Mortality after release from incarceration in New Zealand by gender: A national record linkage study

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\textbf{ABSTRACT}

\textit{Background:} People who enter and leave places of incarceration experience considerable health inequities and are at increased risk of premature death compared to the general population. Causes of premature death in this population vary markedly between countries and so country-specific information is needed. Additionally, there is a lack of large population-based studies which can disaggregate mortality risk based on person and incarceration factors. This study is the first examination of mortality in the period following release from incarceration in New Zealand.

\textit{Methods:} We linked deidentified administrative data on incarceration and release between 1 January 1998 and 31 December 2016 with national mortality data for the same period to examine mortality after release in those who had been incarcerated for at least 1 day. Age standardised mortality rates and mortality ratios compared to the general New Zealand population were calculated separately for men and women, for releases from remand compared with prison, and by cause of death and time since release.

\textit{Results:} 90,195 individuals (13\% women, 49\% Māori) were followed up for 9.4 years after release from incarceration, with 4,764 deaths over the follow-up period. The overall standardised mortality ratio was 3.3 (95\% CI 3.2, 3.4) compared to the general population, and higher for women (3.8) than men (2.7). The most common causes of death were cardiovascular disease, cancer and suicide. Rates of death were similar following release from remand versus prison, however suicide rates were highest following release from remand. Regardless of the type of incarceration, mortality was highest in the first month after release.

\textit{Conclusion:} Experience of incarceration in New Zealand is associated with high rates of mortality from both chronic conditions and external causes. There are urgent policy imperatives to recognise and actively address the increased health and mortality risks faced by people released from New Zealand prisons.

1. Introduction

Mass incarceration is increasingly being understood as a driver of health and social inequities (Massoglia & Pridemore, 2015; Massoglia & Remster, 2019; Wildeman, 2016; Wildeman & Wang, 2017). Prison populations have risen sharply in recent decades, with over 30 million adults released from prisons and other places of incarceration globally on an annual basis (Borschmann et al., 2020). Compared to the rest of the population, those who enter and leave places of incarceration experience considerable inequities and are at significantly increased risk of premature death (Borschmann et al., 2020; Fox et al., 2019). Similar to other colonial societies, the nation-state currently known as New Zealand (NZ) has extremely high rates of incarceration, particularly among the Indigenous Māori population (Department of Corrections, 2022; King et al., 2020). The rate of incarceration in NZ has been reported as 164 per 100,000 total population. This compares with Australia (167), Sweden (73), Denmark (72) and Finland (50). The United States has the highest rate of incarceration in the world at 629 per 100,000 total population (Fair & Walmsley, 2021).

As at March 2022, there are 7,669 people incarcerated in NZ prisons

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(2,988 people remanded in custody awaiting a trial or sentencing, and 4,593 people who have received a prison sentence) (Department of Corrections, 2022) out of an estimated total resident population of 5,127,100 (Stats NZ, 2022).

Although the total number of people in NZ prisons has decreased since 2018, the proportion of people remanded in custody (currently 39% of the prison population) (Department of Corrections, 2022) has continued to grow over the last decade (Department of Corrections, 2021). Māori comprise 16.5% of the NZ population (Stats NZ, 2018) yet more than half of the people within NZ prisons are Māori (53.4%) (Department of Corrections, 2022). Thus, the rate of incarceration for Māori is 528 per 100,000 Māori population, a figure nearing reported incarceration rates for the United States.

Approximately 15,000 people are released from NZ prisons every year and of those released, 24% are re-incarcerated and 38.8% are sentenced within 12-months of release (Department of Corrections, 2016). Of those initially sentenced to less than a year, 63.4% have been reported to be re-incarcerated within 12-months (Department of Corrections, 2021). As a result, there is likely to be rapid cycling of people entering and leaving prisons across the country.

International studies have reported that the risk of premature mortality for people released from prisons is significantly higher compared to the general population. A systematic review and meta-analysis including 18 cohorts (from three countries) examining all-cause mortality following release reported male all-cause standardised mortality ratios (SMR) ranging from 1.0 to 9.4, and female all-cause SMRs ranging from 2.6 to 41.4 (compared with the general population) (Zlodre & Fazel, 2012). Large cohort studies in the United States, Australia, Canada, Sweden, Iceland, and elsewhere have found increased risk of mortality following release from prisons both in the shorter term (weeks) (Borshmann et al., 2020; Bukten et al., 2017; Degenhardt et al., 2014; Lim et al., 2012; Merrall et al., 2010; Ødegård et al., 2010) and longer term (over a year) (Kinner et al., 2013). Studies show that mortality has a dose-response relationship with both length of time in prison (Patterson, 2013) and repeated short-term incarceration (Graham et al., 2015).

Suicide, drug overdose, and other external causes are responsible for many of the early deaths (Merrall et al., 2010; Jones & Maynard, 2013). Longer-term mortality has been related to infectious diseases (such as HIV and Hepatitis C), cardiovascular disease, respiratory disease, liver disease and specific cancers (such as liver and lung cancers) (Kinner et al., 2013; Massoglia & Pridemore, 2015; Massoglia & Remster, 2019). Although studies have consistently found an increased risk of mortality for people released from prisons compared to the general population, causes of death have tended to vary considerably between countries (Borshmann et al., 2020).

Internationally, there remain evidence gaps around mortality following release from prisons. These include inadequate sample size to disaggregate data by important factors including sociodemographic (age, ethnicity, socioeconomic factors), health (behaviours, health conditions, experiences of services, cause of death) and incarceration factors (time since release, whether a person is pre-trial or remand or sentenced, length of incarceration, previous incarceration) (Borshmann et al., 2020). Much of the evidence on mortality following release from incarceration is limited in its capacity to inform evidence-based responses to improve health, and reduce preventable mortality for people released from prisons. There is therefore a need for high-quality whole of population studies measuring a range of health outcomes (including mortality) to contribute to understanding of the impacts of incarceration, and the targeting of interventions to improve health and reduce premature mortality (Borshmann et al., 2020; Kinner & Young, 2018; Zlodre & Fazel, 2012). This work has also indicated a need for the development of appropriate methodological approaches to monitoring mortality post-release from places of incarceration (Borshmann et al., 2020; Kinner et al., 2013; Kinner & Forsyth, 2016).

With regard to the health of people incarcerated in NZ prisons, the Corrections Act, 2004 states that a person in prison is “entitled to receive medical treatment that is reasonably necessary” (Corrections Act, 2004, s75-1) and that the standard of healthcare available to people in prison “must be reasonably equivalent to the standard of healthcare available to the public” (Corrections Act, 2004, s75-2). Corrections provides primary healthcare services to people in prison (including primary dental and mental healthcare), basic emergency care, pharmaceuticals, and some disability support services. Other health and disability services are provided as part of the national system that funds public health and hospital level services for people in prisons (public health and preventive services, secondary and tertiary healthcare services as well as specialist mental health, alcohol and drug services, maternity and Well Child Tamariki Ora services, and disability support services). Five hospitals provide regional services for people with mental illness and learning/intellectual disability within the context of the justice system, including forensic hospital inpatient services, court liaison teams, community forensic services, assessments and transfer of mentally unwell individuals in prison to secure hospital facilities, and in-reach specialist (King, 2019). Consequently, coordination between the justice, corrections, and health sectors in the delivery of health and disability services before, during, and following release from prisons poses considerable challenges (National Advisory Committee on Health & Disability, 2010).

Conditions in NZ prisons, including their impact on the health of people in prison, have been the focus of numerous reports and commentaries over the last decade (Auditor General, 2008; Carr, 2007; National Advisory Committee on Health & Disability, 2010, Roguski & Chauvel, 2009; United Nations Committee against Torture, 2015), giving voice to the daily inhumaneness of the prison environment. For instance, use of solitary confinement and mechanical restraints such as ‘tie-down’ beds, and handcuffs on people in prison who are pregnant including whilst in labour and post-delivery of their babies (Carr & King, 2019; Lamusse, 2018; Office of the Children’s Commissioner, 2021; Shalev, 2017, 2020, 2021). Research into the impacts of incarceration on health outcomes in NZ however is still limited (King, 2019; National Advisory Committee on Health & Disability, 2010). To date, there have been two mental health surveys conducted in prisons in 1999 and 2015, showing high rates of mental health and addictions (Indig et al., 2016).

Less is known about the physical health of people with the latest available data being from a 2005 national level survey conducted in NZ prisons (Ministry of Health, 2006). Corrections reports deaths in custody in its annual report. In 2020/21, there were 24 deaths in custody including 11 ‘unnatural deaths’ relating to ‘apparent suicides (Department of Corrections, 2021). To date, there have been no studies reporting on mortality following release from incarceration in NZ prisons.

Thus, our study focuses on what happens after release from incarceration in NZ prisons for three reasons. Firstly, this has been identified as a time of particularly high risk of adverse events (Borshmann et al., 2020; Kinner et al., 2013; Kinner & Wang, 2014; Massoglia & Pridemore, 2015). Secondly, community re-entry (release from incarceration and the days, weeks, months, years following) is a critical intervention point to address the health impacts of incarceration (Kinner & Wang, 2014; Mears & Cochran, 2014), and thirdly, as mass incarceration inevitably leads to issues of ‘mass re-entry’ of people from prisons into communities (Mears & Cochran, 2014), it is imperative to monitor the impacts of government carceral and other policies on the health of people incarcerated by the state.

The aims of this study were to: 1) describe mortality rates and main causes of death for adults released from incarceration in NZ prisons between the years 1998 and 2016; 2) compare mortality rates to the general population, adjusting for age differences; and, 3) investigate the impact of type of incarceration (prison vs remand) and time since release on mortality rates and causes of death.
2. Methods

2.1. Ethics and data use

Ethics was granted by University of Otago Human Research Ethics Committee (reference number: HD19/082). Data access was approved by Stats NZ. The results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is managed by Stats NZ (Stats NZ, 2020).

2.2. Data source

The analyses were performed using Stats NZ’s Integrated Data Infrastructure (IDI), a large database containing person-level data for individuals who have interacted with NZ government services (Stats NZ, 2020). To create the IDI, births, tax and visa data are used to generate a list of people who have resided in NZ at any time since 1998. This list forms a “spine” to which other datasets are probabilistically linked. Datasets include administrative data, data from non-governmental organisations, and some government survey data. A deidentified version of the IDI is available for researchers to analyse in a secure and safe environment (Milne et al., 2019; Stats NZ, 2020). We used the December 2019 refresh of the IDI.

Information about prison release was taken from Department of Corrections’ sentencing and remand data. Deaths were identified from the Ministry of Health’s mortality dataset. Demographic information was taken from the personal details table (which collates demographic information from across the IDI) and from the Ministry of Health’s National Health Index demographics dataset. 2.2% of the prison release population could not be linked to the spine of the IDI and therefore could not be linked to mortality or other data. These people were excluded from the study as the outcome could not be identified for this group.

Ethnicity was available within the personal details table, in Corrections data at the time of incarceration, and at the time of death as part of the death record. After a thorough data quality analysis of each source, we used ethnicity from the personal details table. This takes ethnicity from several sources in the IDI – Census, Department of Internal Affairs (birth and death registrations), Ministry of Health, Ministry of Education, and others – ranks these sources on data quality and assigns the ethnicity from the best quality source. Total response ethnicity is presented, where each person is included in each ethnic group they identify with, resulting in people being included in multiple ethnic groups.

2.3. Prison release cohort

The cohort includes people, released from prison or remand in NZ between 1 January 1998 and 31 December 2016, and aged 18 years or older at release. We excluded people from the cohort who died during incarceration, as the focus was on death after release from incarceration. Mortality rate calculations are based on those aged between 20 and 64 years at release. We excluded people aged <20 years because of the low numbers of deaths and the lack of standard population data for 18–19 year olds, and people aged over 65 years because of the low numbers of older people in the cohort (reducing the precision of estimates).

2.4. Computation

Analyses were performed using SAS Enterprise Guide 7.1. We identified all incarcerations for the cohort within the ‘Major Management Periods’ table in the Corrections’ datasets. We then grouped all consecutive and overlapping records to form continuous incarceration episodes, each with a date of incarceration, and date of release, to reflect the persons experience of incarceration rather than administrative classification. An individual could have multiple incarceration (and therefore out-side of prison and at risk of mortality) periods during the study time frame. Person-time at risk was counted from the date of release to the date of reincarceration, date of death, or the end of the study period, whichever came first. Age was derived at the end of each calendar year of follow up, to ensure person-time was counted against the correct age group.

We identified death registrations for the cohort from 1 January 1998 to 31 December 2016 in the mortality data. The underlying cause of death, as reported on the death certificate, was grouped into external and non-external (medical) causes, and further classified into eight subgroups (Supplementary Table 1) adapted from the proposed international standards for research in this setting (Borschmann et al., 2020). Demographic data, including month of birth, gender and ethnicity, was derived from the personal details table. We used the date of death from the population cohort demographics data, as full date of death was required to ensure that we only counted deaths in the community after release. This included 18 deaths on the date of release: it was not possible to confirm whether these deaths occurred within incarceration facilities, or in the community.

2.5. Exposure

Any incarceration for greater than one day was the exposure. Releases were categorised as either 1) releases following remand-only periods of incarceration, or 2) releases following periods of incarceration that included time in prison (with or without prior time spent on remand).

2.6. Outcome

Mortality after release was the main outcome. We categorised deaths by the cause of death (Supplementary Table 1). We also used a simplified categorisation of deaths due to suicide, non-suicide external causes and medical (non-external) causes. Deaths were further categorised by time since release, into those which occurred less than a month of release, and those which occurred a month or longer after release.

2.7. Analyses

We calculated descriptive statistics about population released from incarceration, characteristics of the episode of incarceration (releases), and death after incarceration. Where possible, all results were stratified by gender, although some stratified results have not been included due to low numbers of events. Results were also stratified by type of incarceration (remand versus prison) and time since release, to explore the impact of these factors on death rates and causes. Further results stratified by ethnicity will be included in a subsequent paper.

In addition, we calculated age-standardised rates (ASR) and SMRs for deaths. The ASRs were deaths per 100,000 person-years, standardised to the WHO world standard population (Ahmad et al., 2001). The SMRs were the ratio of the death rate within the incarcerated population, compared to the death rate within the age and gender specific groups in the NZ general population. For both ASRs, and SMRs, we calculated all-cause and cause-specific iterations. Where numbers of outcomes were too small to calculate reliable ASRs, only SMRs were presented. This was the case when comparing mortality rates by time after release and type of incarceration. The denominators for the general population mortality rates were annual resident NZ population estimates from 1998 to 2016.

3. Results

3.1. Cohort description

A total of 93,762 individuals were identified from the Corrections dataset as having been released from remand or prison between 1 January 1998 and 31 December 2016. After exclusions, 90,195 individuals aged 18 years and over were included in the prison release...
Fig. 1. Inclusion/exclusion flow diagram.

1. Records were excluded if the person died in prison or remand, or if the record was of poor quality.
2. Some analyses excluded deaths in people aged 18 and 19 years and over 65 years of age, and the person-years for these age groups. This was because standard population data was not available for 18 and 19 year olds, and the low number of people over 65 years of age skewed results.
3. Age was calculated at the start of every person-year at risk of death. There were 2,307 people released over the study period who were only aged 18 and 19 or over 65 years of age in the study period who were excluded from analyses.

Table 1
Demographics of people released from prison or remand in New Zealand, 1998 to 2016.

| Demographics                          | Gender |
|---------------------------------------|--------|
|                                       | Male   | Female |
| Total people                          | 85,146 | 11,349 |
| Total releases                        | 250,752| 23,901 |
| Mean age at release (years)           | 30.9   | 31.0   |
| IQ range range                        | 14     | 15     |
| Std dev                               | 10.3   | 9.9    |
| Age at release (number of releases)   |        |        |
| 18–24 years                           | 84,819 | 77,145 |
| 25–34 years                           | 85,671 | 77,307 |
| 35–44 years                           | 52,467 | 47,214 |
| 45–54 years                           | 21,090 | 18,975 |
| 55+ years                             | 6,711  | 6,213  |
| Total response ethnicity               |        |        |
| Maori                                 | 43,749 | 37,209 |
| Pacific                               | 11,307 | 10,230 |
| Asian                                 | 3,594  | 3,234  |
| MELAA                                 | 1,527  | 1,410  |
| NZ European /Other                    | 45,855 | 40,170 |

Note: all counts are random rounded (base 3) due to confidentiality requirements so will not sum exactly to totals.
releases over the study period. Three quarters of men in the cohort had women. Men had a mean of 2.9 releases while women had a mean of 2.1 remand. The age distribution of releases was similar between men and women released from prison or remand over the study period. The mean follow-up time per person was 9.4 years, and ranged from 1 day to 19 years.

Table 2 provides information on the age and ethnicity of men and women released from prison or remand over the study period (one quarter only had a release from remand), while 69% of women had at least one release from prison. The total number of releases per year increased dramatically over the study period (1998–2016) with the increase primarily occurring in the years 1998–2007. Among men, the annual number of releases increased by 70%, while for women, there was an increase of 170%.

### 3.2. Mortality after release

A total of 4,764 deaths occurred after the follow up period (Table 3), with most (91%) of these observed deaths among men (as the larger group in the study population). The numbers of deaths increased steadily with age for men, but for women the greatest number of deaths were highest from AOD poisoning and interpersonal violence for both men and women. For men the death rate from AOD poisoning was 8.7 times higher than the general population (CI 7.2, 10.1). For women, the death rate from AOD poisoning was 25.5 times higher and was 8.6 times higher than the general population (CI 7.2, 10.1). For the prison release population compared to the general NZ population, the most common causes of death for men were cardiovascular with an ASR of 129.4 per 100,000 person-years, followed by cancer (ASR 123.3), suicide (ASR 89.8) and transport-related (ASR 46.5).

Overall, the standardised mortality ratio (SMR) was 3.3 (CI 3.2, 3.4) for the prison release population compared to the general NZ population, and higher for women (SMR 3.8) than men (SMR 2.7). The SMRs were highest from AOD poisoning and interpersonal violence for both men and women. For men the death rate from AOD poisoning was 8.7 times higher (CI 7.7, 9.8), and the death rate from interpersonal violence was 8.6 times higher than the general population (CI 7.2, 10.1). For women, the death rate from AOD poisoning was 25.5 times higher and the death rate from interpersonal violence was 19.8 times higher than the general population.

Table 5 compares mortality rates between those who had been released from prison and those who had been released directly from remand. The rates of death following release from remand are similar to the rates of death following release from prison, with the exception of
suicide rates which are substantially higher following release from remand (ASR 125.6) than following release from prison (ASR 76.7).

Table 6 shows mortality by time after release, dichotomised to: 1) within a month of release; and, 2) beyond a month of release, and comparing those who have been released from remand with those who have been released from prison. Regardless of type of incarceration, mortality relative to the general population death rates were highest in the first month after release for all causes, with SMRs ranging from 9.9 for medical causes (95% CI 8.2, 11.8) up to 28.8 for suicide (95% CI 23.3, 35.4). However, in the first month following release from remand, compared with the general population, the SMR for suicide was markedly higher than among those released from prison (SMR 68.1 versus SMR 22.9). Beyond the first month, there was much less difference in the SMRs following release from remand versus release from prison. However, compared with the general population, suicide rates after release from remand still remained higher (SMR 6.7 following release from remand versus SMR 4.5 following release from prison).

4. Discussion

This study examined mortality among 90,195 people (13% women) released from prison or remand between 1998 and 2016, followed up for an average of 9.4 years, with an average of 2.5 releases per person and 4,764 deaths during the follow-up period. The most common causes of death for both men and women were cardiovascular disease, cancer and suicide, with the main cause of death for men being cardiovascular disease, and for women, cancer. Compared to the general population, the SMRs of deaths from all major causes were higher in those recently released from incarceration, ranging from 1.6 times higher for deaths from cancer up to 12.5 times higher for deaths from AOD poisoning.

Findings of this study mirror those of international studies reporting the very high risks of mortality during the community re-entry period, particularly within the weeks immediately following release from places from incarceration, but also over the longer term (Borshmann et al., 2020; Fox et al., 2019). Internationally, high risks of fatal opioid overdose have been reported as the predominant driver of increased mortality rates for people in the immediate weeks following release from incarceration compared with the general population (Fox et al., 2019; Merrall et al., 2010). However, findings from our study differed in that deaths from suicide were the driver of increased mortality rates compared with the general population in the weeks following release from incarceration, with the biggest difference found (SMR 68.1) amongst those who had most recently been released from remand. The increased risk of suicide post release from prison has previously been reported (Jones & Maynard, 2013; Merrall et al., 2010). A recent systematic review and meta-analysis reports that remand status is significantly associated with increased risk of suicide (Zhong et al., 2021). Our findings regarding increased mortality and remand status are particularly concerning within the context of NZ, where the proportion of people on remand (39% of the prison population) continues to grow.

In alignment with international studies examining longer-term follow-up, we also found cardio-vascular disease and cancer to be the most common causes of mortality (Binswanger et al., 2013). These are also the leading causes of death for the general NZ population (Ministry of Health, 2021). Our findings also aligned with other international studies reporting higher risks of death from suicide for women compared to men following release from incarceration (Fox et al., 2019). However, although higher death rates were seen from AOD poisoning and interpersonal violence for both men and women compared to the general population, for women, AOD poisoning deaths were 25.5 times higher, and deaths from interpersonal violence were 19.8 times higher than the general population.

This study has a number of strengths. As a population-based study it includes complete national data for 18 years of incarceration releases. It is also the first, to our knowledge, nationally linked cohort study of its kind, and demonstrates the importance of the early period following
interpersonal violence, and suicide are all high risk of subsequent mortality.

Our findings reiterate that, due to different contexts that include driving factors and causes of preventable deaths and thus the need for appropriate policy responses, localised and timely data is critical to addressing the adverse health outcomes of people who enter and leave places of incarceration (Kinner & Forsyth, 2016). As it is the first study of mortality following release from prisons in NZ, this study paves the way for further research on the health of a population group that experience considerable marginalisation.

Mortality patterns seen in the population who have been released from incarceration to some extent reflects patterns of deaths seen in the general Māori population. There is a comprehensive evidence base regarding the inequities in health and disability outcomes experienced by Māori as a result of colonisation, coloniality and racism (Ministry of Health, 2015; King, 2019; Reid et al., 2019). However, further analyses from our work (included in a separate paper currently in preparation examining mortality following release from prison by ethnicity and led by Indigenous Māori authors on the team) demonstrates that for both Māori and non-Māori, incarceration is associated with a significantly higher risk of subsequent mortality.

In NZ, Government commissioned reports have called for fundamental transformation of the justice system, with a priority of addressing mass incarceration of Māori (Hapaitia te Oranga Tangata Safe and Effective Justice Programme, 2019; Te Uepi Hapai i te Ora: Safe and Effective Justice Advisory Group, 2019). Internationally, urgency around addressing mass incarceration has intensified in response to the COVID-19 pandemic impacts on health outcomes for people in places of incarceration, the staff who work there, and surrounding communities (Rapisarda & Byrne, 2020a; 2020b; 2020c; 2020d; Byrne et al., 2020; Henry, 2020; Montoya-Barthelemy et al., 2020; Rapisarda et al., 2020a; 2020b). Hence there have been increased calls for addressing mass incarceration through rapid decarceration (Alohan & Calvo, 2020; Minkler et al., 2020; National Academies of Sciences, Engineering, & Medicine, 2020; UNODC, WHO, UNAIDS, & OHCHR, 2020) moving towards humane, just and fair substitutions to the carceral state (American Public Health Association, 2020).

Achieving this in NZ requires a whole-of-government commitment to an equitable public health approach that reduces the number of people in places of incarceration via curbing admissions to youth justice residences and prisons, and facilitating early release from them (King et al., 2020). This will require inter-departmental work particularly between justice, corrections and the new health entities established under the current NZ health reforms (Department of the Prime Minister and Cabinet, 2022). Additionally, effective implementation of the health reforms will require clear ‘handover’ of the responsibility for funding

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**Table 5**

Deaths after release by type of incarceration and cause, 1998 to 2016, compared to the general population.

| Cause of Death            | Prison                     | Remand only                |
|---------------------------|----------------------------|----------------------------|
|                           | N  | ASR* | 95% CI | SMR** | 95% CI | N  | ASR  | 95% CI | SMR | 95% CI |
| AOD poisoning             | 125| 38.2 | 33.3-43.2 | 8.8   | 7.7-10.1 | 66 | 41.7 | 30.2-53.1 | 12.3 | 9.5-15.7 |
| Interpersonal violence    | 135| 19.7 | 16.2-23.2 | 9.2   | 7.6-11.0 | 30 | 17.6 | 11.1-24.1 | 10.2 | 7.0-14.5 |
| Other injuries            | 33.9| 28.8-39.0 | 3.3   | 2.8-3.8 | 5  | 32.3 | 22.9-41.8 | 5.0  | 3.8-6.6 |
| Suicide                   | 522| 76.7 | 69.8-83.5 | 3.3   | 3.0-3.6 | 216| 125.6| 107.5-143.7 | 7.6  | 6.6-8.7 |
| Transport related         | 354| 54.3 | 48.4-60.3 | 3.1   | 2.8-3.5 | 87 | 47.6 | 37.0-58.2 | 4.2  | 3.4-5.2 |
| Cancer and other neoplasms| 549| 125.7| 114.8-136.6 | 2.1   | 2.0-2.3 | 141| 122.3| 99.5-145.1 | 3.0  | 2.5-3.6 |
| Cardiovascular diseases   | 125.7| 97.2-117.3 | 2.6   | 2.4-2.8 | 138| 102.2| 82.7-121.7 | 3.2  | 2.7-3.8 |

Note: all counts are random rounded (base 3) due to confidentiality requirements so will not sum exactly to totals.

* per 100,000 person years of follow up after release.

** age and gender standardised mortality ratio.

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**Table 6**

Deaths within a month of release and at least a month post-release, 1998 to 2016, by cause of death and type of incarceration, compared to the general population.

| Incarceration type | Cause of death          | N | SMR | From release |
|--------------------|-------------------------|---|-----|--------------|
|                    |                         |   |     | <1 month | ≥1 month | <1 month | ≥1 month | <1 month | ≥1 month |<1 month | ≥1 month |
| All                | Medical/non-external    | 120| 1.79 | 1.57-1.81 | 9.7 | 2.1-2.3 |
|                    | Suicide                 | 48 | 2.3-3.5 | 4.9 | 4.6-5.3 |
|                    | Other external          | 1092| 1.98 | 1.8-2.14 | 5.9 | 5.6-6.3 |
| Prison             | Medical/non-external    | 1584| 10.0 | 9.2-12.1 | 2.2 | 2.1-2.3 |
|                    | Suicide                 | 459 | 22.9 | 17.6-29.3 | 4.5 | 4.1-4.9 |
|                    | Other external          | 867 | 19.9 | 15.6-24.9 | 6.0 | 5.6-6.4 |
| Remand only        | Medical/non-external    | 393| 16.7 | 14.4-27.6 | 2.3 | 2.1-2.5 |
|                    | Suicide                 | 186 | 68.1 | 45.6-97.8 | 6.7 | 5.8-7.7 |
|                    | Other external          | 222 | 22.0 | 11.0-39.4 | 5.7 | 5.0-6.5 |

Note: all counts are random rounded (base 3) due to confidentiality requirements so will not sum exactly to totals.
and provision of health and disability services within prisons to these new health entities, which, under the PaeOra Healthy Futures Act, 2022, must also evaluate the delivery and performance of the services that they fund or provide, inclusive of those within prisons (Pae Ora Act, 2022). Reforms are thus an opportunity to improve the health and disability care for people within and following release from NZ prisons.

5. Conclusion

The findings of our study demonstrate the criticality of decision-making around ensuring safe pathways to freedom in the release of people from NZ prisons, and are of relevance to decision-makers in policy settings, as well as to practitioners working in health and social service settings (for instance, primary care, emergency medicine, mental health and addictions, family violence prevention, suicide prevention). We must not only recognise but also actively address the increased health risks faced by people released from NZ prisons, via facilitated access to income support and safe accommodation, and through comprehensive health and social service planning involving access to high-quality culturally safe health and disability care within prisons, to guarantee timely continuity of care and ongoing support from health and social services within communities upon release.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2022.101274.

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