

Accuracy and predictive value of incarcerated adults' accounts of their self-harm histories: findings from an Australian prospective data linkage study

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Abstract

Background: Self-harm is prevalent in prison populations and is a well-established risk factor for suicide. Researchers typically rely on self-report to measure self-harm, yet the accuracy and predictive value of self-report in prison populations is unclear. Using a large, representative sample of incarcerated men and women, we aimed to examine the level of agreement between self-reported self-harm history and historical medical records, and investigate the association between self-harm history and medically verified self-harm after release from prison.

Methods: During confidential interviews with 1315 adults conducted within 6 weeks of expected release from 1 of 7 prisons in Queensland, Australia, participants were asked about the occurrence of lifetime self-harm. Responses were compared with prison medical records and linked both retrospectively and prospectively with ambulance, emergency department and hospital records to identify instances of medically verified self-harm. Follow-up interviews roughly 1, 3 and 6 months after release covered the same domains assessed in the baseline interview as well as self-reported criminal activity and contact with health care, social and criminal justice services since release.

Results: Agreement between self-reported and medically verified history of self-harm was poor, with 64 (37.6%) of 170 participants with a history of medically verified self-harm disclosing a history of self-harm at baseline. Participants with a medically verified history of self-harm were more likely than other participants to self-harm during the follow-up period. Compared to the unconfirmed-negative group, the true-positive (adjusted hazard ratio [HR] 6.2 [95% confidence interval (CI) 3.3–10.4]), false-negative (adjusted HR 4.0 [95% CI 2.2–6.7]) and unconfirmed-positive (adjusted HR 2.2 [95% CI 1.2–3.9]) groups were at increased risk for self-harm after release from prison.

Interpretation: Self-reported history of self-harm should not be considered a sensitive indicator of prior self-harm or of future self-harm risk in incarcerated adults. To identify those who should be targeted for preventive strategies, triangulation of data from multiple verifiable sources should be performed whenever possible.

The incidence of self-harm is markedly higher among incarcerated^{1,2} and formerly incarcerated^{3,4} adults than in the general population. Although one of the strongest predictors of future self-harm is a history of self-harm,^{5,6} repetition of self-harm is often difficult to predict with any degree of accuracy.^{7,8} In many prison settings internationally, screening for self-harm history at prison reception is conducted exclusively by self-report.⁹ One purpose of screening is to identify people who may benefit from access to mental health services during and after incarceration. However, the validity of self-reported self-harm in this population remains unknown. Accurate identification of previous self-harm events could help to minimize the risk to these people during the transition from custody, a period characterized by elevated rates of suicide and all-cause mor-

tality.^{10–13} The few studies of community populations have shown poor agreement between self-reported and medically verified self-harm,¹⁴ with participants providing conflicting accounts of their self-harm histories at different times.^{15,16}

Self-harm is highly stigmatized,¹⁷ and this may lead to underreporting of the behaviour.¹⁸ Although most self-harm is not associated with help-seeking behaviour,¹⁹ medically severe

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events typically result in contact with health care services such as ambulance, emergency department or hospital.²⁰ Further complicating disclosure of self-harm in correctional settings is the prospect that doing so may result in intrusive observations or monitoring. Self-reported self-harm may therefore fail to identify a proportion of people at risk for subsequent (and medically more severe) self-harm and associated mental health problems. Underreporting may be particularly pronounced among those already marginalized, such as Indigenous people,²¹ people with a mental illness⁶ and those who identify as lesbian, gay, bisexual or transgender.^{22,23} In Canada, historical underascertainment of self-harm events combined with a sharp increase in such events in prisons^{24,25} has led to recent changes in reporting practices in the Correctional Service of Canada, such as allowing staff to report 1 incident under multiple incident categories.^{26,27}

Self-harm in incarcerated populations is prevalent in many countries including Canada,²⁸ England and Wales,¹ the United States,²⁹ Australia,³⁰ France³¹ and Greece.³² There are, however, few studies examining self-harm after release from incarceration, which makes direct comparison between regions almost impossible.^{3,4} In Australia, there is no federal correctional system, as each state or territory system operates independently. In the State of Queensland, adults are asked on reception whether they have ever self-harmed; this is combined with records from previous incarcerations and, on some occasions, information gathered informally from police, mental health records and family members. However, this is provided on an ad hoc basis only, with no system in place for routinely obtaining such collateral information.

In a large cohort of incarcerated adults in Australia, we aimed to determine the level of agreement between self-reported history of self-harm and medically verified history of self-harm. We also aimed to examine the extent to which self-reported history of self-harm, a medically verified history of self-harm and a combination of the 2 predicted the occurrence of future medically verified self-harm following release from prison.

Methods

Participants

The participants were 1325 adult prisoners recruited to the Passports study^{33,34} — a randomized controlled trial of a service brokerage intervention, but here analyzed as a cohort study — within 6 weeks of expected release from 1 of 7 prisons in Queensland. Trained researchers, independent of Queensland Corrective Services, obtained a list of all potentially eligible participants for each prison. Prisoners identified as potentially eligible were approached by researchers and invited to participate in the study; this included screening for eligibility, explaining the project in plain language and obtaining informed, written consent. Researchers recorded the outcome of each approach (not eligible, eligible [participated or declined] or unknown [missed or unavailable]) to permit calculation of a recruitment factor.

Inclusion and exclusion criteria

To maximize generalizability, eligibility criteria were as inclusive as possible. Inclusion criteria were 1) sentenced adult prisoner expecting to be released (full-time or on parole) from 1 of the 7 recruitment prisons within the next 6 weeks, 2) judged safe to be approached and 3) able to provide informed, written consent. Exclusion criteria were 1) on remand (owing to uncertainty around release) and 2) having previously participated in the trial (necessitated by the high rate of recidivism in the population). We intentionally over-sampled women to increase the sample size for sex-stratified analyses. To permit identification of and adjustment for sampling bias, we obtained demographic and offending information from Queensland Corrective Services for all sentenced prisoners released from custody in Queensland during the 2 years of recruitment ($n = 10\,931$).

Data collection

Survey data

Baseline data were collected during confidential, structured, face-to-face interviews that covered demographic characteristics, physical and mental health, self-harm history, substance use before and during incarceration, and other health-related risk behaviours. The interviews were conducted between August 2008 and July 2010. Interviewers were experienced with interviewing vulnerable populations about sensitive topics, were extensively trained (including by a psychologist) and were independent of both corrections and the prison health care service. Substantial reporting of stigmatized behaviours, including behaviours that could have implications for sentencing,³⁵ indicated a high degree of rapport between participants and interviewers. Participants were advised that they were not required to answer any questions that they did not wish to, but that all responses would be kept strictly confidential. Participants in the intervention group received a personalized booklet summarizing their health status and medication needs, and identifying appropriate community health care services; trained workers made weekly telephone contact in the first 4 weeks after release to identify emergent health needs and promote contact with health care services. Participants in the control arm received usual care. Follow-up interviews, completed by December 2010, occurred by telephone roughly 1, 3 and 6 months after release. Although considerably briefer, they covered the same domains assessed in the baseline interview as well as self-reported criminal activity and contact with health care, social and criminal justice services since release. The Passports study is described in greater detail elsewhere.^{33,34}

Administrative and clinical data

We obtained emergency department records from June 1, 2002, to July 31, 2012, ambulance records from Jan. 1, 2007, to Jan. 1, 2014, and hospital records from July 1, 1999, to July 31, 2012. Baseline interview data were linked probabilistically with clerical review by the Queensland Health Data Linkage Unit using full name and any known aliases, sex, date of birth and postcode of last residence. Validation studies and quality

assurance checks from Australian jurisdictions with comparable linkage processes have shown that this method produces false-positive and false-negative rates less than 0.1%.^{20,36–39} The inclusion of all known aliases as a linkage identifier (considered the gold standard for research involving vulnerable populations) has been shown to significantly increase the sensitivity of matching while maintaining the same level of specificity.⁴⁰ Linkage with correctional records and prison medical records was deterministic, based on a unique prisoner identification number. Prison admission and release dates were identified from Sept. 1, 2008, to Dec. 31, 2013 from Queensland Corrective Services records. Queensland Corrective Services data also contained a dichotomous variable indicating whether each participant had been identified by any staff member at any time as being at risk for self-harm/suicide. Prison medical records for participants were coded by the research team using the International Classification for Primary Care Version 2.⁴¹ In addition, coders recorded relevant contextual information, including regarding instances of self-harm, in a free-text field.

Measures

Self-harm

Self-reported: During the baseline interview (and after rapport had been established), participants were asked “Have you ever attempted suicide?” Participants were then asked “Apart from suicide attempts, have you ever deliberately harmed or injured yourself?” Participants who responded in the affirmative were asked a follow-up question: “If yes, how many times have you deliberately harmed or injured yourself?” Participants who responded in the affirmative to either of these stem questions (irrespective of the severity of harm) were recorded as having a self-reported history of self-harm.

Medically verified: We searched all emergency department and hospital records for International Classification of Diseases diagnosis codes for self-harm (X60–X84) and searched the International Classification for Primary Care Version 2 coding of the free-text field of all prison medical records for all participants to identify self-harm events. In addition, free-text fields in all ambulance and emergency department records and all free-text notes made by the coding staff who abstracted the prison medical records were screened by a member of the study team (K.M.) to increase case ascertainment. K.M. was blinded to participants’ self-harm status during the screening process. Free-text data were coded with the use of a system adapted from a large epidemiological study of self-harm.⁴² All emergency department, ambulance and prison health records for all participants were coded as either 0 (did not involve self-harm) or 1 (involved self-harm), with the latter category comprising any contact with health care services resulting from behaviours fitting into any 1 of 5 categories: 1) cutting/burning, 2) self-poisoning, 3) self-battering, 4) non-recreational risk-taking or 5) other self-harm. Any contact with health care services before the baseline interview that was deemed to have resulted from self-harm was coded as a medically verified self-harm event. Because participants may

have self-harmed in the past without self-disclosing this at baseline or without presenting to health care services as a result, neither a failure to appear in the health records nor a failure to self-report a history of self-harm was taken as a definitive indication of absence of historical self-harm. Time at risk commenced at the initial prison release date and was censored on the last day of the follow-up period (Jan. 1, 2014), return to custody or death, whichever came first.

Categorization of self-harm history

Based on the combination of their baseline interview responses and retrospectively linked health records, participants were categorized into 1 of 4 mutually exclusive groups:

- Unconfirmed-negative case: participant did not disclose self-harm at baseline interview and had no medically verified self-harm events before baseline
- False-negative case: participant did not disclose self-harm at baseline interview but had 1 or more medically verified self-harm events before baseline
- Unconfirmed-positive case: participant disclosed self-harm at baseline interview but had no medically verified self-harm events before baseline
- True-positive case: participant disclosed self-harm at baseline interview and had 1 or more medically verified self-harm events before baseline.

Statistical analysis

We calculated descriptive statistics for all measures. We compared differences in participants’ baseline characteristics across the self-harm categories using χ^2 tests. To estimate the agreement between self-reported and medically verified self-harm, we calculated prevalence-adjusted and bias-adjusted κ statistics, as recommended when comparing administrative data as a reference standard and for low prevalence outcomes.^{43,44} In addition, we calculated the average positive and negative agreement, asserted as best practice when assessing agreement.⁴⁵ Crude incidence rates and 95% confidence intervals (CIs) for medically verified self-harm after release from custody were calculated overall and separately for each self-harm category. We estimated the conditional probability of survival to study end without evidence of medically verified self-harm after release from custody by fitting a Kaplan–Meier plot. We estimated the risk of medically verified self-harm after release from custody for each self-harm agreement group by fitting univariate and multivariate Cox proportional hazards models.⁴⁶ We calculated standard errors and bias-corrected 95% CIs of the Cox model parameters using the bootstrap method ($n = 1000$ repetitions).⁴⁷ The multivariate model was adjusted for sex, age, Indigenous status, relationship status, years of education, sexual identity, Queensland Corrective Services self-harm risk flag, prior suicide attempt, lifetime history of mental disorder and whether the most serious offence was violent (including sex offences) or nonviolent (including offences against property, drug trafficking, driving offences and forgery/fraud). The inclusion of violent offences in the model was based on the known association between violent offending and increased risk of both self-harm^{48,49} and suicide.^{50,51} This coding was per-

formed manually based on the Australian Standard Offence Classification (Queensland Extension).⁵² In light of the reported sex differences in self-harm prevalence,⁶ we examined the possibility of effect modification in the adjusted model by fitting interaction terms between self-harm category at baseline and demographic variables (sex, age and Indigenous status). The Cox model was censored at date of death, the first medically verified self-harm event or the last day of the follow-up period, whichever occurred first. We conducted all analyses using STATA, version 14.2.

Ethics approval

Ethics approval was granted by The University of Queensland's Behavioural and Social Sciences Ethical Review Committee, the Queensland Health Human Research Ethics Committee and the Queensland Corrective Services Research Committee.

Results

We conducted all analyses using the data for the 1315 participants (99.2%) for whom linked health and correctional records were obtained (Figure 1). Table 1 describes the baseline characteristics of the participants. Of the 1315 participants, 1037 (78.9%) were men, 336 (25.6%) were Indigenous, and just over half (681 [51.8%]) were aged 25–39 years.

Self-harm

Historical

Of the 1315 participants, 186 (14.1%) disclosed a history of self-harm at the baseline interview, and 170 (12.9%) (119 men and 51 women) had 1 or more medically verified self-harm events recorded before their baseline interview. Of the 170,

64 (37.6%) disclosed a history of self-harm and were categorized as true-positive cases; the remaining 106 (62.4%) were categorized as false-negative cases. Of the 1145 participants who had no medically verified record of self-harm at baseline, 122 (10.6%) reported a history of self-harm and were categorized as unconfirmed-positive cases; the remaining 1023 (89.3%) were categorized as unconfirmed-negative cases. Table 2 displays the relation between self-reported and medically verified self-harm. Most (106 [62.4%]) of the 170 participants with a medically verified history of self-harm did not disclose this at baseline. Disclosure of prior self-harm was uncommon regardless of participant sex, Indigenous status, education or history of mental disorder. Appendix 1, Supplementary Table 1 (available at www.cmajopen.ca/content/5/3/E694/suppl/DC1) displays the demographic and criminogenic characteristics of the cohort at baseline, according to self-harm category.

Overall, prevalence-adjusted and bias-adjusted agreement between self-reported and medically verified self-harm was estimated at 0.65 (95% CI 0.61–0.69). Average positive agreement was 0.36 (95% CI 0.30–0.42), and average negative agreement was 0.90 (95% CI 0.89–0.91). Agreement greater than 0.8 is considered “almost perfect,” and agreement of 0.21–0.4 is considered “fair.”⁵³

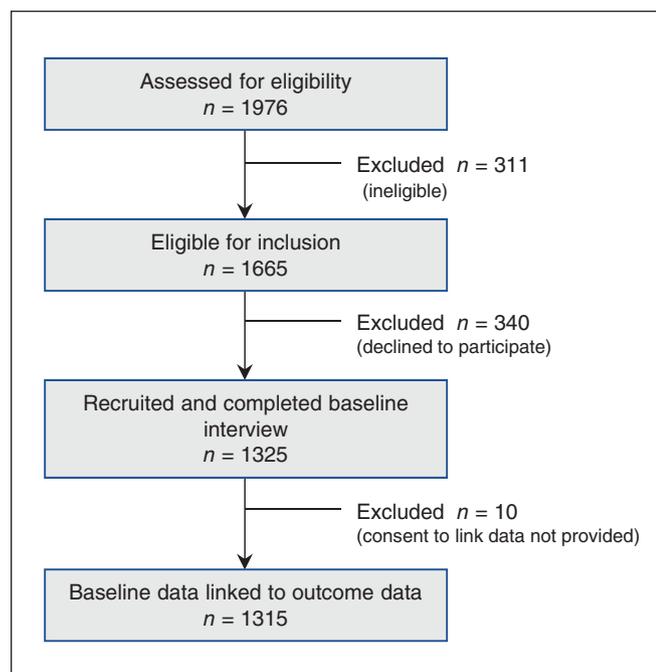


Figure 1: Participant flow through the Passports study.

Table 1: Baseline characteristics of participants

Characteristic	No. (%) of participants n = 1315
Male sex	1037 (78.9)
Age at release, yr	
18–24	336 (25.6)
25–39	681 (51.8)
≥ 40	298 (22.7)
Indigenous	336 (25.6)
Relationship status	
Married or de facto relationship	452 (34.4)
Other	863 (65.6)
< 10 yr of education	574 (43.7)
Sexuality	
Heterosexual	1234 (93.9)
Lesbian/gay/bisexual/transgender	80 (6.1)
Missing	1 (0.1)
Queensland Corrective Services history of self-harm flag	292 (22.4)
Previous suicide attempt*	280 (21.3)
Lifetime history of any mental disorder*	572 (43.5)
Previous hospital admission for mental disorder	125 (9.6)
Violent offence (index incarceration)	684 (52.7)

*Self-reported.

After release from prison

A total of 123 participants (9.4%) had 1 or more medically verified self-harm events recorded after release from custody during a median of 854 (interquartile range 219–1560) days of follow-up. Table 3 displays the proportion of participants with 1 or more medically verified self-harm events across demographic groups. The crude incidence rates per 1000 person-years for the 4 self-harm categories were as follows: true-positive cases 431.8 (95% CI 326.3–571.3), false-negative cases 311.5 (95% CI 238.0–407.8), unconfirmed-positive cases 105.1 (95% CI 71.6–154.4) and unconfirmed-negative cases 35.6 (95% CI 28.7–44.3). The full multivariate model is shown in Appendix 1, Supplementary Table 2.

About 4 in 10 (27 [42.2%]) participants in the true-positive group had 1 or more medically verified self-harm events during the follow-up period, almost twice as many as in any of the other self-harm groups. The proportion of participants with medically verified self-harm events during follow-up was higher among women than men, and among Indigenous than non-Indigenous participants. However, sex, age and Indigenous status did not significantly modify the relation between self-harm category at baseline and medically verified self-harm after release from custody ($p = 1.0$, $p = 0.8$ and $p = 0.6$, respectively). Figure 2 shows the survival function for medically verified self-harm events after release from custody, according to baseline self-harm category.

Interpretation

In this representative cohort of incarcerated adults in Australia, agreement regarding history of self-harm events between self-report and health care service records was poor: just 38% of participants with a medically verified history of self-harm disclosed this history during the baseline interview. After adjustment for covariate effects, participants with both a medically verified and a self-reported history of self-harm were 6 times more likely to have self-harmed during the follow-up period than participants in the reference category (unconfirmed-negative group). Those who had a medically verified history of self-harm but did not disclose this at baseline were 4 times more likely to have self-harmed during the follow-up period than participants in the reference category. Finally, participants who disclosed a history of self-harm but had no medically verified self-harm events in their records were twice as likely to have a medically verified self-harm event during the follow-up period than participants in the reference category.

There are several potential explanations for the observed low prevalence of self-reported self-harm at baseline. First, self-harm is still strongly stigmatized,¹⁷ and social desirability bias may have contributed to failure to disclose prior self-harm. Although the research team was independent of corrective services and interviews were carried out in private, it is possible that some participants with a history of self-harm may have

Table 2: Two-by-two table showing proportions of participants assigned to the 4 mutually exclusive self-harm categories

Self-reported self-harm	Medically verified self-harm; no. (%) of participants <i>n</i> = 1315		
	No	Yes	Total
No	1023 (77.8) (unconfirmed negative)	106 (8.1) (false negative)	1129 (85.8)
Yes	122 (9.3) (unconfirmed positive)	64 (4.9) (true positive)	186 (14.1)
Total	1145 (87.1)	170 (12.9)	1315 (100.0)

Table 3: Medically verified self-harm events after release, by baseline self-harm category

Baseline self-harm category	No. of events recorded after release; no. (%) of participants		HR (95% CI)	Adjusted HR (95% CI)*
	0	≥ 1		
True positive (<i>n</i> = 64)	35 (54.7)	27 (42.2)	10.6 (6.5–17.2)	6.2 (3.5–10.8)
False negative (<i>n</i> = 106)	82 (77.4)	24 (22.6)	5.8 (3.5–9.5)	4.0 (2.3–7.0)
Unconfirmed positive (<i>n</i> = 122)	101 (82.8)	19 (15.6)	3.4 (2.0–5.9)	2.2 (1.2–4.1)
Unconfirmed negative (<i>n</i> = 1023)	965 (94.3)	53 (5.2)	Reference	Reference

Note: CI = confidence interval, HR = hazard ratio.
*Adjusted for sex, age, Indigenous status, relationship status, years of education, sexual identity, Queensland Corrective Services self-harm risk flag, prior suicide attempt, lifetime history of mental disorder and violent offence.

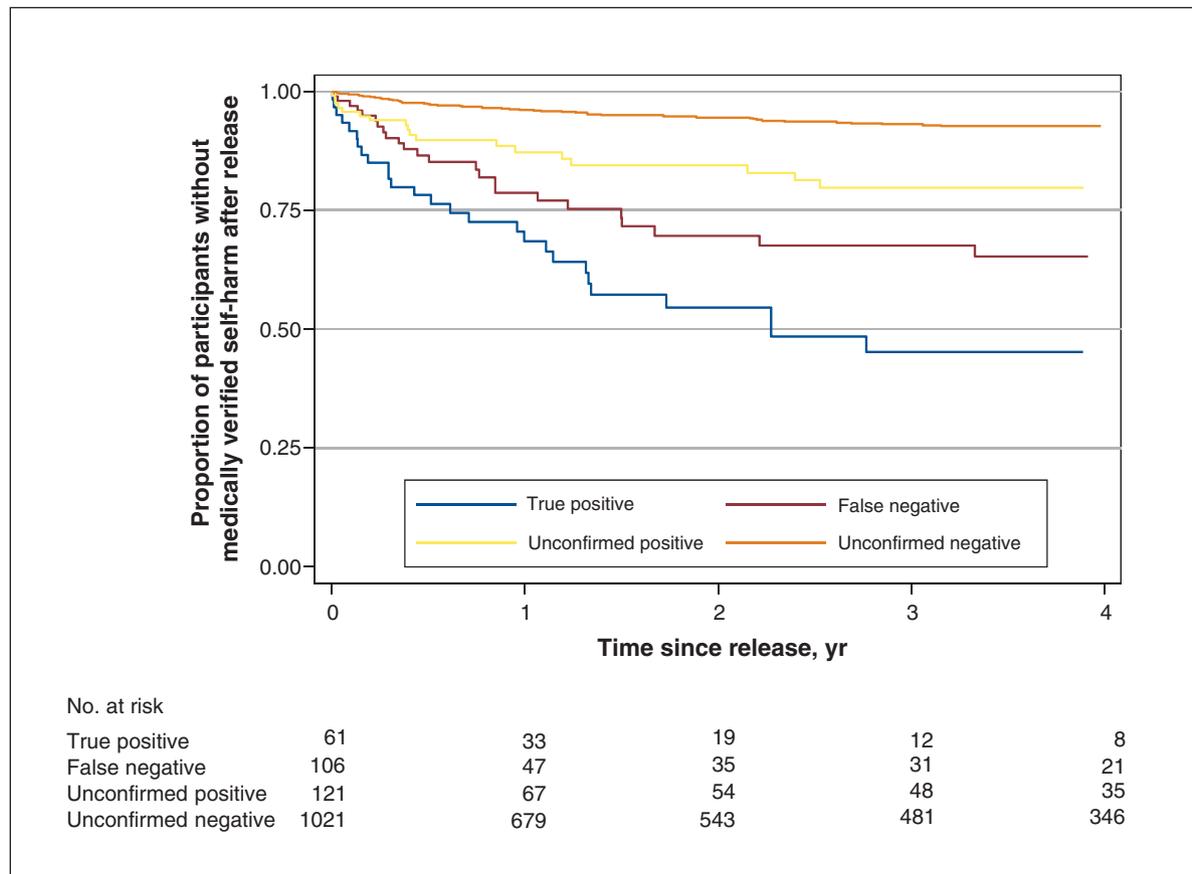


Figure 2: Kaplan–Meier curve of medically verified self-harm events in the first 4 years following release from prison according to self-harm category.

incorrectly believed that a disclosure of self-harm would have an adverse impact on their current incarceration and/or delay their impending release. Second, participants may have had different perceptions about what constitutes self-harm or may not have been able to recall previous events. Although we might have been able to increase ascertainment through more detailed questioning, to the extent that our approach to questioning replicates intake screening in prison settings, this limitation is in fact an accurate assessment of routine practice.

In addition to the high proportion of people with a medically verified history of self-harm who did not disclose this at baseline, we also observed the inverse phenomenon: 1 in 9 participants (11%) reported a history of self-harm at baseline that did not appear in their medical records (unconfirmed-positive group). The most likely explanation for this finding is that most self-harm does not lead to formal help-seeking behaviour,⁵⁴ which makes it more difficult than other clinical phenomena to measure accurately through medical records.⁵⁵ Our finding that people in the unconfirmed-positive group were at increased risk for self-harm following release from incarceration suggests that their self-reported histories were accurate. As such, although self-reported self-harm and medically verified self-harm had low agreement in our sample, there is merit in inquiring about prior self-harm, as it can identify a subgroup

of people who may not yet have come to the attention of mental health services but who may nevertheless be at increased risk for further self-harm. Other potential explanations for the high proportion of participants in this group include failure by clinicians to document the detection of self-harm in some cases, which would have led to underascertainment of self-harm in medical records, and reporting of incidents that participants considered self-harm but that would not have been identified as such by health care professionals (e.g., hair pulling, lip biting or putting oneself at risk from others).

We were unable to identify other studies examining the association between incarcerated adults' self-reported and medically verified self-harm history, and medically verified self-harm after release from prison.

Accurately ascertaining self-harm events is vital for determining the morbidity and mortality associated with this set of behaviours.^{56,57} Our findings indicate that relying solely on a self-reported history of self-harm in incarcerated adults substantially underascertains actual history, which suggests that many vulnerable people will be missed if this is the sole method for screening in prison settings.

One clear implication of our findings is that a more comprehensive method of identifying people at risk for self-harm is to triangulate data from multiple sources including self-report,

clinician/observer ratings (e.g., from prison medical records) and community medical records.⁵⁸ Consistent with this, our findings suggest that incarcerated adults who disclose a history of self-harm and have a medically verified record of self-harm are at considerably increased risk for further self-harm after release from custody (almost 1 in 2 in our study) and may require additional community-based support to prevent these events. Identifying these people to provide such support is likely to require access to historical medical records. Incarcerated people who disclose a history of self-harm, even without a medically verified history, are at moderately increased risk for engaging in self-harm after release from prison (about 1 in 5 in our study) and are also likely to require targeted support and preventive strategies.

Strength and limitations

This study has important strengths. It used 4 separate, unique data sources to ascertain episodes of medically verified self-harm. In addition, we linked highly accurate administrative data with rich baseline interview data, optimizing the ascertainment of key demographic, criminogenic and exposure data.⁵⁹

Most limitations of our study would have resulted in underascertainment of self-harm events and thus rendered our estimates conservative. First, although we were able to verify the true-positive and false-negative categories objectively, the same cannot be said for the unconfirmed-positive and unconfirmed-negative categories. Because prior self-harm events that did not result in medical treatment (and were not disclosed) would not have been recorded in any of the 4 self-harm categories, our estimates of the proportion of participants with a history of self-harm would be correspondingly conservative. Second, we did not have complete historical information from medical records for all participants, and, as such, it is likely that we underascertained self-harm events. Third, neither a failure to appear in the medical records nor a failure to self-report a history of self-harm was taken as an indication of absence of prior self-harm; consequently, we could not calculate the specificity of self-reported self-harm. Fourth, we did not have a sufficient number of events to examine the possibility of a dose-response relation between episodes of reincarceration and patterns of self-harm, similar to the pattern that exists between episodes of incarceration and death.⁶⁰ Future studies should treat reincarceration as a time-varying covariate instead of censoring at reincarceration. Fifth, although we used Jan. 1, 2014 as our censoring date, the ambulance and hospital records ended on July 31, 2012. This would have resulted in underascertainment of medically verified self-harm events and likely attenuated the observed associations between self-harm history and medically verified self-harm. Finally, presentations to health care services outside Queensland would not have appeared in the data to which we had access. However, additional linked data relating to study participants indicated that less than 5% of the sample accessed health care services solely outside Queensland (mirroring recent research⁶¹), and, as such, the number of health presentations due to self-harm outside Queensland is likely to have been small.⁶²

Conclusion

Self-report appears to be an insensitive method for documenting prior self-harm in incarcerated adults. However, self-report is the sole method for intake screening in many prison settings and is subsequently relied on heavily to identify those at risk. The findings of the current study support the use of linked medical records to supplement self-reported indicators of self-harm wherever feasible (with appropriate participant consent), particularly when ascertainment of such events informs allocation of scarce mental health resources in and after release from prison. It is likely that, as with the measurement of violent behaviour, the most accurate way of ascertaining self-harm events would involve triangulating data from multiple sources.

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