

Impact of dual diagnosis on healthcare and criminal justice costs after release from Queensland prisons: a prospective cohort study

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ABSTRACT

Background. People released from prison have poorer health than the general public, with a particularly high prevalence of mental illness and harmful substance use. High-frequency use of hospital-based services is costly, and greater investment in transitional support and primary care services to improve the health of people leaving prison may therefore be cost-effective. **Methods.** A prospective cohort study of 1303 men and women released from prisons in Queensland, Australia, between 2008 and 2010, using linked data was performed. We calculated healthcare costs and the cost of re-incarceration. We compared healthcare costs to the general public, and assessed the impact of past mental illness, substance use disorder, and dual diagnosis on both healthcare and criminal justice costs. **Results.** Healthcare costs among the cohort were 2.1-fold higher than expected based on costs among the public. Dual diagnosis was associated with 3.5-fold higher healthcare costs (95% CI 2.6–4.6) and 2.8-fold higher re-incarceration costs (95% CI 1.6–5.0), compared with no past diagnosis of either mental illness or substance use disorder. **Conclusions.** People released from prison incur high healthcare costs, primarily due to high rates of engagement with emergency health services and hospital admissions. Comorbid mental illness and substance use disorders are associated with high health and criminal justice costs among people recently released from prison.

Keywords: alcohol, harmful substance use, health economics, health equity, mental health, prison health.

Introduction

Within most health systems, people with complex health needs account for a disproportionate volume of health service use (Vickery *et al.* 2018). People who experience incarceration are one such population, partly owing to greater social disadvantage (Australian Institute of Health and Welfare 2016) and a high prevalence of chronic health conditions, including mental illness and substance use disorders (Fazel *et al.* 2016; Fazel *et al.* 2017). Accordingly, people released from prison utilise primary (Carroll *et al.* 2017), acute (Erlyana *et al.* 2014) and tertiary (Alan *et al.* 2011) healthcare services at higher rates than the general population.

Justice-involved people face substantial barriers to engagement with many community-based primary health services, which may limit their access to high-quality preventive care, and thus increase engagement with acute services (Wang *et al.* 2012). Alcohol and other drug services in Australia are estimated to reach fewer than half of those who would benefit from treatment, with particular gaps recognised in the provision of services to people with co-occurring mental illness ('dual diagnosis') and those in contact with the criminal justice system (Ritter *et al.* 2014). There have also been persistent concerns about the accessibility of mental health services in Australia, especially for those with complex needs and without private health insurance (Select Committee on Mental Health 2006).

Received: 30 June 2021

Accepted: 3 February 2022

Published: 6 May 2022

Cite this:

Snow KJ *et al.* (2022)
Australian Journal of Primary Health
28(3), 264–270. doi:[10.1071/PY21142](https://doi.org/10.1071/PY21142)

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Aboriginal and Torres Strait Islander people are incarcerated at much higher rates than other Australians, and suffer a high burden of many health conditions, including mental illness and substance use disorders (Abbott *et al.* 2018). As such, Aboriginal and Torres Strait Islander people leaving prison have particular needs for transitional support, which are not always met (Abbott *et al.* 2018). Australia has a strong system of Aboriginal-controlled health services, many of which provide care to people in prison; however, these services are not universally available (Australian Institute of Health and Welfare 2016).

For people with a dual diagnosis and limited access to community-based services, a mental health crisis may prompt presentation to hospital emergency departments (EDs), which are suboptimal sites for care (Allison *et al.* 2018). Mental health crises and relapse to illicit substance use can also increase the risk of further justice system contact and re-incarceration (Galassi *et al.* 2015).

Given the high costs associated with hospital-based service use and re-incarceration, interventions to improve the health of people released from prison may be cost-effective (Gisev *et al.* 2015). This would be particularly true of transitional support and community-based services, which may provide substantial health benefits at relatively low cost. However, the financial costs of state- and federally funded health service use and re-incarceration after release from prison have not been well quantified to date in Australia or elsewhere. Better quantification of these costs may inform both health economic modelling and targeted investments in community-based mental health and substance-related treatment services.

In a representative cohort of adults released from prisons in Queensland, Australia, the aims of this study were to: (1) calculate the cost of contact with primary care, emergency and in-patient health services after release from prison from a government payer perspective; (2) assess whether and to what extent a recent diagnosis of mental illness, a substance use disorder or a dual diagnosis was associated with higher healthcare costs; and (3) assess the impact of dual diagnosis history on re-incarceration and associated criminal justice costs.

Methods

Baseline data

We used data from a prospective cohort study of 1325 adults recruited within 6 weeks of expected release from prisons in Queensland, between August 2008 and July 2010. Participants were administered a baseline survey covering a broad range of demographic, social and health-related topics. A detailed account of recruitment and the baseline survey has been published previously (Kinner *et al.* 2013).

Women were intentionally oversampled to increase statistical power for sex-stratified analyses: 22% of the sample

for this study were women, compared with 7% of the prison population nationally in 2009 (Australian Bureau of Statistics 2009). Participants were asked to consent to correctional and health records access by the study team, both retrospectively from the interview and for follow-up purposes.

Linked data

Healthcare records included retrospective and prospective (until 30 June 2012) state-funded health service use (ambulance, ED and hospital). Paper-based prison medical records pertaining to the current and any previous episodes of incarceration were accessed retrospectively, and coded according to the International Classification of Primary Care – Second Edition (ICPC-2). Records of federally funded primary healthcare (Medicare Benefits Schedule billable services and Pharmaceutical Benefits Scheme records) were linked prospectively for each participant for 2 years post-release. Criminal justice records were available from the index incarceration until 31 December 2013. This study utilised data from the first 12 months after release from prison for each participant.

Diagnoses of mental illness, substance use disorder or dual diagnosis made prior to the index incarceration episode were ascertained retrospectively from diagnostic information in records from past contacts with prison health services, ED presentations and hospital admissions, using a process described in detail previously (Young *et al.* 2018).

We used ICD-10-AM codes to calculate the proportions of ED presentations and hospital admissions due to injury/poisoning/external causes (ICD chapter S-T) or mental and behavioural disorders (ICD chapter F), and the associated costs. Diagnostic data were not available in ambulance, primary care or prescribing data.

Rates of ED presentations and hospital admissions among the cohort were compared with those among the age- and sex-matched general population by calculating expected event rates for the cohort based on published, age- and sex-disaggregated data for adults in Queensland in 2009–2010. Age- and sex-stratified data for the general population were not available for ambulance attendances. We have previously documented that the cohort accessed primary care at two to three times the rate of the age- and sex-matched general public (Carroll *et al.* 2017), and so did not repeat this analysis for this study.

Data analysis

Costs for Medicare Benefits Schedule services and Pharmaceutical Benefits Scheme dispensing were extracted from reimbursement amounts within the linked records. This analysis was from the government payer perspective, so out-of-pocket costs were not included. ED presentations and hospital admissions were classified using urgency related groupings and diagnostic related groupings, respectively, and then costed based on estimates published by the Independent

Hospital Pricing Authority. Ambulance attendances were costed at A\$681 per encounter, based on published data for 2010–2011 (Department of Community Safety 2011). All costs were subsequently inflated into 2021 A\$ and US\$ based on the consumer price index for health services (Australian Bureau of Statistics 2021) and the exchange rate from Australian dollars (A\$) to US dollars (US\$) on 21 June 2021 (A\$1 = US\$0.7537).

Despite the skewed nature of the data, we used mean costs per person for most analyses, as this is the most relevant measure from the perspective of a government payer who covers the total costs for large groups of people. We used a negative binomial regression to estimate excess mean costs per person according to dual diagnosis status, after adjusting for demographic potential confounders. Negative binomial regression was chosen over Poisson regression due to the over-dispersed nature of the data. Potential confounders were identified *a priori* and included age group (18–24, 25–34 or ≥35 years), sex (female or male) and Indigenous identification (Aboriginal and/or Torres Strait Islander, or other ethnicity).

We estimated the association between dual diagnosis history and time spent re-incarcerated, after adjusting for age, sex and Indigenous identification. We estimated the mean cost per-person incurred through re-incarceration using published estimates from the Australian Institute of Criminology (Morgan 2018).

Unit-record data management and analysis was performed in Stata 13 (StataCorp, College Station, TX, USA). Summary data were managed in Microsoft Excel to produce tables and figures (Microsoft, Redmond, WA, USA).

Ethics approval

Ethics approval for the study was granted by The University of Queensland's Behavioural and Social Sciences Ethical Review Committee. Approval for linkage to federal and state health data were provided by the Australian Institute of Health and Welfare Ethics Committee and the Queensland Health Human Research Ethics Committee, respectively.

Results

Linked data from all sources required for this analysis were available for 98% of the original cohort of 1325 individuals, providing a sample of 1303 for this study. A total of 10 participants did not consent to record linkage, and 12 were not released as expected. The characteristics of the sample at baseline are presented in Table 1.

In the year following release from prison, the cohort experienced 705 ambulance encounters (54 per 100 person years), 1348 ED presentations (104 per 100 person years) and 472 hospital admissions (36 per 100 person years). The cohort presented to ED at 4.23 times the rate expected compared to the age- and sex-matched general population

Table 1. Baseline characteristics of the cohort (*n* = 1303).

Factor	Value	Number (%)
Sex	Female	277 (21.3)
Indigenous status	Aboriginal or Torres Strait Islander	329 (25.2)
Age	Aged 18–24 years	332 (25.5)
	Aged 25–34 years	494 (37.9)
	Aged ≥35 years	477 (36.6)
Incarceration history	Prior incarceration	865 (66.4)
Dual diagnosis history	No diagnosis of mental illness or substance use disorder	616 (47.3)
	Mental illness only	99 (7.6)
	Substance use disorder only	314 (24.1)
	Dual diagnosis	274 (21.0)

(95% CI 3.76–4.78), and were admitted to hospital at 2.45 times the rate (95% CI 2.06–2.91).

Rates of presentation were highest among those with a dual diagnosis, and lowest among those with no diagnosis of mental illness or substance use disorder, although rates in this latter group were still higher than among the age- and sex-matched general population (Fig. 1). Fig. 1 also shows the most common broad causes of ED presentation and hospital admission, according to dual diagnosis status.

Costs

The total cost of the five health service types used by the cohort within 1 year of release from prison was A\$8.0 million (US\$6.0 million). Of this, 77% was incurred through state-funded services: 57% of all costs were incurred during hospital admissions, 11% during ED presentations and 9.3% during ambulance attendances. The remaining 23% of costs were incurred through federally funded services: 14% through Medicare-subsidised services, and 9.2% through subsidised medications.

Within hospital admissions, 30% of costs were generated through admissions due to injury, poisoning and external causes (17% of total costs), and 24% of costs were generated through admissions for mental and behavioural disorders (14% of total costs). Likewise, 33% of all ED costs were incurred through presentations due to injury, poisoning and external causes, and 16% were due to presentations for mental and behavioural disorders.

Total healthcare costs per person were positively skewed within the cohort, with most people incurring low or no costs in the services considered, and a small number incurring very high costs. The median cost per person was A\$1476 (US\$1113), and the mean cost per person was A\$6126 (US\$4617; Table 1). The top 10% of the cohort (130 individuals) accounted for 59% of all measured healthcare costs. Participants with a dual diagnosis comprised 21% of the

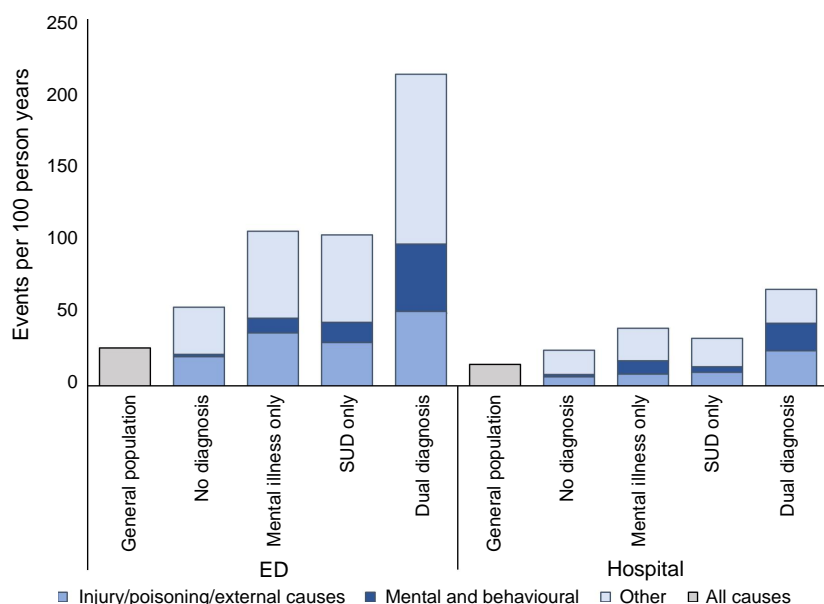


Fig. 1. Rates of emergency department (ED) presentation and hospital admission by broad cause, stratified by dual diagnosis^A history (events per 100 person years). ^A'No diagnosis' refers to those without a diagnosis of either mental illness or substance use disorders. SUD, substance use disorder.

Table 2. Observed mean healthcare costs and adjusted ratios of costs per person.

Group	Observed mean costs (2021 A\$)	Adjusted ^A ratio of healthcare costs (95% CI)
All participants	\$6126	–
Men	\$6213	Ref
Women	\$8304	1.34 (1.03–1.74)
Aboriginal or Torres Strait Islander	\$6754	1.00 (0.78–1.29)
Other ethnicities	\$6626	Ref
Aged 18–24 years	\$5544	Ref
Aged 25–34 years	\$7457	1.10 (0.84–1.45)
Aged ≥35 years	\$6605	1.22 (0.93–1.61)
No diagnosis of mental illness or substance use disorder	\$3915	Ref
Mental illness only	\$8749	2.15 (1.42–3.24)
Substance use disorder only	\$5390	1.37 (1.05–1.78)
Dual diagnosis	\$13 522	3.46 (2.62–4.57)

^AAdjusted for age group, sex and Indigenous status.

cohort, but incurred 43% of total healthcare costs. Costs in the cohort were 2.1-fold higher than expected, based on costs in the age- and sex-matched general public.

Table 2 shows the mean costs per person stratified by key variables. Even after adjustment for demographic factors, dual diagnosis was associated with a 3.5-fold increase in costs compared with no diagnosis of mental illness or substance use disorder (95% CI 2.6–4.6).

Re-incarceration and associated costs

Within the sample, 435 (33%) participants returned to custody during the follow-up period, and 13% of all follow-up time

was spent in custody. However, these proportions varied markedly according to dual diagnosis status (Table 3).

In this cohort, the total cost of re-incarceration would have incurred an additional total cost to government of A\$25.0 million (US\$18.8 m). Fig. 2 shows the mean cost per person associated with re-incarceration in the cohort, stratified by dual diagnosis status. Multivariable negative binomial regression adjusted for age group, sex and ethnicity showed only a slight increase in re-incarceration costs associated with mental illness alone, but a significant increase in re-incarceration costs associated with substance use disorder alone and with dual diagnosis (Table 3).

Table 3. Return to custody, time spent re-incarcerated and associated costs according to dual diagnosis status.

Group	Number re-incarcerated (% of stratum)	Person-years spent re-incarcerated (% follow-up time)	Mean cost of re-incarceration per person (2021 A\$)	Adjusted ^A ratio of re-incarceration costs (95% CI)
No diagnosis of mental illness or substance use disorder	154/616 (25)	58.6 (9.5)	\$14 160	Ref
Mental illness only	19/99 (19)	7.8 (7.9)	\$11 729	1.12 (0.50–2.49)
Substance use disorder only	140/314 (45)	50.1 (16.0)	\$23 779	2.13 (1.26–3.59)
Dual diagnosis	122/274 (45)	51.1 (18.7)	\$27 803	2.83 (1.62–4.97)
Total	435/1303 (33)	167.6 (12.9)	\$19 162	–

^AAdjusted for age group, sex and Indigenous status.

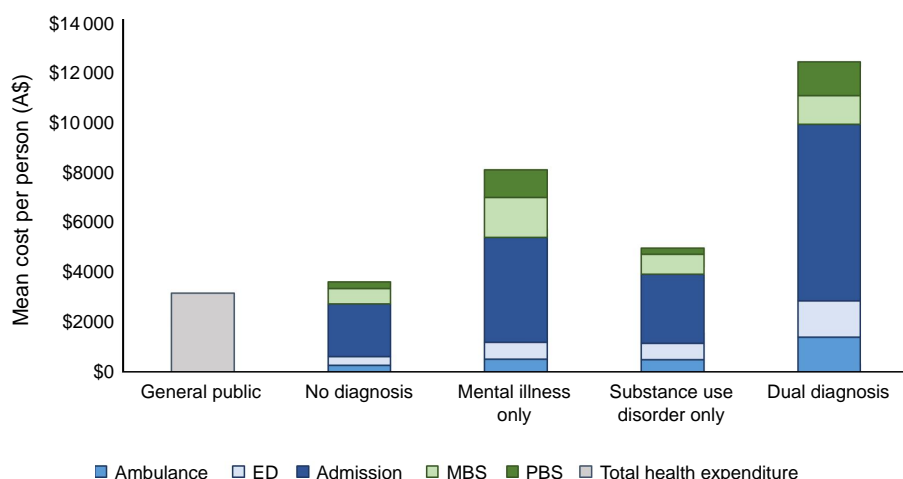


Fig. 2. Mean healthcare costs per person by type of service, stratified by dual diagnosis^A history (2021 A\$ per person). ^A‘No diagnosis’ refers to those without a diagnosis of either mental illness or substance use disorders.

Discussion

In this study, we characterised the costs of health service contacts made by people in the year after release from prisons in Queensland, and the frequency and cost of re-incarceration stratified by history of diagnosed mental illness, substance use disorders and dual diagnoses. In total, the study cohort of 1303 individuals generated costs of A\$8.0 million (US\$6.0 m) through health services, and an additional A\$25.0 million (US\$1.8 m) through re-incarceration. A large majority of healthcare costs (77%) were incurred via state-funded acute and tertiary health services, with hospitalisations due to injury, poisoning and external causes being the single greatest contributor to costs (17% of total health costs). Dual diagnosis was associated with 3.5-fold higher healthcare costs, and a 2.8-fold increase in criminal justice costs after adjustment for demographic confounders.

We have previously shown that this cohort accessed primary care services at two to three times the rate of their age- and sex-matched peers (Carroll *et al.* 2017); that co-occurring substance use and psychiatric disorders are a major driver of non-fatal injury after release from prison (Young *et al.* 2018), and that frequent ED attendance is strongly associated with returning to custody (de Andrade *et al.* 2019). Here, we

documented the costs associated with both health service use and re-incarceration according to dual diagnosis status. We have shown that comorbid mental illness and substance use disorders are associated with worse outcomes, and, therefore, markedly higher costs to government.

These findings confirm that increased investment in transitional support and primary health services to address mental illness and substance use disorders among people recently released from prison are likely to be cost-effective. For example, it has previously been shown that continuation of opioid substitution therapy after release from prison in Australia is extremely cost-effective, at A\$500 per life saved in 2012, and that post-release drug treatment and criminal justice costs were halved among those on opioid substitution therapy (A\$7206 vs \$14 316 in 2012; Gisev *et al.* 2015). Despite this, access to opioid substitution therapy remains variable in Australian prisons, and it is entirely unavailable in many countries around the world (Harm Reduction International 2020).

Our analysis had several limitations. First, high-quality data were not available for all healthcare services that participants may have accessed after release. As such, we have underestimated the total healthcare costs incurred by the cohort, particularly from the state perspective. Costs in

our cohort reflect costs in the Australian health system, which is largely public and strongly regulated. Costs in the USA and other settings may be markedly higher.

The cohort were recruited from 2008 to 2010, and costs in more recently released cohorts may be slightly different. However, the mental and physical health profile of people incarcerated in Australia is not likely to have changed markedly in the intervening years. Consequently, the key findings of this analysis – that health and re-incarceration costs are substantial, especially among people with dual diagnosis – are most likely still accurate. This is a globally unique prospective study of a representative cohort released from prison, and as such is one of very few potential sources for these data, despite their age.

A key strength of the study was the minimal loss to follow up achieved through the data linkage methodology, which did not require ongoing contact with participants – a major challenge in research with this population. The only loss to follow up would occur through migration. This would not have affected the accuracy of our estimates for costs from the government perspective, however, as those who emigrate can no longer use government health services.

Although the cohort incurred considerable healthcare costs, not all health service contacts reflect poor health outcomes or inefficient healthcare expenditure. Higher expenditure on targeted, high-quality preventive health services for this population after release might be offset in whole or in part by reductions in future healthcare costs, as has been demonstrated by a trial in the USA (Wang *et al.* 2012). Better addressing the health needs of this underserved population could shift service engagement into primary care and ambulatory mental health services, and away from reactive services contacted during acute crises. This may increase the frequency of proactive service contacts, while reducing net costs to the health and prison systems (Wang *et al.* 2012). Conversely, low healthcare costs do not necessarily reflect good health status – the fact that Aboriginal and Torres Strait Islander participants incurred similar costs to non-Indigenous participants may reflect limited accessibility or poor acceptability of health services, rather than equivalent health status.

It has been suggested that improved access to high-quality health services may also reduce the risk of re-incarceration (Galassi *et al.* 2015). It seems likely that brief and limited contact with mental health or other services is insufficient to address the needs of people with serious mental illness, or to reduce their high risk of return to custody (Thomas *et al.* 2016). A recent analysis of data from Washington state in the USA showed that only 13% of people with schizophrenia or bipolar disorder released from prison had any contact with mental health services within 90 days of release, and that those who did have contact nonetheless remained at high risk of re-incarceration (Domino *et al.* 2019). Likewise, our cohort used general practitioners at high rates after release (Carroll *et al.* 2017), but general practice may not be the

ideal site to meet all their health needs, particularly those arising from mental illness or substance use disorders.

People released from prison with mental illness or substance use disorders require high-quality, targeted, intensive support as they transition back into the community to meaningfully improve their health and reduce their risk of re-incarceration. However, if this can be achieved it might be cost-effective from a whole-of-government perspective, as well as improving the health of an important and underserved population.

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Data availability. The unit record data used to undertake these analyses cannot be made available to individuals outside the research team, due to the conditions of the ethical approval of the study and the informed consent of the participants.

Conflicts of interest. EH is employed by the Queensland Forensic Mental Health Service. The other authors declare no conflicts of interest.

Declaration of funding. The Passports study was funded through NMHRC Project Grants #409966 and #1002463.

Acknowledgements. The authors thank Queensland Corrective Services for assistance with data collection, and study participants for sharing their stories. The views expressed herein are solely those of the authors, and in no way reflect the views or policies of Queensland Corrective Services.

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