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Violence-related deaths among people released from incarceration: systematic review and meta-analysis of cohort studies

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ABSTRACT

Background: People released from incarceration have an increased risk of violence-related death. As deaths from violence are a rare event, meta-analysis is needed to calculate reliable estimates of this risk. We examined the crude mortality rates (CMRs), standardised mortality ratios (SMRs), and predictive factors for violence-related deaths among people released from incarceration.

Methods: In this systematic review and meta-analysis, we searched MEDLINE, PubMed, PsycINFO, Scopus, Web of Science, CINCH, and Criminal Justice Abstracts from inception to 14 September 2020 for cohort studies published in English that examined violence-related deaths occurring in the community following release from adult or youth incarceration. We used the Methodological Standard for Epidemiological Research (MASTER) scale to assess the quality of included studies. We conducted a random-effects meta-analysis to calculate pooled estimates of the CMRs and SMRs. Heterogeneity was assessed using univariable meta-regression. This review was registered with the International Prospective Register of Systematic Reviews (PROSPERO; CRD42020209422).

Findings: Our search identified 2,489 records, from which 11 studies met the eligibility criteria. The pooled CMR for violence-related deaths after release from incarceration was 78·7 per 100,000 person-years (95%CI 58·0-99·5). The pooled SMR was 7·6 (95%CI 2·4-12·8). The estimate of heterogeneity was high ($I^2 \geq 99\%$) and the Cochran's Q test was significant ($p<0·001$) for the pooled CMR and SMR. Study design (prospective vs. retrospective; p=0·001) and type of incarceration facility (youth detention vs. prison; p=0·006) were identified as possible sources of heterogeneity for CMRs. Risk factors for violence-related death after release were reported in only five studies. These included being male (n=3), Black or Hispanic in the United States (n=3), and younger age at release from incarceration (n=2).

Interpretation: People released from incarceration are almost eight times more likely to die from violence than the general population. Violence-related deaths are preventable, and the high rate at which they occur after release from incarceration represents an important public health issue requiring targeted, evidence-based response.

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1. Introduction

Many adults and young people (aged <25 years [1]) who have experienced incarceration report histories of violence victimisation [2], and these individuals are more likely than someone who has not been involved in the criminal justice system to be a victim of violent

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Research in context

Evidence before this study

We searched MEDLINE, PubMed, PsycINFO, Scopus, Web of Science, CINCH, and Criminal Justice Abstracts from inception to 14 September 2020 to identify previous systematic reviews and meta-analyses that examined violence-related deaths among people released from incarceration. We used a combination of search terms related to incarceration (e.g., detain* OR imprison* OR prison* OR custod* OR incarcerat* OR inmate* OR detention*), release (e.g., post-release* or release*), violence (e.g., violen* or assault or murder* or manslaughter* or homicide*), and death (e.g., mortalit* or death* or dead or fatal* or lethal* or dying or die*). We found one systematic review from 2011 that examined crude mortality rates (CMRs) and standardised mortality ratios (SMRs) of all- and external-cause deaths after release from incarceration. Although violence-related deaths were an outcome of interest, this review did not meta-analyse cause-specific estimates of mortality (e.g., violence-related CMRs or SMRs). Since review was conducted in 2011, several additional studies have examined violence-related death after release from incarceration. We did not identify any systematic reviews or meta-analyses that examined the predictors of violence-related death after release from incarceration.

Added value of this study

In this systematic review and meta-analysis, we identified 11 studies that contained information on 4,835 violence-related deaths among 988,553 people released from incarceration. Our study is the first to calculate pooled estimates of CMRs and SMRs for violence-related deaths after release. This provides updated and more precise estimates for violence-related deaths than previous published evidence. The pooled estimates provided in our study are an important advocacy tool for the prevention of violence in this population. We found that people released from incarceration were almost eight times more likely to die from violence than the general population. The pooled rate of violence-related deaths after release from incarceration was 79 per 100,000 person-years. Being male, Black or Hispanic in the United States, and younger age at release are possible risk factors for dying from violence after release from incarceration.

Implications of all the available evidence

People released from incarceration are at high risk of dying from violence-related causes. This is an important public health issue, and indicates that there is an unmet need to prevent violence victimisation in this population. Further research is needed to better understand how the risk and rate of violence-related deaths differs by sex and ethnicity, as well as whether there are any potentially modifiable risk factors for these deaths. This research would inform the development of targeted, evidence-based violence prevention strategies. People released from incarceration should be considered a priority group for national and international violence prevention strategies.

crime [3]. This may be partly explained by an overlap in underlying factors for both violence victimisation and incarceration. For example, mental health and substance use issues, homelessness, and low socio-economic status are highly prevalent among people who have experienced incarceration [4,5] and are associated with an increased risk of violence victimisation [6]. Evidence suggests that people who have experienced incarceration likely also have an increased risk of dying from violence [7]. However, as deaths from violence are a rare event, meta-analysis is needed to quantify reliable estimates as individual studies usually have low power [8]. While previous reviews have been conducted on other external cause deaths, such as suicide and drug-related causes [7,9], no reviews have meta-analysed the evidence on the epidemiology violence-related deaths among people released from incarceration.

The only prior systematic review conducted in this area [7] found evidence that people released from incarceration were between three and ten times more likely than the general population to die from violence. However, this review did not meta-analyse the crude mortality rates (CMRs) or standardised mortality ratios (SMRs) for violence-related deaths, possibly due to the limited number of included studies that reported these measures (n=5/18, respectively). Meta-analysing these measures would provide a more precise estimate of the rate of violence-related deaths after release from incarceration, and the risk relative to the general population [8]. Since this review was conducted almost a decade ago, a number of salient studies on violence-related death after release from incarceration have been published [10–13]. Given the importance of policy and decision making to be informed by up-to-date research, there is a clear need to update and expand on the current evidence base. Additionally, this review did not examine what were factors associated with violence-related death after release. This information is essential for the development of evidence-informed, cost-effective prevention strategies by identifying where, when, and towards whom, prevention efforts should be directed [14].

Establishing the incidence and relative risk of violence-related deaths after release from incarceration through meta-analysis will not only improve our understanding of the epidemiology of these deaths, but the resulting pooled estimates will also be an important advocacy tool for the prevention of violence. As the number of people who experience incarceration continues to increase globally [15,16], quantifying the increased risk of violence-related deaths in this population is important. We therefore aimed to: 1) synthesise findings from cohort studies examining the CMRs, SMRs, and predictive factors for violence-related deaths among young people and adults released from incarceration; and 2) calculate pooled estimates of these measures.

2. Methods

2.1. Search strategy and selection criteria

Our review is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines [17]. The protocol for this review has been published [18], and is registered with the International Prospective Register of Systematic Reviews (PROSPERO; CRD42020209422), which was updated on 26 May 2021.

We searched seven key health, social science, and criminology databases (MEDLINE, PubMed, PsycINFO, Scopus, Web of Science, CINCH [the Australian Criminology Database], Criminal Justice Abstracts) using search terms relating to incarceration, death, and violence from inception to 14 September 2020. The search strategy (Table S1) was developed in consultation with a librarian at the Murdoch Children's Research Institute in Melbourne, Australia. Reference lists of all included studies were screened to identify any additional relevant studies.

Studies were eligible for inclusion if they examined violence-related deaths occurring in the community following release from incarceration (including youth detention, prison, and jail) and reported at least one measure of interest (CMR, SMR, or significant predictors of violence-related deaths). We contacted the authors if

incarceration status at the time of death could not be determined from the information provided in the study. To fit within the time and resource constraints of this study, only cohort studies published in English and in peer-reviewed journals were included. There is evidence that excluding non-English papers has a minimal effect on overall conclusions of reviews [19,20]. Study eligibility was not restricted by year of publication or geographic location of the study. Studies examining people released from psychiatric in-patient or forensic mental hospital stays only were excluded. Previous literature reviews were excluded however, the reference lists of these reviews were checked for additional relevant studies. Consistent with previous literature [7], studies with fewer than 20 deaths from violence-related causes, less than 6 months of follow-up, or selected samples (e.g., samples that include only people who use drugs, have mental health disorders, or human immunodeficiency virus) were excluded.

After the removal of duplicates, titles and abstracts of potentially eligible studies were screened by MW, with EJ also screening a random 10% sample. There was moderate inter-rater agreement between the two reviewers (kappa value: 0·76) [21]. Any uncertainty related to study inclusion was resolved through discussion with SK. Full-text articles were independently screened by MW and EJ. Any conflicts were resolved through discussion with SK. Where multiple articles used the same study data, only the article with the longest follow-up period was included.

2.2. Data extraction and quality assessment

Data extraction was conducted by MW using a pre-specified Excel form and checked by EJ (a summary of the information extracted from each article is provided in Table S2). If the CMRs were not reported in an included article, we estimated them using the method outlined in Zlodre and Fazel's review [7], using the number of deaths and total person-years at risk, or using median duration of follow-up or the all-cause CMR to estimate total person-years.

Study quality was assessed using the Methodological Standard for Epidemiological Research (MASTER) scale [22]. The MASTER scale ranks studies based on the number of safeguards against bias present in the study, with a higher number of safeguards indicating a lower probability of bias [22]. Risk of bias of each study was assessed by MW and any uncertainty was resolved through discussion and consensus with SK.

2.3. Statistics

We conducted a random-effects meta-analysis to pool CMRs and SMRs for violence-related death after release from incarceration. Estimates were pooled using the DerSimonian−Laird method. A random-effects method was used because we did not expect the assumptions of a fixed-effects model to be met (i.e. the assumption of a common effect size) [23]. Heterogeneity between studies was assessed using the I^2 statistic, with an I^2 value of 50% and higher interpreted as indicating substantial heterogeneity [8].

Where possible, we explored the potential sources of heterogeneity using univariable meta-regression. We did this using restricted maximum likelihood (REML) estimation with the Knapp-Hartung modification. Values less than zero were rounded to zero. As pre-specified in our protocol, the following factors were considered: type of incarceration facility, prospective/retrospective design, length of follow up, geographic location of the study, sample selection techniques (e.g., single sex samples), and whether the time in subsequent periods of incarceration during follow-up was removed from analysis (i.e., interval truncation).

Where data were available, we stratified the analyses by sex. We included studies of all-male cohorts in the main analysis and the sex stratified analysis, as all studies with mixed-sex samples were predominantly comprised of men.

To examine the effect of study quality on the outcomes, we conducted a sensitivity analysis in which we restricted the analysis to studies rated as having a lower risk of bias (defined as scoring above the median on the MASTER scale). Due to the small number of studies that reported SMRs, we were only able to conduct this sensitivity analysis on the CMR meta-analysis (Figure S1). All analyses were performed using Stata/SE Release 15 [24].

2.4. Deviations from protocol

To be consistent with previous reviews [7], we modified our eligibility criteria by excluding studies from the primary analysis that had fewer than 20 deaths from violence-related causes, less than 6 months of follow-up, or used selected samples. To test the effect of excluding these studies, we conducted a sensitivity analysis that included studies that did not meet these criteria but were otherwise eligible to be included in the review (Tables S3-4; Figure S2-5).

2.5. Role of the funding source

There was no funding source for this study.

2.6. Statement on ethics approval and patient consent

This review is exempt from ethics approval as it synthesises findings from published studies that have already obtained ethics approval. There was no patient involvement in this review.

3. Results

Our search yielded 2,489 records, 1,397 of which remained after duplicates were removed (Figure 1). During title and abstract screening, 1,281 records were excluded, leaving 116 full texts to be assessed. Of these, 11 met the eligibility criteria and were included in this review.

The characteristics of the studies are outlined in Table 1. The 11 included studies [10-13,25-31] contained 988,553 people released from incarceration and 4,835 violence-related deaths (range 68-1,708 violence-related deaths). The studies were published between 2007 and 2020 and had a median follow-up period of 13 years (interquartile range 8-16 years). Where reported, the total person-years in each cohort ranged from 238,457 to 1,974,823 person-years. The risk of bias scores of the included studies on the MASTER scale ranged from 16 to 27, with a median score of 18 (scores above the median indicate a lower risk of bias). Four studies scored above the median and an additional two studies scored 18 on the MASTER scale. Ten studies had a retrospective cohort design and only one study had a prospective design. Eight studies were conducted in the US. Only one study examined young people released from youth detention, with the remaining ten studies examining people released from prison or jail. All studies had predominantly male cohorts and one study had an all-male cohort (range 64-100% men). There were no studies with all-female cohorts. The definitions and data sources for violence-related death used in the studies are summarised in Table S5. All studies defined violence-related death using the International Classification of Diseases (ICD). Of the seven studies that reported the specific ICD codes used, all included the ICD 'assault' sub-chapter (ICD 9 E960-E969; ICD 10 × 85-Y09) [32]. Two studies, conducted in the US and Australia, reported on the most frequent type of violence in their cohort, which was violence involving a firearm and a sharp object, respectively.

The CMR was available in 10 studies and ranged from 25·0 per 100,000 person-years (95% confidence interval (95%CI 20·0-32·0) to 279·0 per 100,000 person-years (95%CI 215·8-342·1; Figure 2). The pooled CMR for violence-related deaths was 78·7 per 100,000

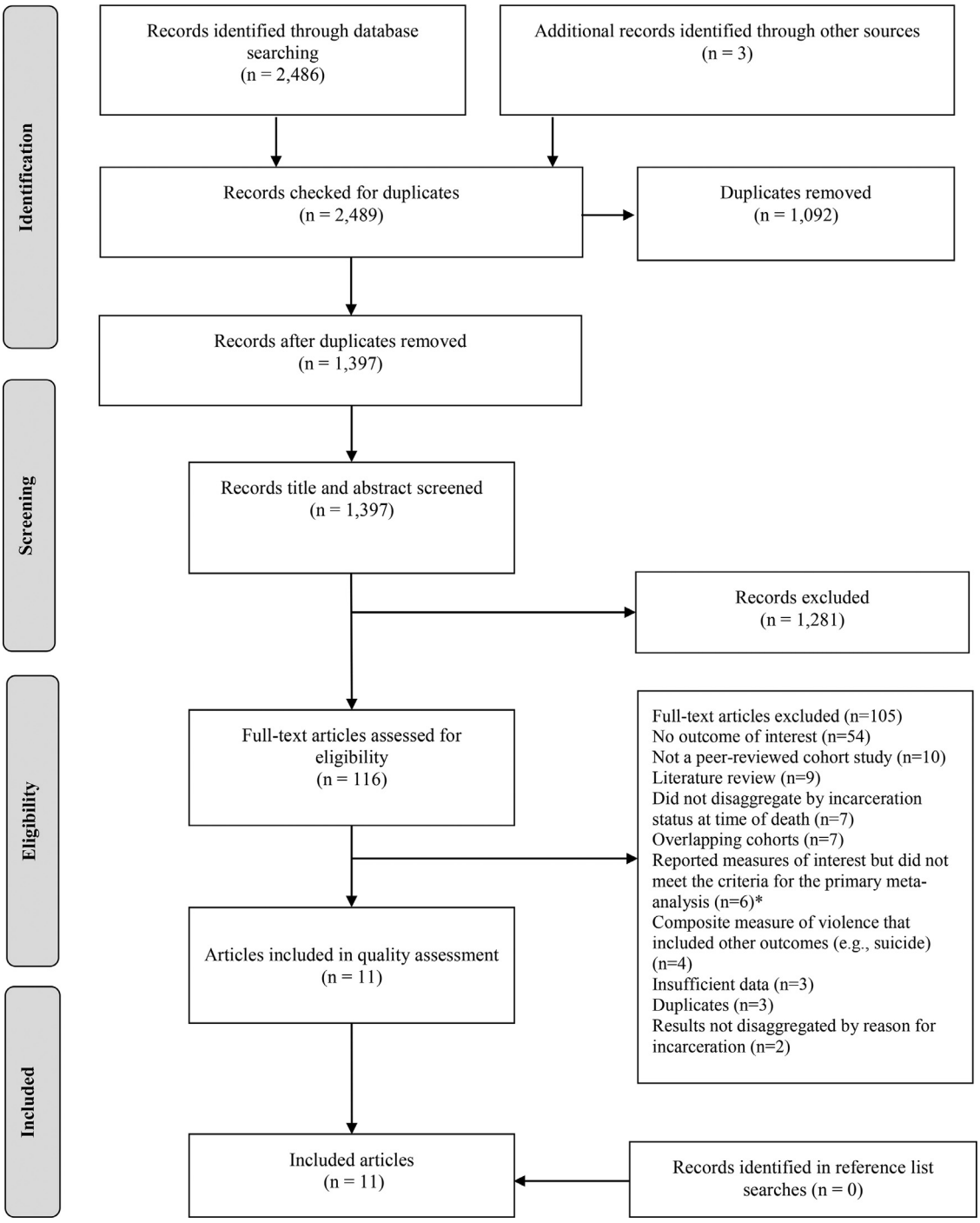


Fig. 1. PRISMA flow diagram of study selection.
*These studies were included in a sensitivity analysis.

person-years (95%CI 58·0-99·5). The estimate of heterogeneity was high (I^2=99·5%) and the Cochran's Q test was significant (p<0·001).

Six studies, including one all-male sample, reported the CMR for men. For men, the pooled CMR was 96.8 per 100,000 person-years (95%CI 59·6-133·9; Figure S6). Five studies reported the CMR for women, with a pooled estimate of 25·7 per 100,000 person-years (95%CI 12·2-39·3; Figure S7). The heterogeneity for both groups was high and the Cochran's Q tests were significant (I^2>80%; p<0·001, for both). We were not able to stratify the analysis by Indigenous status or ethnic groups, as too few studies reported the CMRs by these groups (Table S6).

We used a univariable meta-regression to identify possible sources of heterogeneity in the pooled CMR for violence-related deaths (Table 2). The pooled CMR was higher for studies examining people released from youth detention compared to prison (p=0·006; I^2=99·56%), and for studies with a prospective compared to a retrospective design (p=0·001; I^2=99·54%). We were not able perform a meta-regression to examine the influence of subgroups (i.e., sex, or Indigenous status or ethnic group), due to the small number of studies that reported CMRs by these subgroups.

Four studies reported SMRs for violence-related death after release from incarceration (Figure 3). The reference populations for

Table 1
Characteristics of included studies

First author, year	Design	Country	Years of release from incarceration	Years of follow up	Total py at risk	Median follow up (years)	Population	Total number of people	Males %	Age at baseline (years)	Indigenous/ ethnic groups (%)	Total number of deaths (n)	Deaths from violence n (%)	Violence-related CMR (95%CI) per 100,000 py	Violence-related SMR (95%CI)	Reference population for SMR	Significant risk factors for violence-related death	QA score*
Binswanger, 2013 [24]	R	USA	1999-2009	1999-2009	334238	4•4	People released from prison	76461	84	M: 34•5, SD: 10	Non-Hispanic white (65) Non-Hispanic African American (17) Hispanic (12) Non-Hispanic Asian (3) Other (4)	2462	219 (9)	66•0 (57•0-74•0)	8•5 (7•5-9•5)	Washington State population matched on sex, race, age	NR	17
Brinkley- Rubinstein, 2019 [25]	R	USA	2000-2015	2000-2016	1974823	NR	People released from prison	229274	86	NR	Non-white (60) White (40)	14086	1461 (10)	74•0 (70•2-77•8)§	NR	NA	Restrictive housing during incarceration	23
Chang, 2015 [26]	R	SE	2000-2009	2000-2009	238457	5•1	People released from prison	47326	93	Rg: 16+	Born in Sweden (97) Immigrant (3)	2874	83 (3)	35•0 (27•0-42•0)	NR	NA	NR	18
Kariminia, 2007 [27]	R	AUS	1988-2002	1988-2002	NR	7•7	People released from prison	85203	90	M men: 27•2 M women: 27•3	Non-Indigenous people (86) Indigenous people (11)	4834	229 (5)‡	NC	10•4 (9•0-12•1)	New South Wales population stratified on sex, age, year	NR	16
Lim, 2012 [12]	R	USA	2001-2005	2001-2005	379363	NR	People released from jail	155272	88	Rg: 16-89	Non-Hispanic Black (54) Hispanic (34) Non-Hispanic white (9) Asian (0.8) Other (2)	1149	219 (19)	57•7 (50•1-65•4)§	1•7 (1•5-2•0)	New York City population matched on age, sex, race, and neighbourhood	1-2 weeks after release; incarcerated for ≥ 4 days; Aged less than 33 years; Belonging to an ethnic minority; Male; Not staying in a homeless shelter; Living in low-income area	26
Lize, 2015 [10]	R	USA	2006-2007	2006-2008	NR	NR	People released from prison	476	89	M: 34, SD: 10	American Indian and African American (62) White (38)	166†	111 (67)	107•8 (106•8-108•0)	NR	NA	Being male; Belonging to an ethnic minority; Younger age	21
Rosen, 2008 [28]	R	USA	1980-2004	1980-2005	1822869	NR	Males aged 20-69 years released from prison	168001	100	Med: 32, IQR: 25-40	Black (55) White (45)	15673	1708 (11)	93•7 (89•3-98•1)§	Black people: 2•7 (2•6-2•9) White people: 6•7 (6•1-7•3)	Mid-years from 2008 to 2012 North Carolina population in residents matched on County, sex, race, and age	NR	16

(*continued on next page*)

Table 1 (*Continued*)

First author, year	Design	Country	Years of release from incarceration	Years of follow up	Total py at risk	Median follow up (years)	Population	Total number of people	Males %	Age at baseline (years)	Indigenous/ ethnic groups (%)	Total number of deaths (n)	Deaths from violence n (%)	Violence-related CMR (95%CI) per 100,000 py	Violence-related SMR (95%CI)	Reference population for SMR	Significant risk factors for violence-related death	QA score*
Rosen, 2020 [29]	R	USA	2008-2015	2008-2016	471282	NR	People released from prison	111479	86	Rg: 18-88	Black (50) Non-Hispanic white (42) Hispanic (5) Non-Hispanic other/unknown (3)	3617	395 (11)	83•8 (75•5-92•1)¶	NR	NA	NR	27
Spaulding, 2015 [30]	R	USA	1991	1991-2010	424524	NR	People released from prison	23510	94	M: 32, SD: 9	Non-Hispanic African American (66) Non-Hispanic white (33) Hispanic (1) Unknown (0.2)	3208	267 (8)	62•9 (55•3-70•4)§	NR	NA	NR	16
Teplin, 2014 [11]	P	USA	1995-1998	1995-2011	NR	14•7	Young people released from youth detention	1829	64	Rg: 10-18	African American (55) Hispanic (29) White (16) Other (0.2)	111	75 (68)	279•0 (215•8-342•1)‖	Men: 2•3 (2•1-2•6) Women: 3•0 (1•7-5•2)	2005 Cook County population matched on race, sex, and age	Being male; Belonging to an ethnic minority	18
Willoughby, 2020 [9]	R	AUS	1994-2007	1994-2007	270394	NR	People released from prison	41970	81	Rg: 17+	Non-Indigenous people (81) Indigenous people (19)	2158	68 (3)	25•0 (20•0-32•0)	10•0 (7•9-12•7)	2001 Australian population matched on age and sex	Most recent incarceration <90 days	17

Note. Design: P = prospective; R = retrospective; Country: AUS = Australia; SE = Sweden; USA = United States of America; Age: M = Mean; Med = Median; Rg = Range; SD = Standard deviation; IQR = interquartile range; Other: CMR = Crude mortality rate; NA = Not applicable; NC = Not reported and could not be calculated; NR = not reported; py = person years; QA = Quality assessment; SMR = Standardised mortality rate; 95%CI = 95% confidence interval. *Based on the Methodological Standard for Epidemiological Research (MASTER) scale. Studies which scored above the median score (Med=18) are considered to have a low risk of bias. †Only includes violence-related deaths, suicides, and "other" violent causes. ‡Includes some violence-related deaths in prison. §Calculated using the number of violence-related deaths and total person-years. ¶Calculated using the standard error and violence crude mortality rate. ||Calculated using the median period of follow-up, number of people in the cohort and number of violence-related deaths.

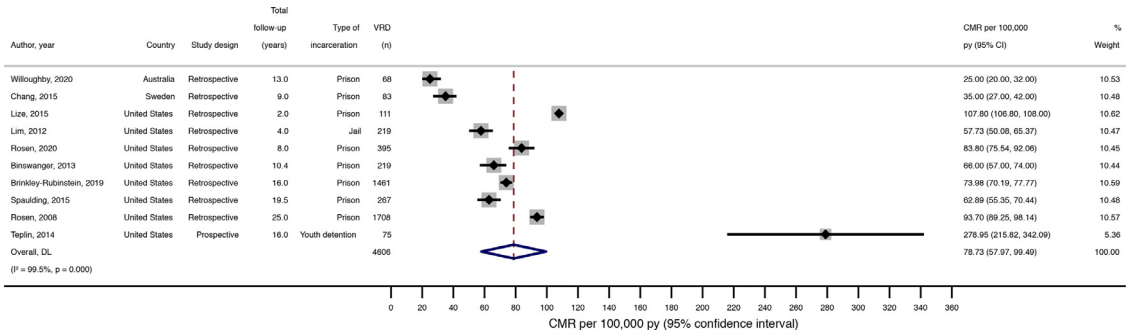


Fig. 2. Meta-analysis of crude mortality rates (CMRs) per 100,000 person-years (py) for violence-related death (VRD) after release from incarceration.
Note. The error bars indicate the 95% confidence interval (95%CI). CMR = crude mortality rate. py = person-years. VRD = violence-related death

Table 2
Univariable meta-regression on the crude mortality rate (CMR) of violence-related deaths by study factors

Factor	Number of studies	CMR (95% CI)	p-value	I^2
Type of incarceration facility				
Prison	8	68.62 (45.11, 92.13)	0.006	99.56%
Jail	1	57.73 (0.00, 124.42)		
Youth detention	1	278.95 (178.13, 379.77)		
Study design				
Retrospective	9	67.43 (46.99, 87.86)	0.001	99.54%
Prospective	1	278.95 (182.94, 374.96)		
Time during subsequent incarcerations excluded from analysis				
No	2	78.31 (0.00, 191.41)	0.888	99.53%
Yes	8	86.29 (29.02, 143.56)		
Total length of follow-up (years)[a]				
≤13 years	6	62.57 (4.98, 120.17)	0.208	99.45%
>13 years	4	117.62 (44.90, 190.34)		
Country				
United States	8	98.14 (42.38, 153.90)	0.464	99.08%
Australia	1	25.00 (0.00, 180.50)		
Sweden	1	35.00 (0.00, 190.61)		
Male only samples				
No	9	83.61 (29.71, 137.52)	0.894	99.55%
Yes	1	93.70 (0.00, 253.49)		

CMR = crude mortality rate; 95%CI = 95% confidence interval;
[a] Included studies had a median follow-up length of 13 years, range 0-26 years.

the SMRs were usually the general population of the geographic location of the study matched on age, sex and/or ethnicity (see Table 1 for reference populations). The SMRs ranged from 1.7 (95% CI 1·5-2·0) to 10·4 (95% CI 909-12·1). An additional two studies only reported SMRs stratified by sex and ethnicity, respectively, and did not report an unstratified estimate for the cohort (Table S6).

The pooled SMR for violence-related deaths after release from incarceration was 7·6 (95%CI 2·4-12·8). The estimate of heterogeneity was high (I^2=99·0%) and the Cochran's Q test was significant ($p<0·001$). We were not able to stratify the analysis by sex, or Indigenous status or ethnic groups, or perform a meta-regression, due to the small number of studies that reported SMRs for these subgroups.

Only five studies reported factors that significantly predicted violence-related death after release from incarceration (Table 1). Three studies, all conducted in the US, found that men and people who identified as Black or Hispanic had an increased risk of violence-related death compared to women, and people who identified as non-Hispanic white, respectively [11–13]. Two of these studies [11,13] found that increasing age at release from incarceration was associated with a decrease in risk of violence-related death. In contrast, one study from Australia did not find a significant association between sex, Indigenous status or age and violence-related death [10]. We were not able to conduct a meta-analysis or a meta-regression on the predictors of violence-related deaths as few studies reported significant predictors and, where they were reported, they were not consistent across the studies.

The results of the sensitivity analyses that 1) restricted the analysis to studies rated as having a lower risk of bias (CMR 81·0 per 100,000 person-years, 95%CI 56·0-105·9, range 57·7-107·8), and 2) included studies that had fewer than 20 deaths from violence-related causes, less than 6 months of follow-up, or used selected samples (CMR 75·7 per 100,000 person-years, 95%CI 56·3-95·1, range 25·0-281·7; SMR 8·3, 95%CI 3·3-13·4, range 1·7-24·1), did not meaningfully differ from the results of the primary analysis (Table S4; Figure S1-5).

4. Discussion

We synthesised findings from cohort studies examining violence-related deaths among young people and adults released from incarceration. Eleven studies, representing 988,553 people released from incarceration and 4,835 deaths from violence-related causes, met our inclusion criteria. We found that people released from incarceration were almost eight times more likely than the general population to die from violence. For reference, the United Nations High Commissioner for Refugees defines a health-related refugee emergency as one where the mortality rate in the refugee population is double that of the reference population (usually the host country or the population prior to displacement) [33]. Among people released from incarceration, the elevation in risk of violence-related deaths compared to the general population was almost four times this threshold. Deaths from violence-related causes are preventable through downstream interventions [6,34,35] and can have a large negative impact on

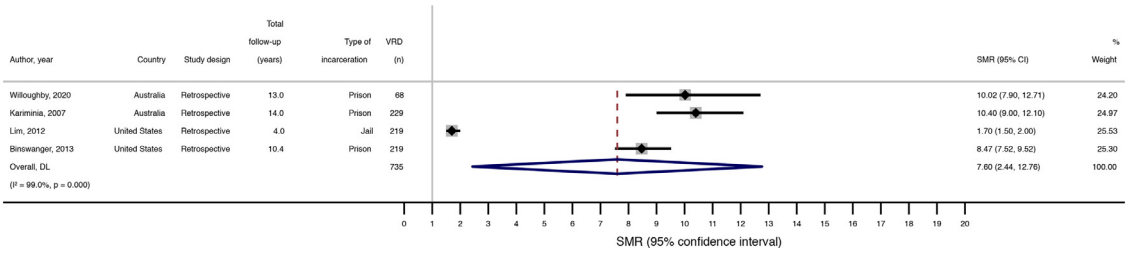


Fig.3. Meta-analysis of standardised mortality ratios (SMRs)*of violence-related death (VRD) after release from incarceration.

*An SMR above one indicates that the rate of dying from violence is higher among people released from incarceration compared to the reference population. An SMR of one indicates that there is no difference in the rate of dying from violence among people released from incarceration and the reference population. See Table 1 for reference populations.

Note. The error bars indicate the 95% confidence intervals (95%CI). SMR = standardised mortality ratio. VRD = violence-related death.

families and communities [36]. As such, reducing violence-related deaths in this population is an important public health issue.

An increase in risk of death was also found in a recent meta-analysis of deaths among people based in the community who had committed a crime, including, but not limited to, people released from prison. This review found that people who had committed a crime had 3.4 times the odds of dying from any cause compared to people who have not committed a crime [37]. The pooled crude rate of violence-related deaths found in this review is lower than the pooled crude rate of other external causes of deaths, such as suicide and drug-related causes, that was reported in a previous review of deaths after release from prison [9], however, this is expected as violence is a rare outcome. The relatively recent body of literature considered in this review (all included studies were published after 2006) reflects a growing recognition of the importance of this issue, and the need to prevent these unnecessary and untimely deaths.

While a high level of heterogeneity in a meta-analysis of observational studies is not unexpected [38], the findings of this review need to be interpreted cautiously due to the amount of unexplained variance between studies. A high I^2 statistic, as found in this review, does not indicate inconsistency across the outcomes in the included studies [39]. Rather, it is a measure of what proportion of the observed variance is real and not due to sampling error [39]. The variance in this review may be due to a range of measured and unmeasured factors, such as the underlying risk of violence-related deaths across different countries, ease of access to firearms in different countries, the age at which people are released from incarceration, and methodological factors such as prospective or retrospective study designs.

Our findings highlight some important gaps in evidence. Very few of the included studies reported the effect measures of interest by sex, Indigenous status, or ethnic groups. In the general population, there are considerable sex and ethnic disparities in the rate of violence victimisation [6], indicating that these are important factors to consider in violence prevention. While our analyses of these groups were limited, we found that the pooled CMR for men was approximately four times higher than that for women (96·8 vs. 25·7 per 100,000 person-years, respectively). Indigenous people and marginalised ethnic groups, such as people who are Black in the US, are more likely to be incarcerated and are more likely to die from violence-related causes compared to non-Indigenous and white people [40,41]. Having a clear understanding of the differences in violence-related death by sex, Indigenous status and ethnicity is important for developing gender- and culturally-sensitive violence prevention programs for people released from incarceration. Future studies should aim to include both men and women in their samples, oversampling women if possible, and examine violence-related death by sex, and Indigenous status or ethnic groups.

The risk factors for violence-related death after release from incarceration remain largely unknown. Very few included studies reported predictors for violence-related deaths and, where predictors were reported, there was limited consensus across the included studies. A small number of included studies reported that being male, and Black or Hispanic were risk factors for violence-related deaths after release in the US [11–13], which is consistent with findings from the general population [6]. Risk factors for violence victimisation in the general population are well established (e.g., substance use and mental health issues, social and economic disadvantage) [6,34,35]. However, it is unknown whether these are generalisable to people who have experienced incarceration. This remains a gap in the literature as few studies included in this review examined the influence of these health and social factors on the risk of violence-related deaths. People who experience incarceration are not representative of the general population, are disproportionately male, young, from Indigenous or marginalised ethnic groups, and more likely experience poor health and social disadvantage [4,5]. It is likely that there would be at least some overlap in risk factors between the general population and people released from incarceration, although the latter population may also experience some unique risk factors for violence-related deaths related to their experiences of incarceration and criminal justice system involvement. The public health approach to violence suggests that multiple factors on the individual (e.g., age, health status), interpersonal (e.g., childhood adversity), community (e.g., high unemployment), and social (e.g., gender norms) levels may influence the risk of violence [6,34,35]. According to this approach, prevention strategies across all levels are needed to effectively prevent violence [6,34,35]. To inform the development of effective violence prevention interventions for this population, potentially modifiable risk factors for violence-related deaths after release from incarceration, such as the prevalence of mental illness and substance use disorders [42–44], need to be consistently measured and reported in future research.

A small number of randomised controlled trials have examined possible interventions to reduce the risk of violence victimisation among women who have had contact with the criminal justice system. For example, motivational interviewing [45] and peer worker case management [46] in the community, and in-prison therapeutic communities [47], although the effectiveness of these interventions has been mixed. More research on risk factors for fatal and non-fatal violence among men and women who have had contact with the criminal justice system is needed to help target these efforts more efficiently. Initiatives such as the Mortality After Release from Incarceration Consortium (MARIC) [48] will enable future studies to be sufficiently powered to examine risk factors for rare outcomes, such as violence-related deaths, after release from incarceration by using individual participant data meta-analysis methods.

Only one included study examined young people released from youth detention [12]. This is surprising given that young people are more likely to be victims of violence [6] and to be involved in the criminal justice system compared to other age groups [49]. However, two studies [50,51] that examined deaths among young people released from youth detention were excluded from this review as they included deaths that occurred during a subsequent period of incarceration in the analysis. Given that the controlled incarceration

environment is starkly different from life in the community, it is likely that the risk factors for violence-related death also differ in these environments [52], where the rate of death due to violence and most other causes is considerably lower than in the community [53]. There is an urgent need for more research on violence-related deaths occurring in the community among young people released from youth detention.

This is the most comprehensive review of violence-related deaths after release from incarceration to date. Our review followed best-practice reporting guidelines [17] and we specified our methods *a priori* [18]. We took a conservative approach by excluding studies with fewer than 20 violence-related deaths, less than 6 months of follow-up, or selected samples, which was consistent with previous literature [7]. Even with this conservative approach, the heterogeneity was high, and not all of this could be explained by the factors examined in our analyses. Due to the uneven distribution of covariates among studies, our meta-regression may lack sufficient statistical power to identify other sources of heterogeneity. The high heterogeneity is unsurprising given that our search was limited to cohort studies [38], which is likely the strongest study design to examine the effect measures of interest. While restricting our search to studies published in English may have introduced some bias, there is evidence that excluding non-English studies does not meaningfully change the findings of systematic reviews [19,20]. Most studies in this review were conducted in the US, which may limit the generalisability of the findings. There is an urgent need for more high-quality evidence on violence-related deaths among people released from incarceration in other countries, including low- and middle-income countries.

People released from incarceration are almost eight times more likely to die from violence than the general population. This indicates an unmet need for prevention of these senseless and avoidable deaths. While limited by high heterogeneity, we generated important information for understanding and preventing violence-related deaths after release from incarceration, and identified critical gaps for future research. The factors predictive of these deaths remain largely unknown which hinders prevention efforts, especially if the factors are modifiable. These violent deaths are preventable, and the high rate at which they are occurring after release from incarceration represents an important public health issue that requires targeted, evidence-based prevention responses. People released from incarceration should be considered a priority group for national and international violence prevention strategies.

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Contributors

MW and MS conceived the idea for the study. MW, JY, MS, RB, and SK designed the study. MW designed and conducted the search. MW and EJ screened and identified eligible studies and conducted the data extraction. MW conducted the analysis, created the figures and wrote the first draft. All authors contributed to interpretation of data and critical revision of the article. MW and EJ verified the data reported in the study. All authors had access to the data, approved the final version of the manuscript and had final responsibility for the decision to submit for publication.

Data sharing statement

Study data are available on request to the authors. The protocol for this review has been published and is openly available [18].

Declaration of Competing Interest

Ms. Willoughby has nothing to disclose. Dr. Young has nothing to disclose. A/Prof Spittal has nothing to disclose. A/Prof Borschmann has nothing to disclose. Ms Janca has nothing to disclose. Prof Kinner has nothing to disclose.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.eclinm.2021.101162.

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