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Violence-related morbidity among people released from prison in Australia: A data linkage study

Running title: Violence-related morbidity after prison

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Abstract

Introduction: People released from prison have an increased risk of morbidity, including from nonfatal violence. We examined the incidence and predictors of violence-related morbidity after release from prison and investigated whether there are differences according to sex and Indigenous status.

Methods: Baseline data were collected from 1325 people within six weeks of release from prisons in Queensland, Australia between 1 August 2008 and 31 July 2010. Data were linked to state-wide health (ambulance, emergency department and hospital) and prison records, and national death records until 31 July 2012. Predictors were identified using a multivariable Andersen-Gill model. Differences according to sex and Indigenous status were investigated using effect modification.

Results: 225 (18.2%) people experienced 410 violence-related events that were recorded in health records. The incidence was 12.8 per 100 person-years (95% CI 11.7, 14.1). Risk factors for violence-related morbidity included diagnosed mental illness (HR=2.0, 95% CI 1.0, 3.9), substance use disorder (HR=1.6, 95% CI 1.1, 2.4) or dual diagnosis (HR=3.3, 95% CI 2.2, 4.9); high-risk alcohol use (HR=2.0, 95% CI 1.4, 2.7); being Indigenous (HR=1.8, 95% CI 1.2, 2.5); and two or more prison releases (HR=1.8, 95% CI 1.2, 2.7). Indigenous status modified the risk of violence-related morbidity, with Indigenous men having twice the risk of non-Indigenous men (HR=1.9, 95% CI 1.3, 2.8).

Discussion and Conclusions: Approximately 1 in 5 people released from prisons in Queensland experienced violence-related morbidity. Co-ordinated and continuous mental health and substance use treatment from prison to the community may reduce the risk of violence-related morbidity in this population.

Key words: substance-related disorders, dual diagnosis, mental health, violence, prisons

Introduction

People released from prison have a high risk of poor health outcomes [1,2], however, violence-related morbidity after release from prison remains poorly understood. Violence-related morbidity typically refers to nonfatal injuries or harms resulting from the intentional use of physical force or power between two or more people [3]. There is good reason to suspect that people released from prison may have an increased risk of violence-related morbidity. People released from prison have a risk of dying from violence that is 10 times higher than their age- and sex-matched peers in the general population [1,4]. People who have had contact with the criminal justice system are more likely to be victims of crime, particularly violent crime, compared to those without criminal justice system contact [5]. People released from prison are admitted to hospital for intentional (including violence-related and self-harm) and unintentional injuries at a rate that is approximately four times higher than that in the general population [2]. Given that non-fatal violence can have both immediate (e.g. physical injuries) and ongoing (e.g. disabilities, chronic pain) health impacts, the costs of which are predominantly borne by public institutions [6], preventing violence-related morbidity in this population is an important public health opportunity.

Many of the risk factors for violence victimisation [7] overlap with the determinants of incarceration [8]. Mental illness and harmful substance use are common among people in prison [9], and are risk factors for violence victimisation [10]. Approximately 10% of men and 14% of women in prison have been diagnosed with major depression, and 10-48% of men and 30-60% of women have substance use disorders [9]. In the general population, people from marginalised ethnic and racial groups are disproportionately impacted by violence [11]. These groups are also overrepresented in prisons [11]. In Australia, Indigenous people are 14.5 times more likely to be hospitalised for violence victimisation [12], and are 13 times more likely to be incarcerated [13], than non-Indigenous people. Among people released from prison, there is some evidence that risk of violence victimisation varies according to sex and Indigenous status. A 2012 retrospective cohort study of Indigenous people released from prison in Australia found that men and women were 12 and 53 times more likely to die from violence, respectively, than their age- and sex-matched peers in the general population [14]. Recognising the considerable overlap of risk factors for violence victimisation and incarceration, people who experience incarceration are likely an important group for targeted violence prevention efforts.

The paucity of information on the incidence and predictors of violence-related morbidity among people released from prison is a critical barrier to developing evidence-based, prevention strategies for this population. While mental illness and substance use disorders are well established risk factors for violence victimisation in the general population [7], it is unknown whether these risk factors are generalisable to people released from prison, who are disproportionately young, male and from

socially and economically disadvantaged communities [15]. In a large, representative cohort of people released from prisons in Queensland, Australia, we aimed to: (i) examine the incidence, timing and predictors (including mental health and substance use) of violence-related morbidity; and (ii) investigate whether there are differences in the risk of violence-related morbidity according to sex and Indigenous status.

Method

Study design

We undertook a data linkage study using linked health service and prison records from a previous randomised controlled trial [16] involving adults aged ≥18 years released from prisons in Queensland, Australia. The original randomised controlled trial evaluated a service brokerage intervention designed to increase use of primary healthcare after release from prison [16]. Except for the intentional over-sampling of women, the sample was representative of people released from prisons in Queensland over the study period, on measured demographic and criminal justice characteristics [16]. Subsequent data linkage was undertaken to examine patterns of health service use and morbidity outcomes as a cohort study.

Data collection

Interview data

Participants (n=1325) were interviewed by researchers independent of correctional authorities within six weeks of their expected release from prison ('index incarceration'), between 1 August 2008 and 31 July 2010. Socio-demographic and criminal justice factors measured in the interview included Indigenous status (Indigenous/non-Indigenous); sexuality (heterosexual/ lesbian, gay, bi-sexual); age (<25/25-39/≥40 years); born in Australia (yes/no); years of school completed (≥10/<10 years [i.e. last compulsory year of schooling in Australia]); housing (stable/unstable) and employment status (employed/unemployed) before incarceration; relationship status (married or in a relationship/not in a relationship); removed from family as a child (yes/no); ever attempted suicide (yes/no); and history of youth detention (yes/no). The following validated measures were categorised using standard intervals implemented in previous research [17,18]: the ENRICHD Social Support Instrument [19] (moderate-high/low social support); and the Alcohol Use Disorders Identification Test [20] (low-moderate/high risk alcohol use). Table S1, Supporting Information, outlines the ascertainment of variables and categorisation of validated tools.

Data linkage

Interview data were probabilistically linked with state-wide ambulance (1 January 2007-31 December 2013), emergency department (ED; 1 June 2002-31 July 2012) and hospital (1 July 1999-31 July 2012) records, and to the National Death Index (to 30 June 2013). Probabilistic linkage matches

records by calculating the likelihood that the records are for the same person by using multiple identifiers (e.g. name, sex, date of birth). A weighted score is given that corresponds to the likelihood that records are a true match [21]. Linked records that score above a predetermined threshold are considered a match [21]. Interview data were deterministically linked with correctional records (1 July 2006-31 December 2013). Deterministic linkage matches one or more identifiers (e.g. unique person-level identification numbers assigned during incarceration) across different records. In strict deterministic linkage a match is made if and only if all identifiers agree; in most applied settings these rules are relaxed somewhat (e.g. using iterative deterministic linkage) to accommodate imperfections in administrative records [21]. These records contained information on parole after index release (no/yes), and dates of incarcerations which were used to obtain the length of most recent incarceration (≤90/91-365/>365 days) and number of releases from incarceration ever (1/≥2). Follow-up was right censored at 31 July 2012 to ensure complete coverage of all data sources.

Consistent with previous research [22], mental health status (no diagnosis/mental illness only/substance use disorder only/dual diagnosis) was ascertained from International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification [23] codes in ED and hospital records, and from International Classification of Primary Care 2nd edition codes [24] that were extracted from paper-based in-prison medical records by two trained researchers (Table S1).

Primary outcome

The primary outcome was violence-related morbidity occurring in the community and resulting in health service contact. We searched three data fields to identify potential contacts resulting from violence in ambulance, ED and hospital records. This included: (i) International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification codes; (ii) pre-coded fields in the records that described the nature of the contact as violence-related; and (iii) a keyword search of free-text clinical notes (Table S2, Supporting Information). All potential violence-related contacts identified in the search were manually screened to remove any false positives. Twenty percent of these contacts were double-coded independently by two researchers (MW, CK). As the inter-rater reliability was high (kappa value 0.85), the remaining records were coded by a single researcher (MW).

To minimise over-counting of violence-related morbidity involving multiple health services, ambulance and ED contacts and hospital admissions occurring within one calendar day were aggregated into a single event (Figure S1, Supporting Information).

Statistical analysis

Time at risk of experiencing violence-related morbidity was calculated as time spent in the community after index release until the end of the study period or death. For people who experienced subsequent incarcerations, time during reincarceration was removed from the analysis. We conducted a complete case analysis as a small proportion (≤2%) of data were missing for each variable. This method is recommended when a small amount of data is missing [25].

We calculated crude incidence rates of violence-related morbidity overall and by sex, Indigenous status and age group, for total violence-related morbidity, and separately for each type of health service contact. Using the stptime command in Stata, we calculated piecewise incidence rates (rates that have been calculated in a number of discrete time intervals) during the periods 0-30, 31-90, 91-180, 181-365, and >365 days after release from custody, to examine the timing of violence-related morbidity after release [26].

To identify predictors of violence-related morbidity, we fit univariable and multivariable Andersen-Gill models with robust error variance, an extension of Cox regression that accounts for recurrent events within individuals [27]. The following variables were included in the adjusted model based on previous research in the general population [7] and predictors of fatal violence among people released from prison [4]: sex, Indigenous status, sexuality, age, born in Australia, years of school completed, housing status before index incarceration, employment status before index incarceration, relationship status, social support, removal from family as a child, mental health status, ever attempted suicide, alcohol use, length of most recent incarceration, number of releases from incarceration ever, history of youth justice detention and released on parole from index incarceration. Length of most recent incarceration and number of releases from incarceration ever were included as time-varying covariates, where the values represented the individual's status at each release from prison during the study period. We did not include a variable for trial arm in the analysis as there was no difference in the proportion of participants with violence-related morbidity in the intervention (106; 17.2%) and control (119; 19.1%) arms ($\chi 2(1)=0.77$, $P=0.380$).

We assessed the potential for effect modification using both the multiplicative and additive scales to examine whether there were differences in risk of violence-related morbidity according to sex and Indigenous status. Effect modification on the multiplicative scale was calculated by including a cross-product term in the multivariable Andersen-Gill model, and was assessed using the Wald test [28]. Effect modification on the additive scale was calculated using the Relative Excess Risk of Interaction method, which is recommended for proportional hazards models [29]. The results of the tests for effect modification are presented in line with best practice [28]. We decided *a priori* that $P<0.05$ indicated statistical significance and employed standard cell suppression (cells n<5) to safeguard against potential data re-identification. All analyses were performed using Stata/SE Release 15.

Sensitivity analyses

We conducted a sensitivity analysis controlling for violence-related morbidity prior to index incarceration in the multivariable Andersen-Gill model, to examine whether previous violence-related morbidity was associated with future violence-related morbidity (Table S3, Supporting Information). To account for instances where a person may have had multiple health service contacts for the same violent event over two calendar days, we conducted a second sensitivity analysis wherein all health service contacts occurring within two calendar days were aggregated into a single violent event (Table S4, Supporting Information).

Ethics approvals

All participants provided written informed consent and the study received approval from the University of Queensland Behavioural and Social Sciences Ethical Review Committee (#2007000607), the Australian Institute of Health and Welfare Ethics Committee (EC2012/4/58), the Queensland Health Human Research Ethics Committee (HREC/11/QHC/40) and the Queensland Corrective Services Research Committee.

Results

Cohort characteristics

We excluded 10 participants whose health records were not linked, eight who were not released from prison during follow-up, and 69 who had missing baseline data. The remaining 1238 participants were included in analyses.

Across the cohort, there were 3193.8 person-years of follow-up in the community, with a median of 2.4 years (interquartile range 1.9-2.9 years) per participant. Baseline characteristics of the cohort stratified by experience of violence-related morbidity after index release are displayed in Table 1. Approximately one-fifth (n=225, 18.2%) of the cohort experienced violence-related morbidity at least once during follow-up. The majority of those who experienced violence-related morbidity were male (n=165, 73.3%), and were aged between 25-39 years at baseline (n=142, 63.1%; median: 28 years, interquartile range 24-35 years). Almost 40% of those who experienced violence-related morbidity were Indigenous (n=87, 38.7%), despite making up 24% of the cohort.

Incidence of violence-related morbidity

Of the 6358 health service contacts during follow-up, 9% (n=574) were related to violence (Figure S1). These violence-related health contacts (n=574) were aggregated into 410 violence-related events. Of the 225 people who experienced the outcome, almost two-thirds (n=134, 59.6%) had only one episode of violence-related morbidity during follow-up (mode: 1; interquartile range 1-2; range 1-13).

The distribution was skewed with 10% (n=22) of participants accounting for 30% of violence-related morbidities (n=121). The incidence of violence-related morbidity was 12.8 per 100 person-years (95% confidence interval [CI] 11.7, 14.1; Table 2). The incidence was almost three times higher for Indigenous people (25.5 per 100 person-years; 95% CI 22.1, 29.5) than for non-Indigenous people (9.2 per 100 person-years; 95% CI 8.1, 10.5; *P* <0.001). The incidence of violence-related morbidity was higher in the first month after any release from prison (25.1 per 100 person-years; 95% CI 16.9, 37.1; Figure 1), than at any other time during follow-up (*P*=0.001).

Predictors of violence-related morbidity

After adjusting for covariates, having a diagnosis of mental illness, substance use disorder, or dual diagnosis, reporting high-risk alcohol use, identifying as Indigenous, and having been released from prison two or more times were associated with an increased risk of violence-related morbidity (Table 1). Being born outside of Australia was associated with a decreased risk of violence-related morbidity. No association was found between sex and risk of violence-related morbidity.

Differences in the risk violence-related morbidity of according to sex and Indigenous status

We found that the relationship between sex and violence-related morbidity was modified by Indigenous status on the multiplicative scale (Wald test *P*=0.016), but not on the additive scale (Relative Excess Risk of Interaction *P*=0.461, Table S5, Supporting Information). Effect modification was only significant for Indigenous men, who had almost twice the hazard rate of non-Indigenous men (hazard ratio 1.9, 95% CI 1.3, 2.8, *P*=0.002, Figure S2).

Violence-related health service contacts

The characteristics of health service contacts resulting from violence are outlined in Table S6, Supporting Information. The most common principal diagnosis resulting from violence in ED and hospital records was injury to the head (n=104, 43.7%; n=52, 51.5%, respectively), followed by injury to other parts of the body (n=54, 22.7%; n=39, 38.6%, respectively). Hospital contacts related to violence were most frequently among people living in the most disadvantaged areas, as measured by Socio-Economic Indexes for Areas [30] (n=38, 37.6%).

Sensitivity analyses

Previous violence-related morbidity was associated with an increased risk of violence-related morbidity after index release (hazard ratio 2.4, 95% CI 1.7, 3.3, *P* <0.001; Table S3). However, after adjusting for previous violence-related morbidity, the associations between other variables in this model and violence-related morbidity were consistent with our primary analysis (Table S3). A sensitivity analysis aggregating violence-related health service contacts over two days also supported our primary analysis (Table S4).

Discussion

In a large representative sample of people released from prisons in Queensland, Australia we found that approximately 1 in 5 people experienced violence-related morbidity during a median of 2.4 years of follow-up. To our knowledge, this is the first cohort study of violence-related morbidity in adults released from prison. The proportion of the cohort that experienced violence-related morbidity (18%) is considerably higher than that which has been reported in the Queensland general population [31]. While not directly comparable, approximately 3% (or 1 in 33 people) of the Queensland general population reported being physically assaulted in the previous 12 months in 2012 (the last year of the study period) [31].

Mental illness and substance use disorder, and high-risk alcohol use significantly increased the risk of violence-related morbidity in the cohort. These conditions are also associated with an increased risk of violence victimisation in general population samples [10]. Similar to general population studies [32], we found that people with a dual diagnosis experience a higher risk of violence victimisation than people who experienced mental illness or substance use disorder alone. Given the high prevalence of mental illness and substance use disorders, and their co-occurrence, among people released from prison [9,22,33], these findings suggest that coordinated substance use treatment and mental health support may improve health and also reduce the risk of violence-related morbidity in this population.

People who identified as Indigenous were at an increased risk of violence-related morbidity after release from prison. Additionally, Indigenous status modified the risk of violence-related morbidity for men, with Indigenous men having almost twice the risk of non-Indigenous men. This finding is consistent with the racial disparities in incarceration rates and violence victimisation in Australia and other countries with colonial histories (e.g. Canada and the United States) [11]. In Australia, Indigenous men are 15 times more likely to be incarcerated [34], and 9 times more likely to be hospitalised for assault, than non-Indigenous men [12]. These disparities are likely related to structural racism and the ongoing and intergenerational impacts of dispossession of land, and disruption of families and culture among Indigenous people [11]. Reducing Indigenous violence victimisation and incarceration are targets for improving the health and wellbeing of Indigenous people in Australia as part of the 2020 ‘National Agreement on Closing the Gap’ policy [35]. Without investment in Indigenous communities, such as through Indigenous-led initiatives and justice reinvestment programs [34], and addressing the structural drivers of racial inequities these targets are likely to remain aspirational.

Interestingly, there was no difference in the risk of violence-related morbidity between men and women in our multivariable model. Based on findings from the general population [36], we would expect that the risk of violence-related morbidity would be higher for men than women. One possible explanation for this disparity may be that women who experience incarceration are a highly selected group, who have a particularly elevated risk of violence-related morbidity. Men, who are more likely to experience incarceration compared to women, may be less selected in this sense. Indigenous women, who are disproportionately impacted by violence in the general population [12], are overrepresented in prisons in Australia [34]. Indigenous women are 21 times more likely to be incarcerated [34], and 29 times more likely to be hospitalised for assault than non-Indigenous women [12]. Interventions to reduce violence against women released from prison are a high priority and should be developed in conjunction with, and connected to, Indigenous communities and organisations.

Considering the potentially long-lasting impacts of violence on health [6], focusing violence prevention efforts on people released from prison could have measurable public health and safety benefits. People released from prison need comprehensive and integrated health services that are trauma-informed and culturally sensitive. However, health services are frequently siloed and fragmented, and often target a single health issue or condition in isolation [37]. This is likely a barrier to service engagement and retention among people released from prison, among whom co-occurring health conditions are normative [33].

We found that the rate of violence-related morbidity was highest in the first month after release from prison, and that multiple releases increased the risk of violence-related morbidity. These findings indicate that the transition from prison to the community is likely an important time to engage people with relevant health and social services, to address key modifiable risk factors for violence victimisation. Ideally, people should be engaged with health and social services throughout their incarceration, and then seamlessly connected to, and supported by, community-based services as they are released from prison, with this support continuing in the community as needed [38].

Strengths and limitations

Our study has several notable strengths. The large sample at baseline was broadly representative of all people released from prisons in Queensland over the study period. Through data linkage, we objectively captured violence-related morbidity in the cohort through multiple data sources, with negligible loss to follow-up. However, while using health records to measure violence is a reliable and accurate method [39], we likely underestimated violence-related morbidity as not all violent events will result in a health service contact, and some types of violence, particularly non-physical violence, may not be captured in health records [40]. Accordingly, our estimates of incidence are

likely conservative. While our findings require replication as the data only recorded violence-related morbidity until July 2012, the overall rates of non-fatal violence in Australia has not changed considerably since then [12]. Additionally, there is no reason to suspect that the risk factors of violence-related morbidity have changed meaningfully over this time. We only captured health service contacts that occurred in one Australian state. However, the number of interstate health service contacts in the cohort is likely to be small [41].

Conclusions

People released from prison experience violence-related morbidity at a higher rate than that in the general population. Considering the potentially long-lasting impacts of violence on health, preventing violence victimisation in this population will likely have measurable public health and safety benefits. People released from prison need comprehensive and integrated health services that are both trauma-informed and culturally sensitive. Connecting people leaving prison to relevant community-based health services prior to release, and continuing this support seamlessly in the community, is likely important to preventing violence-related morbidity in this marginalised population.

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Competing interest statement

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Table 1. Baseline characteristics and Andersen-Gill models of predictors of violence-related morbidity after release from prison

	Baseline characteristics			Andersen-Gill models			
	Violence-related morbidity	No violence-related morbidity	Whole cohort	Unadjusted		Adjusted[c]	
	n (%)	n (%)	N (%)	HR (95% CI)	*P*-value	HR (95%CI)	*P*-value
Sex							
Male	165 (73.33)	812 (80.16)	977 (78.92)	1		1	
Female	60 (26.67)	201 (19.84)	261 (21.08)	1.44 (1.00, 2.08)	0.050	0.96 (0.67, 1.36)	0.810
Indigenous status							
Non-Indigenous	138 (61.33)	802 (79.17)	940 (75.93)	1		1	
Indigenous	87 (38.67)	211 (20.83)	298 (24.07)	2.75 (1.98, 3.82)	<0.001	1.74 (1.21, 2.51)	0.003
Sexuality							
Heterosexual	206 (91.56)	958 (94.57)	1,164 (94.02)	1		1	
LGB	19 (8.44)	55 (5.43)	74 (5.98)	1.60 (0.96, 2.63)	0.072	1.17 (0.66, 2.08)	0.600
Age at baseline							
<25 years	57 (25.33)	247 (24.38)	304 (24.56)	1		1	
25-39 years	142 (63.11)	511 (50.44)	653 (52.75)	1.34 (0.95, 1.90)	0.095	1.25 (0.86, 1.80)	0.240
≥40 years	26 (11.56)	255 (25.17)	281 (22.70)	0.73 (0.43, 1.22)	0.230	1.10 (0.66, 1.83)	0.705
Born in Australia							
Yes	211 (93.78)	871 (85.98)	1,082 (87.4)	1		1	
No	14 (6.22)	142 (14.02)	156 (12.6)	0.26 (0.15, 0.45)	<0.001	0.44 (0.25, 0.77)	0.005
Years of school completed							
≥ 10 years	128 (56.89)	589 (58.14)	717 (57.92)	1		1	
< 10 years	97 (43.11)	424 (41.86)	521 (42.08)	1.39 (1.00, 1.95)	0.050	1.07 (0.78, 1.46)	0.677
Housing status before index incarceration							
Stable	178 (79.11)	851 (84.01)	1,029 (83.12)	1		1	
Unstable[a]	47 (20.89)	162 (15.99)	209 (16.88)	1.51 (1.01, 2.27)	0.045	1.07 (0.75, 1.54)	0.711
Employment status before index incarceration							
Employed	103 (45.78)	539 (53.21)	642 (51.86)	1		1	
Unemployed	122 (54.22)	474 (46.79)	596 (48.14)	1.72 (1.24, 2.39)	0.001	1.13 (0.84, 1.51)	0.419
Relationship status							
Married/in a stable relationship	180 (80.00)	835 (82.43)	1,015 (81.99)	1		1	
Not in a stable relationship	45 (20.00)	178 (17.57)	223 (18.01)	1.38 (0.91, 2.09)	0.126	1.14 (0.76, 1.70)	0.524
Social support (ESSI)							
Medium-high	168 (74.67)	835 (82.43)	1,003 (81.02)	1		1	

Low	57 (25.33)	178 (17.57)	235 (18.98)	1.78 (1.24, 2.55)	0.002	1.32 (0.96, 1.83)	0.088
Removed from family as a child							
No	167 (74.22)	831 (82.03)	998 (80.61)	1		1	
Yes	58 (25.78)	182 (17.97)	240 (19.39)	1.86 (1.27, 2.73)	0.002	1.28 (0.85, 1.91)	0.237
Mental health status							
No diagnosis	69 (30.67)	515 (50.84)	584 (47.17)	1		1	
Mental illness only	14 (6.22)	82 (8.09)	96 (7.75)	1.82 (0.92, 3.61)	0.084	1.98 (1.05, 3.74)	0.036
Substance use disorder only	59 (26.22)	237 (23.4)	296 (23.91)	2.31 (1.58, 3.39)	<0.001	1.56 (1.06, 2.30)	0.025
Dual diagnosis	83 (36.89)	179 (17.67)	262 (21.16)	4.69 (3.19, 6.89)	<0.001	3.17 (2.15, 4.70)	<0.001
Ever attempted suicide							
No	166 (73.78)	813 (80.26)	979 (79.08)	1		1	
Yes	59 (26.22)	200 (19.74)	259 (20.92)	1.26 (0.90, 1.78)	0.183	0.79 (0.55, 1.15)	0.217
AUDIT alcohol use							
Low/medium risk	106 (47.11)	660 (65.15)	766 (61.87)	1		1	
High risk	119 (52.89)	353 (34.85)	472 (38.13)	2.82 (2.07, 3.84)	<0.001	2.05 (1.51, 2.78)	<0.001
Length of most recent incarceration[b]							
≤90 days	82 (36.44)	268 (26.46)	350 (28.27)	1		1	
91-365 days	112 (49.78)	529 (52.22)	641 (51.78)	0.69 (0.50, 0.96)	0.025	0.78 (0.55, 1.11)	0.169
> 365 days	31 (13.78)	216 (21.32)	247 (19.95)	0.50 (0.31, 0.81)	0.004	0.67 (0.41, 1.08)	0.102
Number of releases from incarceration ever[b]							
≤1	90 (40.00)	545 (53.80)	635 (51.29)	1		1	
2 or more	135 (60.00)	468 (46.20)	603 (48.71)	3.17 (2.15, 4.69)	<0.001	1.74 (1.16, 2.61)	0.008
History of youth detention							
No	160 (71.11)	739 (72.95)	899 (72.62)	1		1	
Yes	65 (28.89)	274 (27.05)	339 (27.38)	1.48 (1.01, 2.16)	0.043	0.91 (0.59, 1.41)	0.671
Released on parole from index incarceration							
No	188 (83.56)	860 (84.90)	1,048 (84.65)	1		1	
Yes	37 (16.44)	153 (15.10)	190 (15.35)	1.27 (0.79, 2.05)	0.318	1.29 (0.80, 2.06)	0.296
TOTAL	225 (100)	1,013 (100)	1,238 (100)	-	-	-	-

AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; ESSI, ENRICHD Social Support Instrument; HR, hazard; LGBT, lesbian, gay, bi-sexual. Note: a. Unstable housing included: boarding house/refuge, staying with a friend or family, living in a car, living in a motel/hotel, no fixed address. b. Frequency and proportion indicate the values at baseline. This variable was included in the Anderson Gill model as a time-varying covariate, where the values represented the individual's status at each release from prison during the study period. c. Model is adjusted for all variable in the table.

Table 2. Incidence of violence-related health service contacts and morbidity, according to sex, Indigenous status and age

	Ambulance			Emergency department			Hospital			Violence-related morbidity[b]		
	n	**Rate[a]**	**95% CI**	**n**	**Rate[a]**	**95% CI**	**n**	**Rate[a]**	**95% CI**	**n**	**Rate[a]**	**95% CI**
Sex												
Male (n=977)	160	6.37	5.46, 7.44	170	6.77	5.82, 7.87	76	3.03	2.42, 3.79	294	11.71	10.44, 13.12
Female (n=261)	75	10.99	8.76, 13.78	68	9.96	7.86, 12.64	25	3.66	2.47, 5.42	116	17.00	14.17, 20.39
Indigenous status												
Non-Indigenous (n=940)	127	5.12	4.30, 6.09	141	5.69	4.82, 6.71	56	2.26	1.74, 2.93	228	9.19	8.07, 10.47
Indigenous (n=298)	108	15.13	12.53, 18.27	97	13.59	11.14, 16.58	45	6.30	4.71, 8.44	182	25.50	22.05, 29.49
Age at baseline												
<25 years (n=304)	51	6.85	5.21, 9.02	44	5.91	4.40, 7.94	21	2.82	1.84, 4.33	86	11.55	9.35, 14.27
25-39 years (n=653)	146	8.73	7.42, 10.27	157	9.39	8.03, 10.98	63	3.77	2.94, 4.82	259	15.49	13.71, 17.49
≥40 years (n=281)	38	4.89	3.56, 6.72	37	4.76	3.45, 6.57	17	2.19	1.36, 3.52	65	8.36	6.56, 10.67
All people (n=1238)	235	7.36	6.47, 8.36	238	7.45	6.56, 8.46	101	3.16	2.60, 3.84	410	12.84	11.65, 14.14

Note. a. Rate per 100 person years. b. All health service contacts occurring within one calendar day were aggregated to a single violence-related morbidity. CI, confidence interval.

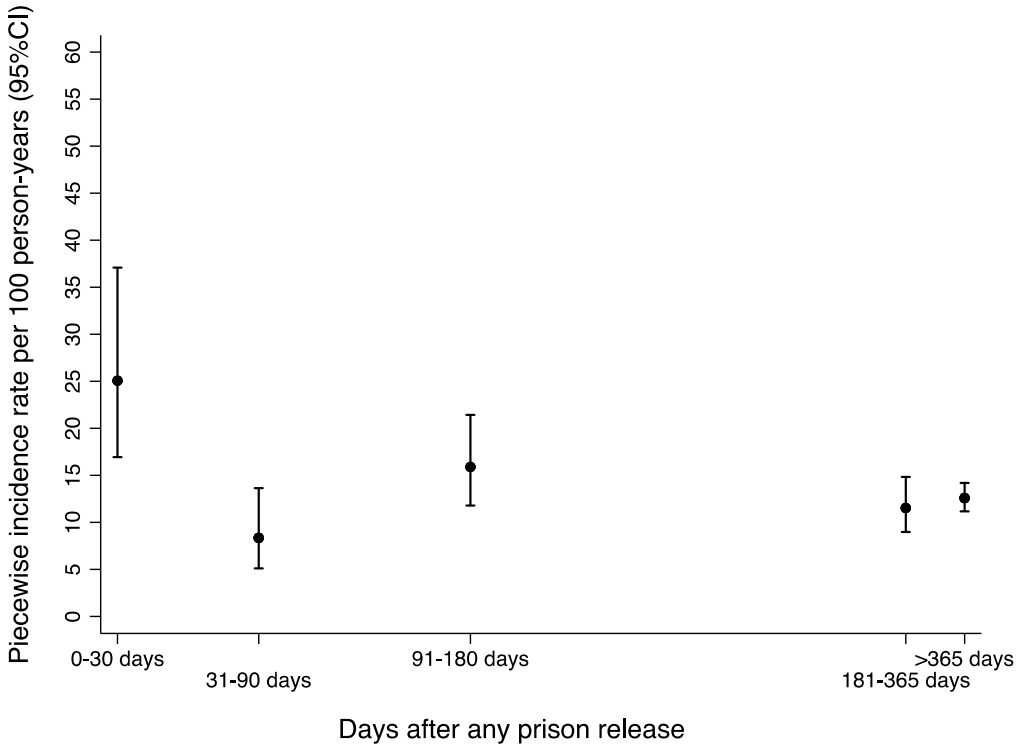

Figure 1. Piecewise incidence rates of violence-related morbidity after any release from prison. Note. Piecewise incidence rates are rates that have been calculated in a number of discrete time intervals.