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Substance use and other mental health disorders among older prisoners

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ABSTRACT

The goal of this study is to explore the status quo of mental health and substance use problems among older prisoners. Our review presents the prevalence as well as co-occurrence of substance use and other mental health disorders in older prisoners. We conducted a systematic review of literature following the PRISMA statement. The search was carried out in four databases and supplemented with manual screenings of bibliographies from all retrieved articles. Publications were included if they met specific inclusion criteria. A total of 17 articles were included and in half of them, older offenders were the main study population. Older inmates have higher prevalence of mental health disorders than younger prisoners and are more likely to use alcohol. Several studies mentioned an association between substance use and other mental health disorders. Access to treatment was a concern with several studies providing recommendations to improve this. Most studies were done on older male prisoners, confirming that older female prisoners constitute a subgroup of a subgroup which is even more vulnerable and under-researched. It is important to carry out more research on both older male and female prisoners to ensure optimal delivery of appropriate mental health care for older prisoners and to prepare for a currently younger population that will age with different and distinct mental health problems and substance use patterns.

1. Introduction

The worldwide number of older prisoners has increased over the past few decades, mirroring the growing ageing population outside prisons (Aday & Krabill, 2012; Cloyes & Burns, 2015; Fazel, Hayes, Bartellas, Clerici, & Trestman, 2016; Nowotny, Cepeda, James-Hawkins, & Boardman, 2016; Pro & Marzell, 2017). Causes for this increase, such as changes in the legal system have been described elsewhere (Loeb & Abudagga, 2006; Vogel, Languillon, & Graf, 2013). Loeb and Abudagga (2006) stated that prisoners 50 years and older constituted the most rapidly increasing age group of prisoners in the United States.

However, the population of older prisoners is not homogeneous. They can be divided into distinct groups such as offenders who were incarcerated at a younger age and grow old in prison; offenders who have been incarcerated multiple times throughout their lifetime; and offenders who commit their first crime after 50 years of age (cf. Glaser, Warchol, D'Angelo, & Guterman, 1990; Kakoullis, Le Mesurier, & Kingston, 2010; Nowotny et al., 2016). Sodhi-Berry, Knuiman, Alan, Morgan, and Preen (2015) mentioned that the third group constitutes more than half of all 'old' prisoners and they experience relatively more adjustment problems with imprisonment compared to the other groups. Additionally, a study from Canada revealed that the third group accounted for the majority of older prisoners (72.8%), with 17.1% belonging to 'repeat offenders', and only 10.2% being 'long term offenders' (Uzoaba, 1998).

Almost 20 years ago, Beitchman (1998) found an increasing number of incarcerated individuals over 50 who were at the same time diagnosed with a major mental illness. It is reported that older prisoners with mental illness are not only the fastest-growing sub-population among those incarcerated but also the one with the worst health (Chodos, Ahalt, Cenzer, & Goldenson, 2013; Pro & Marzell, 2017). It has also been shown that older inmates have a higher number of somatic (Moschetti et al., 2015; Wangmo et al., 2015) and mental disorders (Aday, 1994; Baillargeon, Binswanger, Penn, Williams, & Murray, 2009; Nowotny et al., 2016) when compared to younger prisoners.

There is lack of specific research that examines the different mental health needs of older prisoners. Such evaluations are critical since the definition of mental health has changed over time. For instance, substance use has not always been considered a mental health problem. Also, from the literature, we know that older prisoners are less likely to use illicit drugs, but more likely to use alcohol before incarceration (Gallagher, 1990). A study in Iowa showed substance use problems in

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71% of inmates over the age of 55, with alcohol being the primary drug of use (Arndt, Turvey, & Flaum, 2002). Surprisingly, they were significantly less likely to receive treatment for substance use in comparison to younger inmates.

Mental health issues affecting older offenders comprise, among others, substance use, anxiety disorders, psychotic disorders, mood disorders, neurodevelopmental disorders and personality disorders with an onset that often starts at a younger age, but the additional disease burden of old age includes age-related neuropsychiatric disorders like dementia or depression (Davoren, 2015; Fazel & Grann, 2002; Hayes, 2012). Mental health could also be affected due to the prison environment and experiences that are traumatic and stressful. A survey of a US prison system revealed that 20% of 1,800 prisoners (of whom 8% were aged 48 or above) were pressured or forced to have at least one unwanted sexual contact (Struckman-Johnson, Struckman-Johnson, Rucker, Bumby, & Donaldson, 1996 as cited in Haugebrook et al.,2010).

According to Arndt et al. (2002) only little systematic research has been conducted on the mental health disorders and substance use treatment needs of older prisoners. A thorough and transparent investigation of what should be provided to prisoners in terms of mental healthcare may be required for legal reasons, such as disability discrimination laws and the principle of equivalent care (Kakoullis et al., 2010). For psychiatric care, treatment needs are even less clear than for somatic care (Fazel, Hope, O'Donnell, & Jacoby, 2004; Hayes, Burns, Turnbull, & Shaw, 2012; Sodhi-Berry et al., 2015). A few scholars have sought to provide recommendations that would improve the overall mental healthcare provided to older prisoners (Di Lorito, Völlm, & Dening, 2017; Pro & Marzell, 2017; Williams, Sudore, Greifinger, & Morrison, 2011).

It is known that prisoners who are relatively healthy and well-prepared to function adequately in the community are less likely to reoffend and will probably cost society less in terms of health care (Freudenberg, 2001; Rich, 2015; Rich et al., 2014). In light of lack of information on the status quo for mental health disorders and substance use among older prisoners, our review explores their prevalence as well as co-occurrence in older prisoners by reviewing the available data on this topic. A comprehensive and critical synthesis of all available information on this topic for older prisoners (both male and female) could help tailor available resources for this growing prison sub-group with distinct mental health burden and mental health needs.

2. Methods

2.1. Search strategy (with inserted PRISM chart)

The present review follows the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009). The authors discussed the formulation of search terms and strategies based on their experience as well as based on published literature. The search was carried out in PubMed/MEDLINE, PsycINFO, EMBASE and CINAHL between the date of database conception and April 2017. The search terms included: ["geriatr*" or "older"or "elder*"] AND ["jail"or "offender"or "correctional"or "prison*"or "inmate"or "sentence*"or "remand"or "detaine*"or "felon"] AND ["mental*"or "psychiatr*"or depress*"or "personality"or "disorder"or "retardation"] AND ["drug*"or "substance*"or "psychotropic"or "alcohol]. This resulted in a total of 786 publications, of which 209 were from PubMed/MEDLINE, 200 from PsycINFO, 308 from EMBASE and 69 from CINAHL.

The above search of the literature was supplemented with manual screenings of bibliographies from all retrieved articles which led to the addition of one article. All literature identified were then subject to the article inclusion/exclusion criteria that are listed below (see PRISMA flowchart, Fig. 1).

2.2. Article inclusion/exclusion criteria

Publications were included if they met specific inclusion criteria. To be included in our review, a publication had to meet the following criteria, which were specified before conducting the search: Studies published in English, German or French discussing both psychiatric disorder and substance use on a specifically defined group of older prisoners (cutoff age defined by the authors of the respective publication) in remand prisons or after conviction. In cases where a study focused on a broader prison population, it could be included if it had a separate category of older participants.

Excluded articles were those publications that dealt with temporary incarceration, ex-prisoners or older adults in forensic settings without being convicted. In addition, we excluded publications that only treated substance use without mentioning other mental health disorders. Also excluded were articles presenting systematic reviews or meta-analyses, conference abstracts, book chapters and dissertations.

The authors did not categorically exclude qualitative publications from the start because we hypothesized that using a mixed research technique might help to summarize the extant literature, as opposed to drawing on findings of quantitative studies only. However, the final step in the analysis consisted of exclusively quantitative publications.

2.3. Study selection and appraisal

Title and abstract screening of all initial results was carried out by the main author (SH) who dismissed the papers that were clearly ineligible for the review (see Fig. 1). The remainders (n = 93) were checked for eligibility against the inclusion/exclusion criteria by two authors (SH and HM or AI). Specific reasons for rejections at this point were recorded. Differing results during these steps were discussed between the researchers, and remaining disagreements were resolved by another author, TW. A total of 17 quantitative papers met the standards for inclusion. Quality appraisal of each study was done using a set of six questions adapted from Munn, Moola, Riitano, and Lisy (2014). The following items were evaluated with binary yes/no values: (a) older prisoners with mental health problems and/or substance use as main study sample, (b) study description, (c) use of ICD or DSM classifications, (d) sample size of at least 100 participants, (e) use of validated screening instruments, and (f) co-occurrence of substance use and other mental health disorders as the primary research focus.

3. Results

3.1. Study characteristics

In 9 of the 17 studies, older offenders were the main study population. The 17 studies were conducted in Western countries, mostly in the United States, but also the UK, Ireland, Sweden, Switzerland and Australia. The total population of prisoners included in the 17 studies was 49855, of which "older" prisoners numbered 8081. Table 1 provides further information on study characteristics. The definition of an 'older' offender varied considerably across studies. The range of age cutoffs arches from 45 years (Gates, Staples-Horne, Walker, & Turney, 2017; Sodhi-Berry et al., 2015) to 65 years, with 60 years being the most chosen cut off age (see Table 1).

Twelve out of the 17 studies included older female prisoners. However in six studies, they only appeared in the demographic information without further discussion of gender-specific findings, and one study did not differentiate between older and younger female prisoners (Table 2). The included studies revealed important information on the following topics: the prevalence of specific mental health disorders and substance use in older male prisoners, followed by the same in older female prisoners. We also extracted data that compares the mental health of older prisoners versus older persons in community and issues revolving around access to mental health care and

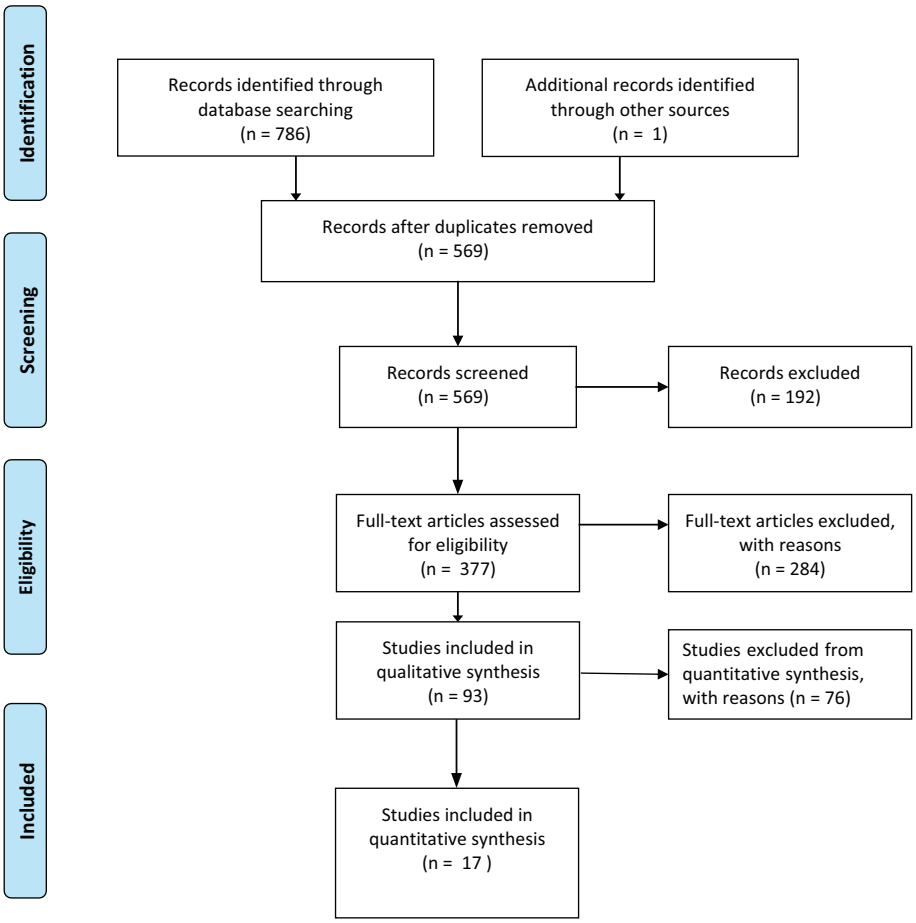

Fig. 1. PRISMA 2009 flow diagram.
From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta- *A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097, For more information, visit www.prisma-statement.org.

recommendations to improve overall mental health care for older prisoners.

3.2. Older male prisoners

3.2.1. Mental health disorders among older male prisoners

Main results concerning mental health disorders among older male prisoners are shown in Table 3 and specific prevalence rates are presented in Table 4. Our review indicates that older inmates have a higher prevalence of psychiatric disorders than younger prisoners (Hunt 2010; Moschetti et al., 2015; Sodhi-Berry et al., 2015). Almost half of the older male inmates suffered from at least one psychiatric disorder such as personality disorders, neurosis, schizophrenia or 'mood disorders' (Moschetti et al., 2015). Comorbid mental illnesses such as dementia, depression, psychoses or substance use disorders appeared very often even when the focus was on somatic illness (Sodhi-Berry et al., 2015).

There were differences in the rates of mental health disorders among offenders aged 50 years and over (Hayes et al., 2012). That is, the group aged 50–54 years was more likely to have a psychotic disorder and personality disorders than those 55 years and older. Offenders aged 50 to 59 years were more likely than those over 60 years to suffer from a 'mental disorder including mental illness, major depression, substance use and personality disorders' (Hayes et al., 2012). However older offenders showed comparable rates of psychosis as younger ones (2% vs 4 %) but higher rates of affective disorders (38% vs 17%) (Davoren et al., 2015). Here the difference between age groups was much more significant among older male than among older female remand prisoners, namely 40% versus 32%. Fazel and Grann (2016) concluded that almost a third of their study population aged 60 and over were suffering from a psychotic illness, a fifth manifested personality disorder, 8% of them had a depressive or anxiety disorder and 7% had a diagnosis of dementia.

Proportionally more prisoners aged 65 years and older 'suffered from mental illness, especially depression, at the time of the offence' (Overshott et al., 2012). In most cases there was considerable overlap of diagnoses (addiction, dementia, and antisocial personality disorder) so that it was difficult to associate specific diagnoses with violence (Koenig, Johnson, Bellard, Denker, & Fenlon, 1995).

3.2.2. Substance use among older male prisoners

Table 5 shows main results concerning substance use disorders among older male prisoners, specific prevalence data are given in Table 6. A total of 15% of forensic psychiatric evaluations with individuals aged 60 revealed substance abuse or dependence problems (Fazel & Grann, 2002). Older and younger male remand prisoners had similar rates of substance use disorders, but older prisoners were more likely to use alcohol while younger prisoners were more likely to misuse illicit drugs (Davoren et al., 2015). Only a small minority of older prisoners used illegal drugs, alcohol and pharmaceuticals at the same time (Moschetti et al., 2015). Among older prisoners, the group aged 50–54 years were more likely to suffer from substance misuse disorder, alcohol misuse disorder or drug misuse disorder than the group aged 65–69 years (Hayes et al., 2012).

Several studies mentioned an association between substance use and other mental health disorders. For instance, Haugebrook, Zgoba, Maschi, Morgen, and Brown (2010) stated that older prisoners of both

Table 1
Overall characteristics of studies included in the review (N = 17).[a]

Author(s)	Year	Country	Population	All offenders N = 60335	Older offenders N = 8081	% older offenders (Older/ All offenders)	Cutoff age (in years)	Average age of older offenders (in years)	Study design[b]	Quality assessment score
Arndt et al.	2002	USA	All offenders in Iowa Medical and Classification Center	10952	180	1.6	55	61.3	1	6
Gates et al.	2017	USA	All adult offenders in Kentucky	10988	2940	26.8	45	52.8	1	5
Moschetti et al.	2015	Switzerland (Vaud)	All prisoners in closed facilities in the canton of Vaud	1664	136	8.2	50	57.0	1	5
Nowotny et al.	2016	USA	Data from Bureau of Justice	1160	1160	100.0	50	56.3	1	5
Sodhi-Berry et al.	2014	Australia	All older offenders in Western Australia	1853	1853	100.0	45	53.2	1	5
Fazel & Grann	2002	Sweden	All persons referred to a forensic psychiatric evaluation	7297	210	2.8	60	64.0	1	4
Fazel et al.	2004	England and Wales	All older sentenced men in selected prisons	203	203	100.0	60	66.0	3	4
Haugebrook et al.	2010	USA	Older adults drawn from database of New Jersey department of correction	114	114	100.0	55	55.5	1	4
Hayes et al.	2011	England	All male prisoners in 13 of the 14 prisons in North Western prison service area	165	165	100.0	50	-	3	4
Davoren et al.	2015	Ireland	All older persons in two Irish remand prisons	22608	213	0.9	60	63.1	1	3
Koenig et al.	1995	USA	All older prison inmates in North Carolina	95	95	100.0	50	57.0	3	3
Williams et al. (a)	2010	USA	All older persons from Survey of Inmates in State Correctional Facilities	360	360	100.0	55	61.0	2	3
Williams et al. (b)	2014	USA	All older prisoners in one county jail	210	210	100.0	55	59.4	2	3
Lewis et al.	2006	USA	All older persons referred to a Psychiatric Institute in South Carolina	99	99	100.0	60	66.8	1	2
Overshott et al.	2012	England and Wales	All persons convicted of homicide as notified by Home Office	47	47	100.0	60	65.8	1	2
Farragher & O'Connor	1995	Ireland	All older persons referred to National Forensic-Psychiatric service	42	42	100.0	65	70.0	1	1
Hunt et al.	2010	England and Wales	All persons convicted of homicide as notified by Home Office	2478	54	2.2	65	-	1	1

[a] Order based on result of quality assessment score.
[b] 1 = retrospective cross-sectional quantitative data collection, 2 = prospective cross-sectional quantitative data collection, 3 = both retrospective and prospective quantitative data collection.

Table 2
Characteristics of older female offenders and key findings (N = 12).[a]

Author(s)	Older female offenders as main study population or subgroup	Number of females offenders	% female offenders (among all prisoners)[b]	Number older females offenders[b]	% older females (among all older offenders)	Key findings older female prisoners
Arndt et al.	Subgroup	1213	11.1	11	6.1	-
Moschetti et al.	Subgroup	140	8.5	14	10.0	-
Sodhi-Berry et al.	Main	351	18.9	351	18.9	• Older men were twice as likely to use mental health services for substance use disorders after sentence than older women.
Fazel & Grann	Subgroup	657	9.0	16	7.6	• Types of mental disorders in this sample of men and women aged 60 and over were: psychotic illnesses in 32%, personality disorder in 20%, substance abuse or dependence in 15%, depressive or anxiety disorders in 8%, and dementia in 7%.
Haugebrook et al.	Main	9	7.9	9	7.9	-
Davoren et al.	Main	56	26.3	56	26.3	• Female remands had more affective disorder than younger female controls but not statistically significant. • No significant difference in rates of alcohol misuse or history of neurological disorder between younger and older females. • Older females were less likely to misuse illicit drugs than younger female prisoners.
Williams et al. (a)	Main	22	6.2	22	6.2	-
Williams et al. (b)	Main	10	4.9	10	4.9	• Older persons with severe pain were more likely to be female (9% vs 2%). • Incarcerated older women use health care services more frequently than older men; and community-dwelling older women report pain at higher rates than older men.
Lewis et al.	Main	12	12.1	12	12.1	-
Overshott et al.	Main	4	8.6	4	8.6	-
Farragher & O'Connor	Main	2	4.8	2	4.7	-
Hunt et al.	Subgroup	319	12.8	7	3.8	• More female perpetrators in those aged 45-64 compared to other age-groups.

[a] Order based on result of quality assessment score,
[b] Please refer to Table 1 for the following denominators.

Table 3
Mental health concerns among older male prisoners: Main results (N = 17).[a]

Author(s)	Methods used in the study to categorize MH concerns among older prisoners	Main results related to mental health
Arndt et al.	Chart review	• 22.5% of older offenders suffered from a psychiatric illness.
Gates et al.	ICD-9 classification	• Aging offenders had significantly greater odds for 'having dementia, depression or depressive symptoms'. • There was no association between age groups and the number of comorbid MH disorders. • Of those with MH prescriptions, only one in 6 received medication.
Moschetti et al.	ICD-10 classification	• More than one in four older inmates suffered from at least one psychiatric disorder. • The prevalence of mental disorders was significantly higher compared to younger prisoners.
Nowotny et al.	Decision to include 2 specific serious mental health problems	• Older veteran inmates had higher rates of PTSD than older nonveteran inmates.
Sodhi-Berry et al.	ICD-9-CM Classification	• The second most commonly treated disorder in older offenders were neurotic/ depressive disorders. • Older offenders with a treated mental disorder had a much higher risk of suffering from a comorbid substance use disorder than non-offenders (1.4% vs. 0.05%). • In the 1-year pre-sentence period, older offenders were six times more likely to have at least one MH service contact for any mental disorder than older non-offenders.
Fazel & Grann	ICD-9 from 1988; DSM-IV from 1997	• Older offenders were more likely than younger offenders to be diagnosed with an affective psychosis, less likely to suffer from a personality disorder or schizophrenia. Types of mental disorders in this sample of men and women aged 60 and over were: psychotic illnesses in almost one in 3 cases, personality disorders in one in 5 cases, depressive or anxiety disorders in one in 12, and dementia in one in 14 cases.[b]
Fazel et al.	Geriatric Mental State	• Psychiatric medication needs were met only in 18% of all reported cases. • Of those who were defined as having depression, only 14% were being treated with anti-depressants at the time of the interview.
Haugebrook et al.	Case record review	• MH issues were reported in more than a third of cases.
Hayes et al.	SCID-I and SCID-II, MMSE	• High rates of MH disorder for those aged 50 years and over. • Prisoners aged 50 to 59 were significantly more likely to have mental disorders than those over 60 years.
Davoren et al.	Chart review	• A higher rate of affective disorder was found among older offenders. • Older prisoners have a greater need for general medical and psychiatric services than younger prisoners.
Koenig et al.	DSM-III checklist, Diagnostic Interview Schedule	• More than half of older participants met one-month criteria for psychiatric disorder. • Over a third had a previous psychiatric history requiring treatment. • The one-month prevalence of major depression was 50 times higher compared to the community. • Inmates with psychiatric disorders were more likely to show drug abuse or dependence.
Williams et al. (a)	Self-report for MH problems using survey	• One in seven older individuals reported at least one "serious mental illness".
Williams et al. (b)	Definitions of mental health disorders from Bureau of Justice Statistics	• Half of all older participants suffered from a serious mental illness.
Lewis et al.	Chart review	• Almost a third of older participants had antisocial personality disorder. • Only six subjects had neither Axis I nor Axis 2 diagnosis. Over 2 in 3 subjects had more than one psychiatric disorder. • Almost half had been psychiatrically hospitalized at least once, half of the sample had a family history of mental illness, • Almost 1 in 5 had a history of at least one suicide attempt, more than half had been in outpatient psychiatric treatment immediately before arrest.
Overshott et al.	psychiatric reports (not described in detail)	• At the time of the offence, almost a third of perpetrators suffered from depression. • Older homicide perpetrators had similar proportion of lifetime diagnosis of mental disorder to homicide perpetrators in general. • At the time of the offence, almost of the sample suffered from depression, almost a fifth from personality disorders.
Farragher & O'Connor	Chart review	• Two thirds of the sample of older offenders had a past psychiatric or forensic history.
Hunt et al.	Psychiatric reports for occurrence of certain MH disorders ("symptoms of hypomania, depression, delusions, hallucinations and other psychotic symptoms")	• Older perpetrators were more likely to have symptoms of mental illness at the time of the offence (particularly affective disorder in those aged 65 and over). • They had less personality disorder but more often received a diminished responsibility verdict and a hospital disposal.

[a] Order based on result of quality assessment score
[b] Results similar as Table 2 since findings for older male and older female prisoners were not distinguishable.

genders 'have psychosocial problems and needs, particularly unaddressed trauma and stress histories, and health, mental health, and substance use issues' (p. 223) and the inherent stressfulness of a prison environment may contribute to even more somatic and mental health problems for older adult prisoners. Older offenders who had committed homicide were more likely to suffer from depression while the younger offenders rather showed psychotic disorders and alcohol/drug problems at the time of the offence (Overshott et al., 2012). Another research

Table 4
Mental illness among older prisoners.[a]

Author(s)	Number of older offenders	Any psychiatric problems n (%)	Psychotic disorders n (%)	Affective disorders n (%)	Personality disorders n (%)	Sexual disorders n (%)	Neurological disorders n (%)
Arndt et al.	180	41 (22.5%)					
Gates et al.	2940	1321 (44.9 %)	184 (6.3%)	Depression: 600 (20.4%) Anxiety: 478 (16.3%)			Dementia: 59 (2%)
Moschetti et al.	136	58 (42.6%)	Schizophrenia: 9 (6.6%)	Neurotic, stress-related and somatoform disorders: 18 (13.2%) + mood (affective) disorders 5 (3.7%)		35 (25.7%)	
Nowotny et al.	1160						
Sodhi-Berry et al.	1853	220 (11.9%)	26 (1.4%)	32 (1.7%)	15 (0.8%)		
Fazel & Grann	210	172 (82%)	Psychoses: 67 (32%) Schizophrenia: 15 (7%)	16 (8%)	41 (20%)	6 (3%)	Cerebral lesions: 10 (5%) Dementia: 15 (7%)
Fazel et al.	203	61 (30%)					
Haugebrook et al.	114	41 (36%)					
Hayes et al.	165	160 (97%)	Psychotic disorder: 8 (5%) Any psychotic features: 12 (7%)	91 (55%)	51 (31%)		
Davoren et al.	213		4 (2.2%)	80 (44.4%)			49 (27.2%)
Koenig et al.	95	51 (54%)					
Williams et al. (a)	360	49 (13.6%)	Schizophrenia: 11 (3.0%)	Depressive and bipolar disorders: 64 (17.8%) PTSD: 23 (6.3%)			
Williams et al. (b)	210	104 (50%)					
Lewis et al.	99	93 (93.9%)	25 (25.2%)	11 (11.1%)	34 (32.3%)		Dementia: 44 (44%)
Overshott et al.	47	20 (42%)	2 (4%)	15 (32%)	8 (17%)		5 (11%)
Farragher & O'Connor	42		Schizophrenia: 6 (14%) Paranoid disorders: 4 (10%)	2 (5%)			6 (14%)
Hunt et al.	54	29 (54%)	Schizophrenia: 5 (9%)	27 (50%)			

[a] Order based on result of quality assessment score.

Table 5
Substance use among older male prisoners: Main results (N = 17).[a]

Author(s)	Methods used in the study to categorize substance use	Main results concerning substance use
Arndt et al.	Substance Abuse defined by DSM-IV criteria	• More than two thirds of older inmates report substance abuse problems at admission to prison (less than younger prisoners). • Older inmates are more likely than younger inmates to have abused one substance only (primarily alcohol). • Older inmates are less likely to have received previous treatments for substance abuse problems.
Gates et al.	ICD-9 classification	• Aging offenders had significantly lower odds for having a history of cannabis and cocaine use disorders.
Moschetti et al.	ICD-10 classification	• Lower rate of mental illness related to psychoactive substance use. • Less likely to misuse illegal drugs, more likely to abuse alcohol. • Two measures on drug problems revealed differences: 32% declared being active drug users in entry examination with nurse, 18% were diagnosed with drug abuse problems in psychiatric follow-up.
Nowotny et al.	DSM-IV for substance use	• Among substance users with behavioral issues, there is a high burden of disease related to drug and alcohol use (HIV/AIDS, Hepatitis) and also a high level of behavioral health issues. • Substance users with behavioral health issues have greater criminal justice involvement, higher rate of past incarceration episodes. This group has the highest percentage of African-American men.
Sodhi-Berry et al.	ICD-9-CM classification	• Substance use disorders were the most commonly treated disorders for offenders and non-offenders.
Fazel & Grann	ICD-9 from 1988; DSM-IV from 1997	• Substance abuse or dependence problem in one in 6 older prisoners.
Fazel et al.	Review of prison records	• Older prisoners have a very low level of drug misuse.
Haugebrook et al.	Case records	• Very high reported prevalence of 'substance use issues'.
Hayes et al.	Review of prison records	• Substance use disorders were more likely in the age group 50-59 (for both, alcohol and drugs).
Davoren et al.	-	• Less illicit drug use among older prisoners. • Higher rates of alcohol misuse among older prisoners.
Koenig et al.	DSM-III checklist	• More than half of older offenders were incarcerated on drug charges. • More than half of the sample showed alcohol or drug abuse.
Williams et al. (a)	TCU Drug Screen, CAGE alcohol dependency questionnaire	• 25.2% had a drug dependency score over 3 on TCU. • 45.6% had an alcohol dependency score over 2 on CAGE.
Williams et al. (b)	Drug Abuse Screening Test and AUDIT-C	• 56% drug use, 60% problematic alcohol use.
Lewis et al.	Prison charts	• Alcohol dependence was the most common diagnosis (over two thirds of the sample). • 62% of the co-morbidity cases, it included alcohol abuse or dependence.
Overshott et al.	Psychiatric reports	• Prevalence rates of alcohol dependence were low at the time of offence.
Farragher & O'Connor	Review of prison records	• More than one third of the sample (much higher prevalence depending on the subgroup 10 - 82%) had a history of alcohol abuse.
Hunt et al.	Psychiatric reports for occurrence of certain MH disorders	• Rates of previous drug misuse, alcohol misuse, and violence were lowest in those aged 65 and over.

[a] Order based on result of quality assessment score.

mentioned an unexpectedly low proportion of older offenders with 'MHS[1] contacts and comorbid substance use'. This may be explained by a possible under-treatment of substance use disorders or under-reporting of these in administrative databases (Sodhi-Berry et al., 2015).

The relation between general 'alcohol abuse or dependence and alcohol use at the time of the offense' was linked to violent crime both for older and for younger offenders (Lewis, Fields, & Rainey, 2006). Older offenders with a history of alcohol or drug use were found to be at higher risk for a current psychiatric disorder and substance abuse (Koenig et al., 1995). This in turn may hide underlying mental health problems.

Finally, while rates of drug/alcohol dependence were similar among prisoners irrespective of age, Williams et al. (2010) reported that participants with severe persistent pain (who were older prisoners) were more likely to receive opioids than those with less severe pain.

3.3. Older female prisoners

3.3.1. Mental health disorders and substance use among older female prisoners

Since female prisoners compose an important segment of the 'older prisoner' group, we sought to analyze them separately. These studies are summarized in Table 2. Specifically, older female remand prisoners suffered more from affective disorders than their younger prisoners, but the difference was not statistically significant. Women in general had higher prevalence of psychiatric problems than men, especially for 'mood disorders, reaction to severe stress and personality disorders' (Moschetti et al., 2015), and greater odds for suffering from dementia, depression or depressive symptoms, but there were no gender differences for the association of age and prevalence or number of mental health diagnoses (Gates et al., 2017). Likewise, Davoren et al. (2015) noted no significant difference between older and younger female remand prisoners when alcohol use and history of neurological disorders were compared. As stated previously, they also found that older female remand prisoners were less likely to misuse illicit drugs than younger female prisoners.

3.4. Older prisoners vs older adults in the community

Few of the included studies compared the prevalence rates of mental illness among older individuals in prison and in the community leading to differing results. In one study, rates of serious mental illness in older prisoners are comparable to older persons in the community although a possible under diagnosis and consequent under treatment of mental health problems among the prison population was mentioned (Nowotny et al., 2016). Comparing the older forensic and general psychiatric populations, a possible link between 'psychotic symptoms, specifically paranoia, and violent crime' may exist in both populations (Lewis et al., 2006). Elsewhere, around 14% of older offenders were reported to suffer from at least one serious mental illness, a result comparable to a prevalence of 15 to 20% in older adults in the community, but the authors cautioned that PTSD was excluded from this category leading to under diagnosis (Williams et al., 2010). Diagnostic instruments pointed to drug dependency in 25% of cases and to alcohol dependency in almost half of the sample. Another study mentioned a higher prevalence of mental health issues in prisons compared to the community (56% compared to 10.6 %) underlining that 'the health status of prisoners in their 50s is viewed as equivalent to the health status of community members in their 70s' (Haugebrook et al., 2010). Although studies

[1] mental health service

Table 6
Substance use among older prisoners.[a]

Author(s)	Number of older offenders	Substances included	Any substance use n(%)	alcohol n (%)	Cannabis n (%)	Other illicit drugs n (%)	Other n (%)
Arndt et al.	180	Alcohol, Cocaine/Crack, Marijuana, Methamphetamine, other substances	128 (70.9%)	153 (85.04%)	3 (1.6%)	Cocaine/ crack: 14 (7.9%)	
Gates et al.	2940	Alcohol, cannabis, cocaine, heroin, IDU, narcotic, tobacco	2134 (add %)	542 (18.4%)	188 (6.4%)	Heroin: 16 (0.7%) IDU: 229 (8%) Cocaine or crack: 160 (5.4%)	Tobacco: 999 (34%)
Moschetti et al.	136	‚drug misuse‘‚pharmaceutical misuse‘, ‘alcohol misuse‘, ‘cigarette misuse‘	26 (19.1%)	33 (24.2%)		8 (5.9%)	Pharmaceuticals: 5 (4.0%) Tobacco: 53 (38.9%)
Nowotny et al.	1160	‘Substance use dependence’, ‘injecting drug use’	657 (56.6%)			IDU:749 (64.6%)	
Sodhi-Berry et al.	1853	‚substance use‘	106 (5.7%)				
Fazel & Grann	210	‚Alcohol/drug abuse/dependence‘	31 (15%)				
Fazel et al.	203	Substances	10 (5%)				
Haugebrook et al.	114	Substances	92 (81%)				
Hayes et al.	165	‚Drug misuse disorder‘ ‚alcohol misuse disorder‘	83 (50%)	77 (47%)		23 (14%)	
Davoren et al.	213	Substances, alcohol, ‘illicit drugs’	83 (39%)	77 (36%)		16 (8%)	
Koenig et al.	95	Alcohol and drugs	54 (56.8%)				
Williams et al., 2010	360	Alcohol (CAGE), ‘drug dependency’ (TCU drug dependence score)	drug dependence: 91 (25.2%), alcohol: 164 (45.6%)				
Williams et al. 2014	210	’drug/alcohol dependence’		127 (60%)		118 (56%)	
Lewis et al.	99	Alcohol, drugs		67 (68%)		17 (17%)	
Overshott et al.	47	Alcohol		3 (6%)			
Farragher & O‘Connor	42	Alcohol	15 (35.7%)	15 (35.7%)			
Hunt et al.	54	Drugs, alcohol		History of alcohol use: 6 (11%)	0	0	

about the general population mention prevalence of mental health disorders reducing with age, high psychiatric morbidity is reported in older offenders (Sodhi-Berry et al., 2015). Compared to both younger prisoners and older adults in the community, older prisoners show significantly higher rates of major illnesses and functional impairment, with 'alcohol misuse, underdiagnosed depression, and liver diseases' as particular problems (Fazel & Baillargeon, 2011).

3.5. Older prisoners' access to mental health care and recommendations

As early as 1995, low treatment rates for psychiatric conditions were reported in a prison context (Koenig et al., 1995). Likewise, Fazel et al. (2004) confirmed that only 18% of older male prisoners with a recorded problem were receiving psychotropic medication. In comparison to younger prisoners, older prisoners were found to be significantly less likely to be diagnosed with schizophrenia or a personality disorder, but more likely to be diagnosed with dementia or an affective psychosis (Fazel & Grann, 2002). Another study pointed out that none of the prisoners aged 65 years old or older had ever been in contact with psychiatric services, although more than two-thirds of this group was suffering from a 'mental illness, especially depression' (Overshott et al., 2012). For the prisoners 60 to 64 years old, 35% had had previous lifetime contact, and almost half of that group had a diagnosis of mental illness when committing the offence.

Included studies also provided further recommendations to address the limited access to mental health services provided to older prisoners. Arndt et al. (2002) cautioned that the release of elderly inmates at a time when they need more medical and social support may conflict with effective rehabilitation strategies. Numerous authors recommended better age-sensitive detection and treatment of mental health disorders within the prison context and advocated special forensic and therapeutic services (Davoren et al., 2015; Fazel & Grann, 2002; Sodhi-Berry et al., 2015). For individuals with substance use and/or mental health disorders, efficient pain management can be hindered by clinicians' fears of misuse or diversion of medication or overdosing. For appropriate therapy and medication, developing a specific approach to assessment and management of pain in older inmates is recommended Williams et al., 2011. Further suggestions consisted of ensuring an assessment by geriatric psychiatrists for all offenders above pension age and revising traditional age cut-offs to become more inclusive in terms of who is an 'older' person in prison. Reasons for this are to correct possible under diagnosis of depression in particular and to take into account 'the specific issues of old-age psychiatry' in a comprehensive way during cognitive assessments (Overshott et al., 2012).

4. Discussion

4.1. General remarks

This paper is the first to our knowledge to present information on co-occurrence of substance use and other mental health disorders among older offenders. It presents comprehensive information by ensuring that all data relevant for older male and female prisoners are included. This systematic review of literature on this under-researched topic allows us to underline the increased burden of mental illness that occurs within the aging offender population, which is often neglected. As only 17 studies fulfilled our inclusion criteria, the sheer number in and of itself may be depicting the limited knowledge that is available on this topic. The fact that our search did not identify any studies from regions such as Eastern Europe, Asia and Africa might depict lacking resources to carry out research, or disinterest in this issue in particular and older prisoners in general. A lot more needs to be done to understand the overall burden of mental health illness among prisoners worldwide. With respect to who is an "older" prisoner, our results show that the included studies used varying age "cut-offs". Such varied usage (45 to 65 years) has several implications not only on the comparability of data, but also concerning access to mental health care.

The quality of the included studies varied considerably in terms of scientific value. Results of the quality appraisal tool (total score 6) were on a range of 1 (n = 2) to 6 (n = 1). Reasons for a low score include lacking information about how a diagnosis was classified, i.e. international classification of disorders or validated screening instruments; small sample size; or a main study sample that was too specific (e.g. only individuals having committed homicide). However, the majority of studies (n = 9) obtained a score of 4 or above, which means that the overall quality of the included publications was satisfactory.

4.2. Mental health disorders and substance use

The analysed studies show a higher prevalence of mental health disorders among older prisoners compared to younger inmates. This finding confirms previous results (Anno, Graham, Lawrence, & Shansky, 2004; Binswanger, Krueger, & Steiner, 2009; Binswanger, Merrill, Krueger, et al., 2010). Second, our finding that alcohol is the most common substance among older offenders mirrors the patterns of substance use among older individuals in the general population where alcohol is the most widely used substance as well (Kuerbis, Sacco, Blazer, & Moore, 2014). The fact that drug use prevalence among offenders is much higher than among the general population has been long stated (cf. Lintonen et al., 2011), and we hypothesize possible changes in substance use patterns due to demographic changes. Third, older female offenders differ from older male offenders both for substance use patterns and for prevalence of certain mental health issues. Forth, regarding substance use among older prisoners, studies differed considerably in the substances that were mentioned. Only two recent publications included tobacco among mental health problem which might show the growing focus on health hazards due to smoking in prison. Most studies named alcohol as a separate category and one of the oldest publications focused on alcohol alone (Farragher & O'Connor, 1995). Two studies only indicated "substance use" without explaining if alcohol was considered a psychoactive substance or not and included in this (Haugebrook et al., 2010; Sodhi-Berry et al., 2015). Ideally, in further studies substance use should be coded according to internationally used ICD or DSM classification because differing degrees of detail and random choices of substances make comparisons difficult.

Older prisoners diagnosed with mental health disorders and in particular with substance use may be subject to under diagnosis and under treatment of pain. This can severely reduce their quality of life. Reasons for this may be limited resources in prison health services, but also other factors like fears of misuse and diversion of pain medication or overdosing may play a role here, just as in the general population (O'Brien et al., 2017). However, this should not be a barrier to efficient and appropriate treatment. Medical staff need to decide about treatment options based solely on state-of-the-art, evidence-based guidelines.

The high prevalence of mental health disorders among older prisoners is a phenomenon that needs to be addressed. Symptoms of mental illness at the time of the offence increased with age. Offenders over 64 suffered particularly from affective disorder. As mentioned, the age segment between 45 and 64 includes "older" offenders according to some cut-off ages. For these "middle age groups", alcohol dependence was common in addition to schizophrenia. More than half of offenders aged 65 and over were mentally ill (mostly depression and possible psychosis), with some even living with dementia. Proportionally, fewer detained adults aged over 64 had been in contact with mental health services before committing the offence. Similarly, Hunt et al. (2010) describe prisoners aged 65 and over as having significantly more symptoms of mental illness at the time of the offence and also at later evaluation.

An important finding is that several studies show drug use to be more common among younger prisoners than among older prisoners, although rates and populations differed considerably for example for

alcohol use (Hunt et al., 2010) or for remand prisoners (Davoren et al., 2015). One study did not differentiate by gender but showed that younger offenders differed significantly from older offenders mainly for cannabis consumption while consumption of other substances was comparable (Arndt et al., 2002). Substance use patterns are thus likely to shift when currently young or middle-aged offenders will age.

4.3. Definition of "older offenders" and age cutoff

As alluded previously, clarity and consistency in using a 'correct' cutoff age is important. Several studies note 50 years (Loeb & AbuDagga, 2006; Wangmo et al., 2015), while others use 55 Williams et al., 2011, or 60 (Davoren et al., 2015) or even older. The Australian Institute of Criminology recommends different thresholds to define older non-Indigenous and Indigenous offenders, 50 (for non-Indigenous) and 45 years (for Indigenous) because of the latter group's decreased life expectancy and poorer health status (Sodhi-Berry et al., 2015). Similarly, extensive discussion arose concerning the definition of the 'older prisoner' and the different cut-off ages of 50, 60 and 65 years that have been applied especially in UK-based research (Hayes et al., 2012). Pointing out the lack of scientific evidence for a cut-off at age 50, they chose a cut-off at 60 in order to make their research comparable with other studies but also included a random sample of prisoners aged 50 and older to examine the utility of this cut-off. They confirmed the utility of a cutoff age of 50 because the health needs of this group proved to be very similar to offenders aged 60 and older.

The choice of a cut-off age may have important consequences. A greater likelihood to be diagnosed with diminished responsibility may also be influenced by 65 years being "the traditional age limit for old-age psychiatry services in the UK" (Overshott et al., 2012) and consequently examination and diagnoses done by geriatric specialists.

4.4. Gender in prisons

Most studies in the prison context are done on male prisoners. Although excluding female prisoners from the study population was justified with ethical arguments and accompanied by acknowledging their 'constitutively different' needs, it confirms the fact that older females constitute a subgroup of a subgroup and are thus even more vulnerable and neglected concerning research, as previous studies have shown (cf. Aday & Farney, 2014; Handtke, Bretschneider, Elger, & Wangmo, 2015).

One study's finding that female adults in remand prisons were overrepresented in the older prisoner group (Davoren et al., 2015) was explained by the fact that older women live longer than men and the global population of older persons is thus predominantly female. However, it is known that women commit far less crimes than men and that the population of a remand prison is not representative of a population of sentenced prisoners; for Ireland, a third to half of incarcerated women were said to be on remand (Quinlan, 2006). More research might elucidate this overrepresentation. Although the percentage of women was indicated in those studies that included female offenders, not all authors subdivided them into older and younger females.

The specific challenges of older female prisoners – such as a higher prevalence of smoking, drug use, mental health problems, and severe pain – may partly be explained by the different type of offences they commit, which went beyond the scope of this literature review.

4.5. Limitations of the study

First, our keyword search may not have included every search term designed to find all possible results. Studies which solely focused on smoking and mental health issues may not have been retrieved with our keywords. Second, several studies did not differentiate between older male and female prisoners, and due to the much higher proportion of male than of female offenders, we decided to put them under prevalence rates for male offenders. However, they may not reflect the accurate prevalence rates. Third, diagnostic criteria were not always clear. In studies where data are copied from charts and medical records it was not always evident how diagnoses and observations were generated. Misdiagnoses and bias may thus not be excluded, and we may have interpreted possibly different things to mean the same. On the other hand, relying on self-reports can be problematic because prisoners may fear stigmatization for mental health problems and tend to underreport current or past problems which may lead to unmet health needs (Fazel et al., 2004; Hunt et al., 2010; Koenig et al., 1995). Another consequence of relying solely on self-reports could be malingering and inflation of certain prevalence rates (Hayes et al., 2012; Sodhi-Berry et al., 2015). Finally, due to the mentioned differences and the variety for the choice of an 'appropriate' age cutoff (between 45 and 65 years), subgroups that were defined as 'middle aged' in one publication could have been included in the 'older' category of other studies, with possible changes of the results, but it is beyond the scope of this review to see which change in prevalence may stem from this.

5. Conclusion

To our best knowledge, the present study is the first to systematically review possible prevalence of both substance use and other mental health disorders among the population of older prisoners. The lack of reliable data on this issue for this group is evident. Neurodegenerative disorders that are typical for an aging population, such as dementia, are only partially reflected in these studies and will require specific approaches. Also, the prison administrations and health services will need new strategies to tackle issues related to mental health problems including substance use. Due to limited access to alcohol in prison, the problem could be overlooked or forgotten. Case managers or other liaison persons need to be aware of the high prevalence of substance use also in older prisoners in addition to mental health disorders and to facilitate a seamless transition from prison to the outside world by not only making sure that all relevant information from prison records is not only passed on but also by proactively requesting appointments or assessments.

Although research has clearly shown that the group of older offenders has distinct needs for somatic as well as for mental health care, limited resources and lacking political will can make it difficult to provide adequate possibilities for diagnosis, treatment and accommodation. Given recommendations range from small steps that can be easily implemented in daily practice (like making geriatric assessments a standard part of health service provision, or changing clinicians' fear of adequately prescribing pain medication) to resource intensive changes like constructing new units for vulnerable prisoners or adapting healthcare provision given in the community to the needs of older prisoners that have been released. Recommendations made in the various publications are still valid, no matter the publication date. Ignoring the problem that has become more obvious over the years will not result in making it go away. More research – on both genders - is urgently needed to plan the optimal delivery of appropriate mental health care for the currently older prisoners and prepare for a currently younger population that will age with different and distinct mental health disorders and substance use patterns.

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