety disorders 14.2%, PTSD 6.2%. Older prisoners were found to have higher RR for every single psychiatric disorder against older people in the community, with the sole exception of alcohol abuse (RR=1) and dementia (RR=.75). The prevalence rates were statistically significantly higher ($p<.05$) among the prisoners for "Any psychiatric disorder", depression and personality disorder. Overall, the sensitivity analyses confirmed our original results.

Conclusion. Our findings point at a high prevalence of every single psychiatric disorder among older prisoners, who also experience rates of dementia and alcohol abuse comparable to those reported in the community. Our results have relevant implications for policy and practice in this area. Further research is crucial to confirm findings from this study.

Keywords

Prison, older people, psychiatric disorder, dementia, meta-analysis.

Introduction

In the last fifteen years, the overall number of prisoners has increased worldwide by about 6% (Walmsley, 2016). This has been accompanied in many countries by a disproportionately higher increase in the prevalence of older prisoners. In Japan for example, the number of older inmates has doubled (Williams et al., 2012). A similar trend was experienced in the United Kingdom (UK), where male prisoners over 60 years doubled in the period 2002-2011, with an 8-fold increase since 1990 (Senior et al., 2013). In the United States of America (USA), over the same period, the older prison population grew by around 300% (Williams et al., 2012), in Australia from 21,714 to 29,696 individuals (+36%) from 2000 to 2010 (Baidawi et al., 2011) and in Canada by more than 50% from 2001 to 2011 (Penal Reform International, 2015).

Today, prisoners over 50 years old represent an increasing percentage of the prison population. In Ireland, they constitute almost 10% of the total number of inmates (Joyce & Maschi, 2016) and in the UK around 13% (13,000 individuals) (Prison Reform Trust, 2014). The percentage raises to 18.8% in the USA, where more than 250,000 inmates were over 50 years old in 2014 (Carson, 2015) and in Italy, where among 62,000 prisoners, one in five is aged over 50 (n=12,400) (ISTAT, 2015).

A number of factors have contributed to the accumulation of newly-incarcerated and long-term older prisoners (Frazer, 2003). The ageing of the general population and of baby-boomers (Senior et al., 2013) has been accompanied by cultural and societal changes. Behaviours that were once often condoned are now more frequently prosecuted, such as in the case of sexual offences, which are prevalent among older offenders (Yorston, 2015; Frazer, 2003). The technological and scientific advances in forensic evidence have led to an increase in charges for historical offences (+95% in the UK between 1995 and 2005) and in the conviction of past offenders in old age (RECOOP, 2015). In addition, the justice system has systematically implemented a tougher sentencing policy to discourage crime (HM Inspectorate of Prisons, 2008). This has resulted in an increase in longer and whole life sentences (Moll, 2013; Frazer, 2003), the implementation of indeterminate prison sentences with no fixed release date (RECOOP, 2015) and tougher approaches to breaches of supervision (+855% in the UK) and Bail Act offences (+746% in the UK).

Older prisoners have been identified by the United Nations as a special need population because of their unique physical, mental health and social care needs (Atabay, 2009). However, a recent international systematic review has evidenced that these needs are only being partially met at present time (Di Lorito, Völlm & Dening, 2016). While prisoners of all ages have been reported to experience poor mental and physical health (Cooney and Braggins, 2010; Baldwin and Leete, 2012; Moll, 2013), the added challenges of aging in the prison system and the neglect of health needs may expose the older prisoner to a high risk of developing psychiatric disorder or exacerbating pre-existing psychiatric morbidity.

Despite the increasing numbers of older prisoners worldwide and the accumulating evidence on their exposure to psychiatric disorders, epidemiological research in this area has been relatively scant thus far. While the phenomenon of an aging population has generated robust literature around the mental health of older people in the community, we were unable to retrieve a systematic review on the prevalence of psychiatric disorders among older prisoners.

The aim of the present systematic review is to bridge the existing research gap by investigating the prevalence of psychiatric disorders among older prisoners reported in the existing international literature and by comparing results against the prevalence rates of psychiatric disorders reported in community studies on older people.

We hypothesise that older prisoners experience higher rates of psychiatric morbidity compared to older people in the community.

Methods

Search strategy

The present review complies with the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Moher, Liberati, Tetzlaff & Altman, 2009). Our search strategy is based on the PICO (Patient, Intervention, Comparison, Outcome) worksheet for conducting systematic reviews, a widely used model to frame research questions (Sackett, Richardson, Rosenburg & Haynes, 1997). The PICO format was adopted to define the target population, context and outcomes of the review.

We undertook a systematic literature search on 5 electronic databases: Assia, PsycInfo, MedLine, Embase and Web of Science. The databases were accessed in December 2015 and again in December 2016 to ensure we retrieved up-to-date literature. Our search strategy combined terms from three domains:

1. The age domain, including the following terms: Age*, old*, aging, elderly, mature.
2. The prison domain, including the following terms: Prison*, crim*, imprison*, offen*, sentence*, inmate*, incarcerat*, detain*, detention*, convict*, felon*, penitentiar*, "locked up", "behind bars".
3. The psychiatric disorder domain, including the following terms: Mental*, health*, suicid*, psychotic, psychos*, psychiatr*, psycholog* depress*, ill*, disease*, schizophreni*, dement*, Alzheimer*, disorder*, "alcohol abuse", "cognitive impair*", "personality disorder*", anxi*, "Post-Traumatic Stress Disorder", PTSD.

The strategy was consistent across databases, except where minor modifications were needed to respond to different characteristics of the databases.

In order to identify any relevant grey literature, government reports (e.g. published from the Parliament and the Ministry of Justice) and campaigning literature from lobby groups and charities, we also ran a search on Google and Gov.uk and inspected the first 100 hits. The reference pages of the articles retrieved through the electronic searches were further screened for further relevant literature.

Study selection and appraisal

Title and abstract screening of all initial results was carried out by the main author (CDL), who dismissed the papers that were clearly ineligible for review. The remainders were checked for eligibility against the inclusion/exclusion criteria by two independent raters (CDL and BV).

Inclusion criteria

- Studies on prisoners over 50 years old, male and/or female. Prisoners have been evidenced to experience a premature aging process of around ten years due to their poor health management and common history of substance abuse (Cooney & Braggins, 2010; Baldwin & Leete, 2012; Moll, 2013). Given that age 60 is generally used as inclusion criterion in old age research, it is common practice in old age forensics to apply a 50-year-old cut-off. Nonetheless, we acknowledge that feeling older is a subjective experience and that defining an age cut-off, albeit necessary, may present some limitations.
- Studies collecting primary data with a primary aim to calculate the prevalence of psychiatric disorder among older prisoners. In identifying studies on psychiatric disorder, we adopted the classification of mental disorder provided in the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) (WHO, 1992). Our rationale for choosing this classification system lies in the fact that its development is global, multidisciplinary and multilingual, thus being most suitable for a literature review with an international focus.
- Studies published in any language and any year.

Exclusion criteria

- Given our focus on prisoners, we excluded studies about offenders awaiting sentence, prisoners held in temporary incarceration (jails or local prisons), ex-prisoners or older people in other forensic settings such as psychiatric facilities. We also excluded studies on offenders referred for psychiatric evaluation, on the ground that these may present with disproportionately higher rates of psychiatric disorders.
- We also excluded studies on the general population of prisoners and which do not report a subset of data on older prisoners, review papers and all types of non-empirical studies such as commentaries and editorials or papers discussing mental health, mental health needs, service provision or policy.

Given the small number of studies retrieved, we did not exclude any study on the grounds of methodological quality. However, two independent raters (CDL and BV) assessed the studies' risk of bias and quality in two ways (table 1). First, we used the guidelines for evaluating prevalence studies published in the journal Evidence-Based Mental Health (Boyle, 1998), which assesses potential biases in sampling, measurement and analysis.

Secondly, we used a modified version of the appraisal strategy developed by Prince et al. (2013) in their systematic review on the global prevalence of dementia and scored the studies as follows: For participant sample size, we assigned one point if the study included up to 200 participants, two points if it included between 200 and 300 participants and three points if it included more than 300 participants. For gender, one point if the study included male participants only and two points if it included both male and female participants. For the number of prisons, one point if the study was single-site, two if it was multi-site. For diagnostic assessments, one point for self-reports, two points for audits of medical records, three points for clinical assessments; for response rate, one point if up to 50%, two points if

between 50% and 80% and three points for more than 80%. Any discrepancies between the two raters in assessing bias and in attributing the quality score were resolved by consensus with the third author (TD).

Further, in order to assess whether the studies were meta-analysable, we ran a heterogeneity test through the I^2 statistic, which calculates the percentage of variation across studies due to heterogeneity rather than chance (Higgins and Thompson, 2002; Higgins et al., 2003). We carried out heterogeneity tests for depression and schizophrenia/psychoses, as these disorders included the largest number of studies.

Data extraction

Data were extracted independently by two authors (CDL and BV) through a piloted form derived from the data extraction software for reviews developed by the Cochrane Collaboration (2000). Data on prevalence were retrieved and extracted for "any psychiatric disorder", depression, schizophrenia/psychoses, bipolar disorder, personality disorder, dementia, cognitive impairment, alcohol abuse, anxiety disorders and Post-Traumatic Stress Disorder (PTSD).

Data analysis

Meta-analysis of data on psychiatric disorders

We meta-analysed prevalence data by means of an aggregate mean -weighted by the number of subjects in the study- of the percentage of patients who met the criteria for each psychiatric disorder. Aggregate weighted mean is recommended for good practice in meta-analysis, as it factors the study sample size into the calculation of prevalence, enabling studies with a larger number of participants to have more weight than smaller ones (Rothstein, Higgins, Hedges & Borenstein, 2009).

For dementia, we differentiated between: 1) Weighted prevalence rate of dementia, diagnosed through clinical assessments only and 2) Weighted prevalence rate of cognitive impairment, detected through the use of the Mini-Mental State Examination (MMSE) (Folstein, Folstein & McHugh, 1975). This was deemed necessary to obtain more accurate prevalence rates, as some studies used the term "dementia" indiscriminately to report diagnoses based on the MMSE (Folstein, Folstein & McHugh, 1975), which in fact only detects cognitive impairment.

Comparisons against data from community studies

We compared results from our meta-analysis against prevalence rates from community studies on older people through Relative Risk (RR) and Chi-Square test for statistical significance.

In contrast with the population of older prisoners, there is a large amount of international literature around the prevalence of psychiatric disorders in older people in the community. The studies are extremely diverse in samples, methodologies, geographical location, and assessments. Although a meta-analysis of community studies would derive accurate

comparable data, the capacity needed for such investigation fell beyond the scope of our review.

We therefore identified suitable comparable data through existing systematic reviews (i.e. depression, schizophrenia/psychoses, and personality disorder), large epidemiological governmental surveys (i.e. anxiety disorders and alcohol abuse) or prevalence data reported by governmental agencies (i.e. "Any psychiatric disorder") and relevant third sector organisations (i.e. dementia). Alternatively, we selected studies which reflected the geographical location, cultural background, legal system and/or aging trends of the studies included in our review (i.e. bipolar disorder, cognitive impairment and PTSD).

For "Any psychiatric disorder" in the community (15%), we used prevalence rates published by the US Department of Health and Human Services (1999) and the World Health Organisation (2016). For depression in the community (10.3%) we compared against data published in a recent systematic review of 132 international studies (Barua, Ghosh, Kar and Basilio, 2011). This rate is in line with other community studies on depression among older people (Denihan et al., 2000; Kay et al., 1985; Schoevers et al., 2000; Newman, Bland & Orn, 1998; Liu et al., 1997).

For schizophrenia/psychoses, we used a prevalence rate of 0.5%, as reported in a systematic review and international consensus study (Howard et al., 2000). For bipolar disorder, we compared against a community prevalence rate of 1%. This was obtained through combination of data from Hirschfeld et al. (2003), who reported a 1.6% rate for older people aged 55 to 64 and 0.5% for older people aged 65 and older. For dementia (3.5%), we obtained the prevalence rate for the community population through combination of data published by AgeUK (2016) and the Alzheimer's Society (2016). For cognitive impairment, we compared against a prevalence of 6%, obtained through calculating the mean of the values by age group reported by Rait et al. (2005).

For personality disorder, we compared against a prevalence rate of 10%, reported in a meta-analysis by Abrams and Horowitz (1996). For alcohol abuse (11%), we calculated the mean of the prevalence for older people aged 50–64 years and 65 years old and over reported in the National Surveys on Drug Use and Health (NSDUH) (Blazer & Wu, 2009). For anxiety disorders, we used a prevalence rate of 10.5%, reported in the Longitudinal Aging Study Amsterdam (LASA) (Beekman et al., 1998). For PTSD, existing prevalence rates range from 2.5% to 3.9% (Böttche, Kuwert & Knaevelsrud, 2012). We combined data from two large German studies (Spitzer et al., 2008; Maercker et al., 2008) and obtained a prevalence of 3.2%.

Sensitivity analyses

To assess the robustness of our results, we carried out sensitivity analyses by sequentially excluding each study. We then re-calculated the prevalence weighted mean for each disorder and re-ran the comparison study against community prevalence rates.

Additionally, in order to test whether any study bias affected our results, we conducted post-hoc sensitivity analyses by removing:

- Studies with only male participants, on the ground of gender bias.

- Studies with a high non-response rate - set at 40% (Fincham, 2008) - on the ground of poor representativeness.
- Retrospective studies, as they could be based on poor data collection.
- Single-site studies, based on the ground of selection bias.
- Studies with participants' age below 55. The reason for this analysis was that although the majority of prison studies set 50 years old as inclusion in the category "old age", there is no consensus on this age cut-off. We therefore repeated our analysis by slightly raising the age criterion.

All data were analysed through IBM SPSS Statistics version 22 (IBM, 2013).

Results

The initial search retrieved 3,222 papers, of which 3,200 were identified through the databases and 23 through Google and Gov.uk. Following title or abstract screening, 3,120 studies were dismissed, as they were clearly ineligible. The remaining 103 papers were screened for duplicates and assessed for eligibility against the inclusion criteria. Nine studies were selected for full review. The selection process is shown in figure 1 through a PRISMA (Moher, Liberati, Tetzlaff & Altman, 2009) flow diagram.

Study characteristics

Study characteristics are shown in table 2. In brief, the studies were carried out in the UK (n=4) (Fazel et al., 2001; Murdoch, Morris & Holmes, 2008; Kingston, Le Mesurier, Yorston, Wardle & Heath, 2011; Hayes et al., 2012), in the USA (n=4) (Koenig, Johnson, Bellard, Denker & Fenlon, 1995; Regan, Alderson & Regan, 2002; Caverley, 2006; Williams et al., 2010) and in France (n=1) (Combalbert et al., 2016).

All the studies report point prevalence, which is the prevalence of psychiatric disorders at census date. The studies from France (Combalbert et al., 2016), the UK (Fazel et al., 2001; Hayes et al., 2012; Kingston et al., 2011; Murdoch et al., 2008) and one study from the USA (Koenig et al., 1995) were cross-sectional, while three studies from the USA were retrospective cohort studies (Caverley, 2006; Regan et al., 2002; Williams et al., 2010). The number of participants ranged from 95 to 671 (Mdn= 237; IQR=230.5). The age cut-off for inclusion in the "older" group varied: Caverley (2006), Combalbert et al. (2016), Hayes et al. (2012), Kingston et al. (2011) and Koenig et al. (1995) included inmates over 50 years old; Murdoch, Morris and Holmes (2008), Williams et al. (2010) and Regan, Alderson and Regan (2002) examined prisoners aged over 55 years old and Fazel et al. (2001) prisoners over 60 years old.

There was variation also in terms of the sites of the investigation: Three studies from the USA were single-site (Caverley, 2006; Regan, Alderson & Regan, 2002; Koenig et al., 1995), whereas the remaining studies were multi-site, focusing on two to fifteen prisons. In two studies (Combalbert et al., 2016; Williams et al., 2010), the number of establishments was not specified. All the studies were published literature.

The assessment tools included: An audit of the prisoner's health records (n=5), the MMSE (Folstein, Folstein & McHugh, 1975) (n=4), the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders-IV (SCID) (First, Spitzer, Gibbon & Williams,

2002) (n=2), the Computerised Diagnostic Schedule for Geriatric mental scale (GMS-AGECAT) (Copeland et al., 1976) (n=2), the Geriatric Depression Scale (GDS) (Yesavage et al., 1982) (n=1), the Camberwell Assessment of Need Forensic Short Version (CANFOR-S) (Thomas et al., 2003) (n=1), the Short-Form 12 (SF-12) (Ware, Kosinski, & Keller, 1996) (n=1), the Diagnostic Interview Schedule (DIS) (Robins, Helzer, Croughan, & Ratcliff, 1981) (n=1), self-reports (n=1), the Symptom Checklist–90 (Pearson Assessments) (Derogatis et al., 1973) (n=1), the Mini International Neuropsychiatric Interview (MINI DSM-IV) French Version (Lecrubier et al., 1998) (n=1) and the Frontal Assessment Battery (Batterie Rapide d'Efficience Frontale) (Dubois, Slachevsky, Litvan, & Pillon, 2000) (n=1).

For dimensional questionnaires, assessment cut-offs were based on standard practice. For the Symptom Checklist–90, a T-score above 60 was considered abnormal (Holi, 2003); for the Short-Form 12, a score below 45.6 identified morbidity (Vilagut et al., 2013). A GMS/AGECAT score of 3 or above was indicative of depression (Yohannes, Baldwin & Connelly, 2003). For the MMSE, a cut-off score of 24 or below identified cognitive impairment (O'Bryant et al., 2008); for the GDS a score of 10 and above identified depression (Yesavage et al., 1982). For the Frontal Assessment Battery, a score below 16 points was considered symptomatic of reduced executive functioning (Dubois, Slachevsky, Litvan, & Pillon, 2000).

In regard to study outcomes, all the studies looked at depression, eight at schizophrenia/psychoses, seven at "any psychiatric disorder", five at anxiety disorders, four at dementia, and three at bipolar disorder, personality disorder, alcohol abuse, cognitive impairment and PTSD. The operational definition of the category "Any psychiatric disorder" varied across studies. Most notably, it differed as to whether alcohol misuse was included.

Our test for heterogeneity evidenced combinability of the studies for statistical analysis (I^2= 0% for schizophrenia/psychoses; I2= 1% for depression).

Quality/bias assessment

Results are reported in full in Table 1. Briefly, the assessment evidenced the studies had mixed quality. Little attention was often paid to features of the sampling design that may have affected the results. In regard to the representativeness of samples for example, six studies included only male participants and three were single-site investigations. In addition, response rates were sometimes low or unreported. In most cases, the special features of sampling design were not addressed in the analysis.

We also found great diversity in terms of screening tools. Most investigations (n=7) were based on solid screening methodology, which included clinical assessment. However, while some of the diagnostic tools were designed for the assessment of older people specifically (e.g. GMS-AGECAT, GDS), the majority were developed for use with the general population and do not include items related to old age and/or to forensic settings. We observe that in one study (Williams et al., 2010) the use of self-reports only might have generated biased results and that one study (Regan, Alderson & Regan, 2002) did not report its screening methodology at all. Confidence Intervals for prevalence rates were not reported in most studies (n=7).

Prevalence of psychiatric disorders

The prevalence rates of psychiatric disorders for each study are reported in table 3. The calculation of the weighted prevalence yielded the following results: "Any psychiatric disorder" 38.4%, 95 CI [37.4, 39.6]; depression 28.3%, 95 CI [27.8, 28.8]; schizophrenia/psychoses 5.5%, 95 CI [5.3, 5.7]; bipolar disorder 4.5%, 95 CI [4.4, 4.6]; dementia 3.3%, 95 CI [3.2, 3.4]; cognitive impairment 11.8%, 95 CI [11.4, 12.1]; personality disorder 22.9%, 95 CI [22.4, 23.4]; alcohol abuse 15.9%, 95 CI [14.6, 17.2]; anxiety disorders 14.2%, 95 CI [13.6, 14.7]; PTSD 6.2%, 95 CI [6.0, 6.4].

Comparison studies

Results from our comparison study evidenced that the RR for an older inmate to have "any psychiatric disorder" is more than double (2.5) compared to an older person living in the community. The Chi-Squared tests evidenced statistical significance between the two groups ($p<.05$). For depression, we obtained a RR (prison against community) of 2.8. The Chi-Squared tests evidenced statistical significance between the two groups ($p<.05$).

For schizophrenia/psychoses, we obtained a RR (prison against community) of 6. The difference in prevalence rates was not statistically significant ($p>.05$). Similar results were obtained for bipolar disorder (RR=4.9; $p>.05$). The RR for dementia in prison against the community was .75. The result bore no statistical significance ($p>.05$). For cognitive impairment, we found a two-fold RR for older prisoners against older people in the community. The difference in prevalence rates however was not statistically significant ($p>.05$).

For personality disorder, we obtained a RR of 2.3 (prison against community) and the prevalence rate was statistically significantly higher in the prison group ($p<.05$). Similar prevalence rates in the two populations were obtained for alcohol abuse (RR=1.4; $p>.05$) and anxiety disorders (RR=1.3; $p>.05$). For PTSD, we found a two-fold RR (prison against community). The prevalence rates bore no statistically significant difference ($p>.05$).

Sensitivity analyses

Sensitivity analyses carried out by excluding each study confirmed the results from our prevalence and comparison studies with two exceptions. When we sequentially excluded the studies by Combalbert et al. (2016) and Koenig et al. (1995), the prevalence rate for alcohol abuse increased to 22% and 19.6% respectively, thus gaining statistical significance against the community studies ($p>.05$).

When we excluded the study by Fazel et al. (2001), we obtained a prevalence rate for personality disorder of 18.9% (22.9% in the original analysis), resulting in a p-value just slightly over the threshold for statistical significance ($p=.053$) against the community studies.

The post-hoc sensitivity analyses confirmed our original results. We observed that the prevalence of "any psychiatric disorder" among older prisoners increased to 57.6% (RR=3.9 against community studies) when we excluded retrospective studies and to 44.7% (RR= 3) when we excluded single-site investigations. For alcohol abuse, the difference against community studies raised just above the threshold for statistical significance ($p=.04$; RR=1.9) when we removed studies with a high non-response rate.

Discussion

The present study aimed to review the existing literature around the prevalence of psychiatric disorders among older prisoners and to compare the results with prevalence rates reported in studies on older people in the community.

Our findings evidenced that more than one third of older prisoners (38.4%) suffers from "any psychiatric disorder", with more than double the prevalence reported in community studies (15%). The difference is statistically significant. In comparison with older people in the community, older prisoners also experience higher RR for every single psychiatric disorder, with the sole exception of alcohol abuse (RR=1) and dementia (RR=.75). This confirms our hypothesis that overall, older prisoners are more exposed to psychiatric disorders than older people in the community.

We observe that in fact our aggregated prevalence rates may even be underestimated, as several studies were based on retrospective data and medical records collected from staff rather than researchers, thus bearing reduced reliability. In relation to "any psychiatric disorder" for example, when we excluded studies based on poorer methodologies (i.e. retrospective and single-site investigations) in our sensitivity analyses, we obtained even higher prevalence rates (and RR) for the prison population against community studies.

Interestingly, for the most severe disorders like schizophrenia/psychoses and bipolar disorder, the gap in prevalence rates (and the RR) between the two groups was extremely marked, showing how older prisoners tend to lie at the most severe end of the spectrum of psychiatric morbidity.

In regard to dementia, we obtained similar prevalence rates (3.3%) as in community studies (3.5%). Our findings suggest that dementia is present in the prison population and diagnosed at rates comparable to the community, despite the difficulties in the diagnostic process in the prison setting, which may be hindered by the use of inadequate screening procedures/tools (Moll, 2013) and the lack of geriatric training among prison staff (Senior et al., 2013). In addition, the comparison study on cognitive impairment found a two-fold RR for the prison population against older people in the community. This suggests that when older prisoners with cognitive impairment eventually develop full-blown dementia, the number of prisoners with dementia might potentially match or even surpass community rates.

This study has several limitations and any conclusions should be viewed in perspective. Despite our effort to include a diverse range of literature, we were not able to retrieve suitable grey literature (e.g. unpublished studies), thus potential incurring in publication bias. In addition, we excluded studies which did not set the prevalence of psychiatric disorder as their primary outcome and those reporting data on the general prison population and not by age groups. This was because the availability and the quality of the data was not sufficient to allow for accurate extraction and meta-analysis. This may have led to selection bias.

Another limitation of our review pertains to external validity, as we were only able to retrieve studies in English, despite we placed no restrictions on publication language. In addition, nearly all of the studies were carried out in the UK (n=4) or the USA (n=4). This may reflect a longer tradition in prison literature in the case of the USA or the fact that in these two countries the increased number of older prisoners over the last years (Walmsley, 2016) has deepened the interest of researchers, resulting in a larger amount of scientific investigations.

The recent publication of the first study on psychiatric disorders among older prisoners in France (Combalbert et al., 2016) which we were able to include in our review, potentially indicates that the interest in older prisoners is extending to other countries.

The lack of relevant literature from other countries evidences that the phenomenon of an aging prison population is experienced very differently, owing to the specificity of legal systems, cultural/societal views/approaches against older offenders, aging trends and sentencing policies. In Spain for instance, prisoners are released at 80 years old and in Azerbaijan and Russia courts do not give life sentences to people over the age of 65 (Penal Reform International, 2015). We therefore urge caution in interpreting and generalising our findings, which may not reflect the condition of older prisoners in other countries.

Some limitations pertain to the quality of the studies we included. In relation to sex representation, only the US studies included a sample of women, potentially resulting in an underestimation of psychiatric disorders that are most typically diagnosed among females, such as depression. There was quality disparity also in the screening tools that each study used, even to diagnose the same psychiatric disorder. In several instances, the instruments were not specific for the assessment of older people and this may have resulted in less than accurate evaluations, carrying substantial biases. For example, the CANFOR-S investigates needs in the general forensic population. The scale includes some items which are hardly applicable to older prisoners, such as caring for a child under 18. In this case, consideration of the Camberwell Assessment Needs for the Elderly (CANE) (Orrell & Hancock, 2004), which investigates needs relevant in older age, would have been appropriate.

Another limitation was that although some studies were affected by poor response rates, the authors did not report non-responder analyses and missing data. This may have resulted in unrepresentative prevalence rates. Although our sensitivity analyses evidenced that this generally did not impact on our original findings, results for alcohol abuse were substantially altered when we excluded the two studies with the lowest response rate (Combalbert et al., 2016; Kingston et al., 2011). In this case, we found statistically significantly higher rates for alcohol abuse in the prison sample. The same result was obtained when we performed sensitivity analysis by removing the study by Koenig et al. (1995). Given the results of these sensitivity analyses and the fact that only three studies reported on alcohol abuse, we urge careful consideration when interpreting our findings around the condition.

In relation to personality disorder, although statistical significance against community studies was lost when we performed sensitivity analysis by excluding the study by Fazel et al. (2001), the p-value found (p=.053) was only just above the threshold for statistical significance. Given that statistically significantly higher rates of personality disorder among older prisoners were confirmed by all other sensitivity analyses, we conclude that the findings from our original analysis are accurate.

In regard to the comparison studies specifically, given that the research methodologies and assessment tools adopted in prison and community studies vary according to the specificity of the population under investigation, making comparisons presents some limitations. It is also crucial to highlight the fact that prevalence rates around psychiatric disorders in older people vary quite substantially across studies (Volker et al., 2013) and that therefore despite our efforts to select representative studies for the comparison studies, they may not fully reflect this diversity. Unfortunately, we were not able to make comparisons against the prevalence

rates of psychiatric disorders among prisoners under age 50 because of a lack of suitable studies to compare.

Qualitative evidence suggests that compared to the younger inmates, older prisoners may be more exposed to psychological distress given factors related to reduced mobility, physical health issues, increased social isolation, lack of suitable age-friendly recreational and vocational activities and increased risk of victimisation (Smyer, Gragert & LaMere, 1997; Lemieux et al., 2002; Aday, 1994). The emotional burden generated by the unique combination of age-related and prison-related factors may also partially explain the higher prevalence rates of psychiatric disorders against older people in the community. However, further research is needed to establish whether there are significant differences in the genesis and presentation of psychiatric disorders among older prisoners in comparison to different age groups of prisoners and peers living in the community.

Conclusion

The present study is the first to systematically review the existing evidence-base around the prevalence of psychiatric disorders among older prisoners and to compare data on a prison population against community studies on older adults. We feel that our findings have relevant implications for policy and practice.

For example, the high rates of psychiatric morbidity reported among older prisoners evidence the need for specialised healthcare service provision in the prisons system of those countries where this has not been adequately addressed yet. For example, research reports that at present time in English and Welsh prisons only about half of the institutions (53%) offer clinics specialised in old age medicine (Senior et al., 2013). The lack of adequate care provision is particularly evident in regard to psychiatric health needs (Fazel et al., 2001).

In this sense, our findings indicate the cruciality to deliver effective staff training and at the importance of adequate screening procedures, which should be undertaken at regular intervals throughout imprisonment by means of standardised and age-specific assessment tools. Ideally, administration should be carried out by a qualified/trained medical professional specialised in old-age psychiatry.

Given that around 95% of older prisoners are eventually released in the community (Williams, Stern, Mellow, Safer & Greifinger, 2012), addressing effectively psychiatric health needs during incarceration would also contribute to decrease the risk of re-offence upon release, to the safety of the community and the public. In addition, addressing older prisoners' needs would prevent relapse and further need for psychiatric treatment (e.g. GP appointments, referrals to specialists) contributing to reduced public spending in healthcare costs.

In regard to dementia, highlighting that older prisoners experience similar rates of the condition as older people in the community will potentially contribute to draw the attention of policy makers and healthcare professionals on the emerging issue of dementia in the prison system, which has been thus far neglected, compared to the profusion of initiatives in health care and social services available to people with dementia living in the community.

In terms of policy implications, our findings support the accumulating evidence on the need to develop specific national strategies to address older prisoners' needs. Some governments

have committed to these initiatives. It is the case of Ireland, which is in the process of creating a national strategy on older prisoners as per the Prison Service Strategic Plan 2016-2018 (Joyce & Maschi, 2016). Conversely, in several other countries experiencing high prevalence of older prisoners, principles and guidelines on health care provision for older prisoners are still based on general policies around older people, such as the UK NICE guidelines on mental wellbeing and independence in older people (NICE, 2015). These policies however, seem insufficient to grant adequate health care at the national level, rendering provision for older prisoners still sparse and mostly relying on the commitment on individual institutions (Yorston, 2015). We therefore advocate that national initiatives be systematically taken to adequately address the psychiatric needs of older prisoners.

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Figure 1. Selection of papers

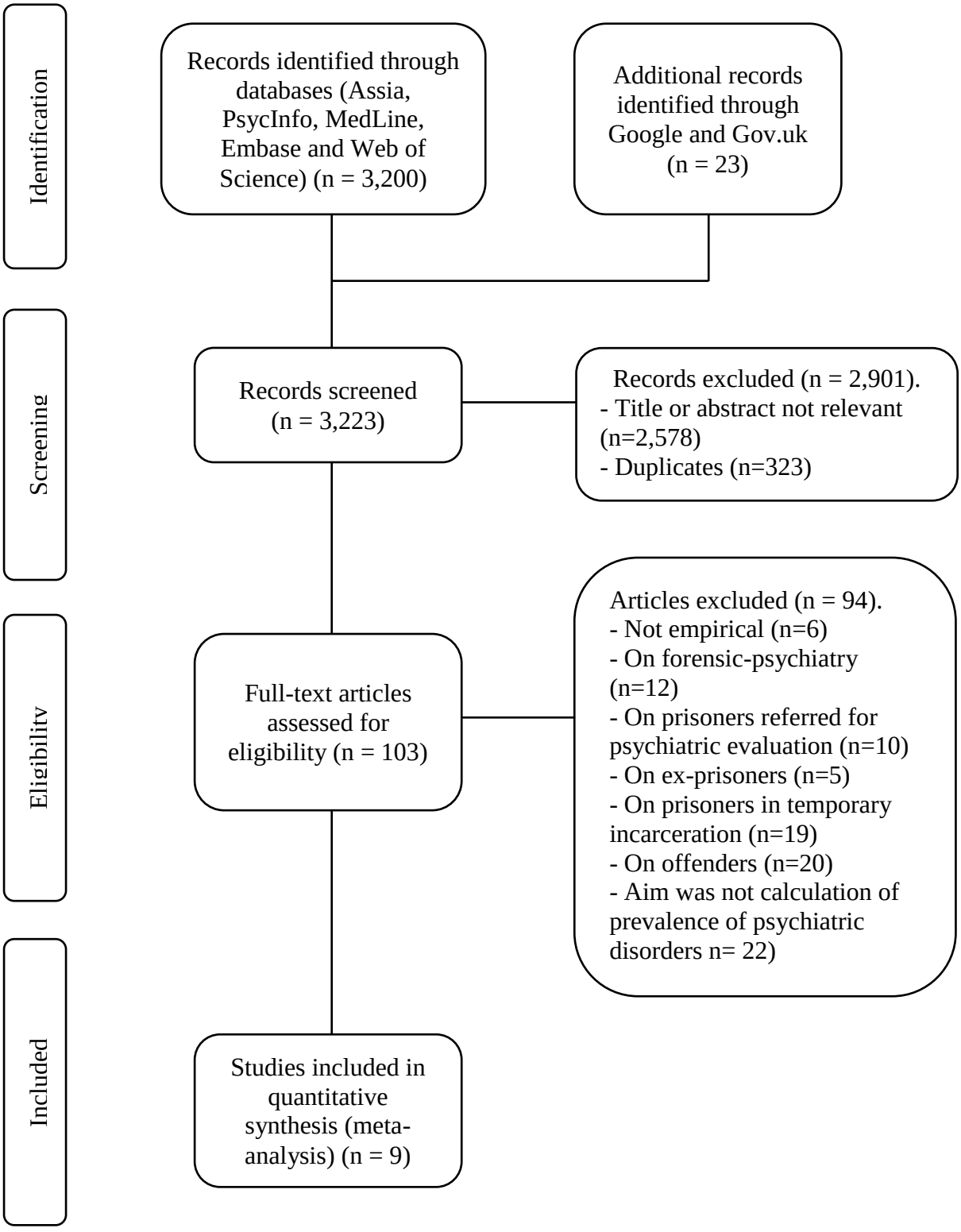

Table 1. Basic quality assessment (Boyle, 1998) and quality scores derived from Prince et al. (2013).

Author(s)	Basic quality assessment				Quality score					
	Sampling	Measurement	Analysis							
	Representative?	Was it reliable and valid?	Features of sampling design addressed in analysis?	Are Confidence Intervals reported?	Participants[a]	Sex[b]	Prisons[c]	Measures[d]	Response[e]	Tot.
Caverley	Yes	Yes	Not mentioned	No	3	2	1	3	-	9*
Combalbert et al.	No (Only males)	Yes	Yes	No	1	1	2	3	1	8
Fazel et al.	No (Only males)	Yes	Yes	Yes	2	1	2	3	3	11
Hayes et al.	No (Only males)	Yes	Not mentioned	Yes	2	1	2	3	2	10
Kingston et al.	No (Only males)	Yes	Not mentioned	No	2	1	2	3	1	9
Koenig et al.	No (Only males)	Yes	Yes	No	1	1	1	3	3	9
Murdoch et al.	No (Only males)	Yes	Yes	No	1	1	2	3	3	10
Regan et al.	Yes	Not reported	Not mentioned	No	3	2	1	-**	-	6*
Williams et al.	Yes	No (Self-reports only)	Not mentioned	No	3	2	2	1	-	8*

[a] = Up to 200, one point; 200-300, two points; 300+, three points.
[b] = Males only, one point; males and female, two points.
[c] = Single-site, one point; multi-site, two points.
[d] = Self-reports, one point; audits of medical records, two points; clinical assessments, three points.
[e] = Up to 50%, one point; 50–80%, two points; more than 80%, three points.
*Total is missing response rate score as these were retrospective studies.
** Tests score not assigned as screening assessment used in the study are not reported in the paper.

Table 2. Study characteristics.

Author(s)	Year	Country	Design	Site	Sample demographics	Did not consent to participate	Diagnostic assessments
Caverley	2006	USA	Retrospective cohort study	Single site: Utah State Prison	318 males and 42 females aged 50+	Not applicable	Interview, health records, Pearson Assessments
Combalbert et al.	2016	France	Cross-sectional	Multi-site	138 males aged 50+	n=510; 78.7%	MINI DSM-IV, Frontal Assessment Battery, MMSE
Fazel et al.	2001	UK	Cross-sectional study	Multi-site: 15 prisons in England and Wales	203 males aged 59+	n=30; 12.87%	GMS-AGECAT, SCID-II, health records
Hayes et al.	2012	UK	Cross-sectional study	Multi-site: 13 prisons in North West England	262 males aged 50+	n=40, 20%	SCID-I, SCID-II, MMSE, CANFOR-S, health records
Kingston et al.	2011	UK	Cross-sectional study	Multi-site: 4 prisons in Staffordshire	237 males aged 50+	n=121; 49.95%	GMS-AGECAT, MMSE, SF-12, health records
Koenig et al.	1995	USA	Cross-sectional study	Single-site: 1 prison in North Carolina	95 males aged 50+	n=11; 10%	DIS, health records, interview
Murdoch et al.	2008	UK	Cross-sectional study	Multi-site: 2 prisons in England	121 males aged 55+	n=0; 0%	GDS, MMSE
Regan et al.	2002	USA	Retrospective cohort study	Single site: Tennessee State Prison	671 (males and female) aged 55+	Not applicable	Not mentioned
Williams et al.	2010	USA	Retrospective cohort study	Multi-site: US federal or state prisons	360 (males and females) aged 55+	Not applicable	Self-report survey

Table 3. Prevalence rates from individual studies (out of total population of older prisoners).

Author(s)	Any psychiatric disorder	Depression	Schizophrenia Psychoses	Bipolar disorder	Dementia	Cognitive impairment MMSE score < 24	Personality disorder	Alcohol abuse	Anxiety disorders	PTSD
Caverley	13.6% (n=49)	7.7% (n=28)	3.3% (n=12)	5% (n=18)	-	-	-	-	-	-
Combalbert et al.	68.4% (n= 95)	39.9% (n=55)	1.45% (n=2)	-	-	18.84% (n=26)	-	0% (n=0)	39.1% (n=54)	9.4 (n=13)
Fazel et al.	53.2% (n=108)	29.6% (n=60)	4.9% (n=10)	-	1% (n=2)	-	30% (n=61)	-	-	-
Hayes et al.	64% (n=160)	34% (n=87)	3% (n=8)	-	-	7% (n=17)	20% (n=51)	30% (n=77)	19% (n=48)	-
Kingston et al.	49.6% (n=60)	41.3% (n=50)	1.6% (n=2)	-	1.6% (n=1)	13.2% (n=15)	-	-	1.65% (n=2)	-
Koenig et al.	53.7% (n=51)	35.8% (n=34)	1.1% (n=1)	1.1% (n=1)	1.1% (n=1)	-	15.8% (n=15)	0% (n=0)	4.2% (n=4)	1.1% (n=1)
Murdoch et al.	-	51.2% (n=62)	-	-	-	-	-	-	-	-
Regan et al.	-	33% (n=36)	12% (n=13)	-	5% (n=5)	-	-	-	13% (n=14)	-
Williams et al.	13.6% (n=49)	12.9% (n=46)	3% (n=11)	4.9% (n=18)	-	-	-	-	-	6.3% (n=22)

Blank boxes indicate data were not reported.