

Natural deaths in male prisoners: a 20-year mortality study

Seena Fazel¹, Ram Benning²

Background: Although morbidity is high in prisoners compared with the general population, uncertainty exists over rates for natural causes of death. We investigated natural deaths in prisons in England and Wales over a 20-year period. **Methods:** All men who died in English and Welsh prisons from 1978–1997 were identified. All deaths received a post-mortem. Death certificates were obtained to provide mortality information according to ICD-9. Standardised mortality ratios (SMRs) for major causes of natural death were calculated in those <60 years. **Results:** 574 male prisoners died in custody from natural deaths, of which 307 (53%) deaths were from circulatory diseases and 91 (16%) from respiratory causes. Overall, SMRs for natural deaths were significantly lower than the general population (SMR = 0.70; 95% CI = 0.65–0.76). However, SMRs from respiratory pneumonia (SMR = 2.35; 1.75–3.16) and from other infectious causes were higher (SMR = 1.52; 1.03–2.23). **Conclusion:** There are important methodological challenges in calculating SMRs in prisoners. Bearing these in mind, we found increased mortality ratios for respiratory pneumonia and other infections. These findings highlight the need for the screening and effective treatment of infectious diseases in prisoners.

Keywords: infections, mortality, pneumonia, prisoners, prisons

There are 9 million prisoners worldwide, numbers that have been increasing in most countries over the last decade.¹ Prisoners have increased rates of morbidity, in particular, serious mental disorders,² tuberculosis,^{3,4} hepatitis and other infectious diseases,^{5–7} and self-reported physical ill-health.^{8,9} However, uncertainty exists over whether this increased morbidity is associated with raised mortality. Research in France and the US have found that mortality rates from natural causes were lower in prisoners than in the general population,^{10,11} which have been attributed to the potentially positive aspects of the lifestyle in detention, while a recent study of 92 natural deaths in England and Wales found increased mortality rates in male prisoners.¹² To address this uncertainty over death rates compared with the general population, we investigated 574 natural deaths in prisons in England and Wales over a 20-year period. With around 75 000 prisoners, England and Wales has one of the highest rates of incarceration in Western Europe.¹³

Improving the health of prisoners has a number of public health implications. The most important of these is that inmates are from marginalised populations that have poor access to primary health care in the community, and therefore prison provides a rare opportunity to screen for and treat illnesses, particularly contagious and chronic ones.^{14,15} Furthermore, updated studies of prisoner morbidity and mortality is important as prison healthcare becomes the responsibility of state-run public health services, as has been occurring in the UK over the last few years.¹⁶ Such work may contribute to developing further Europe-wide standards for prison healthcare, an issue that is increasingly recognized.^{17,18}

Methods

All prisoners who die in custody in England and Wales receive a post-mortem. Prisoners who transfer to outside hospitals and die there remain classified as prisoners, as do prisoners who die

en route to court, on home leave, or elsewhere. From 1978, Her Majesty's Prison Service has kept a record of all deaths in custody in England and Wales, with information on the coroner's inquest finding (which reports whether the cause of death was from natural causes, misadventure, suicide, or an open verdict). We requested information from 1978 to 1997 on the deaths of all male prisoners, both sentenced and remand. Subsequently we approached the Medical Research Unit, UK Office for National Statistics, for copies of death certificates, which coded deaths according to the ninth revision of the International Classification of Diseases (ICD). Where death certificates were not available ($n = 94$), the coroner's inquest finding was used. We found very good agreement between these two sources of information in deaths where post-mortem information was available: a Cohen's kappa of 0.91 was found on whether a death was classified as being from natural causes or not.

Age information was taken from death certificates. Of male prisoners who died in custody, 16 did not record date of birth, and these were assumed to have the same age at death as the average age of other male deaths in custody. Social class information was gathered from death certificates, which report last known profession. This was coded according to the standard UK governmental system.¹⁹ Mortality rates were not adjusted by social class as information was available in only 61% of prisoners. Information on social class was available in 352 prisoners, of whom 11 were in social class I (professional), 24 in II (managerial and technical), 30 in IIIN (skilled non-manual), 143 in IIIM (skilled manual), 44 in IV (partly skilled) and 100 in V (unskilled).

As with other studies,¹⁰ the total number of prisoners each year was taken to be the average annual prison population reported by the Home Office of remand and sentenced prisoners in England and Wales.

Standardised mortality ratios (SMRs) were calculated²⁰—the ratio of the observed to the expected frequency of deaths—according to the standard UK Prison Service age banding: 14–16, 17–20, 21–24, 25–29, 30–39, 40–49, 50–59, and over 60 from 1978–1989, with the first two age groups changing to 15–17 and 18–20 from 1990–1997. Information on general population death rates was specifically requested from the Office for National Statistics on these age bands for every

1 Department of Psychiatry, University of Oxford, Oxford, UK

2 Derby City General Hospital, Derby, UK

Correspondence: Dr Seena Fazel, University Department of Psychiatry, Warneford Hospital, Oxford OX3 7JX, UK, fax: +44-1865793101, e-mail: seena.fazel@psych.ox.ac.uk

year 1978–1997, including the change in age banding after 1990. An advantage of SMR analyses is they take into account changes in the age structure of prison population. Information on duration of custody was not reliably available and therefore not investigated in relation to mortality experience. Information on death rates in the over 60s (149 natural deaths) was reported separately due to the disproportionate effect these deaths had on the overall SMR, in keeping with previous work.¹⁰

We received ethics approval from the Prison Health Research Ethics Committee (RP00007).

Results

There were 1631 deaths in male prisoners between 1978–1997 in England and Wales, of which 723 (44.3%) were from natural causes, 840 (51.2%) from suicide and undetermined causes (and open verdicts), 30 (1.8%) from homicide, 33 (2.0%) from accidental causes, and in 5 deaths (0.3%), there was no information as to the cause of death. The annual number of male prisoners based on the average daily population was 45 309. The mean age of death from all causes for male prisoners was 38.4 years (range 15–91, standard deviation = 14.7). For natural deaths, it was 47.5 years (range 16–91, 14.4).

Death certificates were not retrieved for 94 men. However, 89 of these had coroner's inquest findings, of which 47 recorded death by natural causes, 1 homicide, 1 accidental death, 9 open verdicts, and 31 suicides. So, in total, information on causes of death was not available in 5 men (0.3%).

Main causes of natural deaths in male prisoners <60 years old

There were 574 deaths in men under 60 years from natural causes (see table 1). The most common cause of death was diseases of the circulatory system which led to 307 deaths (53.5% of natural causes). Of these, 160 died of ischaemic heart disease and 43 of cerebrovascular disease. The next most common causes of deaths were from respiratory causes (91 deaths, of which 44 were from pneumonia) and neoplasms (61 deaths). There were 115 deaths from other causes, and of these 26 were related to infections and parasitic causes [including septicaemia ($n = 9$), TB ($n = 5$), and HIV ($n = 3$)].

The SMR for all natural causes was 0.70 (95% CI = 0.65–0.76). The SMR was higher for infections (SMR = 1.52; 1.03–2.23). Deaths from neoplasms had the lowest SMR of the natural causes of death (SMR = 0.23; 0.18–0.30), and deaths from digestive (0.24; 0.14–0.40) and endocrine causes (0.57; 0.33–0.98) were also significantly lower. For all causes (natural, accidental, homicide and suicide) of death, the SMR was 2.93 (2.78–3.08).

SMRs for subcategories of causes of death

We investigated SMRs for subcategories of the common natural causes of death. Within the category of circulatory diseases, SMRs for ischaemic heart disease (SMR = 0.86; 0.74–1.00) and cerebrovascular disease (0.97; 0.72–1.31) were not significantly lower than the general population, but for other circulatory diseases the SMR was significantly higher (1.50; 1.20–1.88). Within the category of respiratory diseases, the SMR for pneumonia was significantly higher (2.35; 1.75–3.16) but not for asthma (1.17; 0.68–2.01). Within the neoplastic causes of death, specific cancers had significantly lower SMRs including respiratory (0.43; 0.29–0.63), gastrointestinal (0.24; 0.14–0.40)

Table 1 Causes of natural deaths and SMRs in male prisoners

Causes of death (ICD 9 code)	Observed deaths	SMR	95% CI
All natural causes of death (001–999)	574	0.70	0.65–0.76
.....
Infectious and parasitic diseases (001–139)	26	1.52	1.03–2.23
.....
Neoplasms (140–239)	61	0.23	0.18–0.30
.....
Endocrine, nutritional, and immunity disorders (240–319)	13	0.57	0.33–0.98
.....
Diseases of the nervous system and sense organs (320–389)	33	0.79	0.56–1.11
.....
Diseases of the circulatory system (390–459)	307	0.97	0.87–1.08
.....
Diseases of the respiratory system (460–519)	91	1.23	0.96–1.57
.....
Diseases of the digestive system (520–529)	15	0.24	0.14–0.40

Note: There were 28 deaths from other causes. Deaths of prisoners 60 years and over are excluded. CI, confidence interval. 95% CI calculated as SMR/EF to SMR × EF (where EF is the error factor = $\exp[1.96/\sqrt{D}]$ and D = number of deaths)

Table 2 SMRs of natural deaths in male prisoners by age band

Age band	No. of deaths	SMR (95% CI)
15–17	2	0.34 (0.09–1.36)
.....
18–20	28	0.64 (0.44–0.93)
.....
21–24	27	0.51 (0.35–0.74)
.....
25–29	41	0.62 (0.46–0.84)
.....
30–39	134	0.89 (0.75–1.05)
.....
40–49	160	0.73 (0.63–0.85)
.....
50–59	178	0.63 (0.54–0.73)

and genitourinary cancers (0.09; 0.02–0.36). The SMR for tuberculosis was significantly higher (2.83; 1.18–6.80).

Causes of death by age band

Information by age band was calculated (table 2). There was no obvious pattern in the results by age band. In the oldest age band (60+), where there were 149 natural deaths, the SMR was lower (SMR = 0.30; 0.26–0.35) than the SMRs for younger age bands.

Conclusion

This study of 574 deaths in male prisoners investigated SMRs for natural causes of death and its major subcategories. It is the largest study to date, more than twice the size of previous studies combined, and in contrast to them, adjusted more precisely by

age.^{10,12} Its main findings are that the SMR for all natural causes is apparently lower in prisoners, and the SMR for respiratory pneumonia and infections is higher. Although public health initiatives have focused on the rise of TB²¹ and HIV^{7,22} in prisoners, more the preventable deaths in this sample were from septicaemia. Risky drug injecting behaviours is likely to predispose prisoners to septicaemia, and therefore clean needle sharing initiatives before and in prisons may reduce death rates in addition to other health benefits.⁵

Our finding of a lower SMR for natural causes replicates previous research in France and the USA. A French study, based on 148 natural deaths and using 10-year age bands, estimated the SMR to be 0.84 and found a dose–response relationship between length of incarceration and lower mortality rates.¹⁰ An investigation of 57 natural deaths in New York prisons found that deaths from natural causes were less than in the age-matched general population.¹¹ In contrast, a survey of 92 natural deaths in English and Welsh prisons over 2 years reported a higher SMR for prisoners than the general population but adjusted less precisely for age, using population mortality data for 15–44 year olds as a whole. In addition to a larger sample size, the advantage of the investigation reported here is that the age bands were more precise, particularly in the younger age bands where the prison population is largest.

The finding in this study of a lower SMR for natural deaths is counter-intuitive, particularly as high rates of morbidity have been reported amongst inmates and poor medical care repeatedly highlighted.^{23–25} Possible reasons for this lower SMR in prisoners have included lifestyle factors, higher rates of health service use by prisoners,²⁶ and selection biases. Two selection biases are likely to be important. The first is the healthy worker effect, and it is possible that those with physical illnesses are at reduced risk of committing crimes or preferentially given community sentences, although to our knowledge, there is no research to confirm or deny this suggestion. In support is the SMR for ischaemic heart disease reported here, which was 0.86 (0.74–1.00), although prisoners report increased rates of smoking compared with the general population.⁸ A second likely selection bias is that prisoners diagnosed with serious physical illnesses may be released early from their sentences for compassionate reasons. The evidence for this early release hypothesis is conflicting. In support is that the Prison Service in England and Wales report that 26 prisoners were released early for health reasons since July 2000, when the relevant database started, until September 2004 (personal communication, Cliff Howells, Medical Director, Prison Health, Department of Health, dated 6 October 2004). Although, the medical reasons for these early releases are not known, it is likely that they are mostly for cancer rather than acute illnesses, such as infections, because prisoners transferred acutely to general hospitals remain classified as prisoners, even if they die in hospital.

Assuming that the rates of prisoners released early for compassionate reasons were similar during 1978–1997 and that all these early released prisoners died from neoplasms (i.e. 4.5 prisoners were discharged early from their sentences per year in 1978–1997 who would have died in custody of neoplasms), this would have increased our estimate of SMR for neoplastic causes to 0.58 (95% CIs = 0.50–0.68). This would have increased the overall SMR for natural deaths to 0.81 (0.75–0.87)—a slight increase from the 0.70 that is reported in this study. Therefore, although the early discharge hypothesis may account to some extent for lower death rates in male prisoners, it does not appear to account for all of it. Other studies have investigated the death rates of newly released prisoners. The French study accounted for prisoners released because of health conditions (16 prisoners in total) but still found a lower SMR for natural deaths.¹⁰ In contrast, a Finnish study of 57 natural deaths in released Finnish prisoners demonstrated that death rates were around three times that of the general population, although the

general population that was compared was of higher socioeconomic background.²⁷

Another factor that needs to be considered is the effect of social class on death rates. In the UK, mortality is increased by a factor of 1.5–2.5 for natural causes of death for those in the lowest social class compared with the general population.²⁸ With the qualification that social class was available in 60% of the sample, around 30% of the prisoners were in the lowest social class whereas in the general population it is 10%.²⁹ The effect that this would have on the estimated SMRs in this sample is to lower them. Overall, we believe that the effects of the early discharge hypothesis (to raise the SMR) and social class (to lower it) are likely to balance each other out.

A final methodological challenge is accounting for the changing age structure of the prison population. With the increasing number of younger prisoners serving shorter sentences, the turnover of men passing through the prison system has increased. The SMRs reported in this study are calculated using the average daily population of the prison system and may be reduced further if the number of receptions is used instead.³⁰

Policy implications that can be drawn from this study need to be tempered with the fact that more than half the deaths in custody were from suicide. This proportion of suicide deaths is similar to a study in Finland,³¹ but higher than investigations in Scotland,³² France,¹⁰ and the state of Maryland³³ where suicide deaths made up between 18 and 37% of all deaths in custody. Nevertheless, it reinforces the need for comprehensive improvements in safety and suicide prevention initiatives in jails and prisons, including, for example, improved management of prisoners with mental illnesses and improved access to psychiatric services, removal of potential ligature points, and optimum training of prison staff.³⁴

In conclusion, 26 deaths from infectious diseases and 44 from respiratory pneumonia occurred in English and Welsh prisons during 1978–1997. Potential interventions are important as incarceration provides an opportunity to reach an elusive and marginalized group who are unlikely to access health care appropriately in the community.¹⁵ Recent changes in the commissioning and delivery of prison health in England and Wales are likely to improve management of acute diseases. As the turnover of prisoners is high, treatment of infectious diseases during custody would have wider public health implications including for the families and partners of inmates and the communities to which they return. In low-income countries, the repercussions are likely to be larger as the burden of infectious diseases is much higher.³⁵ Specific interventions that could be used to improve management of infections specifically and other illnesses more generally include a structured delivery of health care services, standard disease management guidelines, a common formulary, greater access to subspecialties, the use of telemedicine and electronic records, and close links with academic medicine.³⁶

Competing interests

None declared.

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Key points

- There is uncertainty over whether rates for natural causes of deaths in male prisoners differ from age-standardised general population data.
- We investigated SMRs for natural deaths in male prisoners in England and Wales over 20 years.
- For all natural deaths combined, SMRs were significantly lower in male prisoners.
- For specific causes of death, SMRs were significantly increased in male prisoners for infectious diseases and respiratory pneumonia.
- These findings highlight the need for the screening and effective treatment of infectious diseases in prisoners.

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