https://doi.org/10.1192/bjp.175.1.50 Published online by Cambridge University Press

Suicide in prisons

Reflection of the communities served, or exacerbated risk?

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Background A recent review showed that opioid users' deaths from suicide were 10 times as common as expected on the basis of age and gender. Surveys showing prisoners' high prevalence of injecting or opioid dependence have led to a new statistical approach to prison suicides.

Aims To estimate the expected number of UK prison suicides annually, having taken account of inmates' age, gender and opioid dependence.

Method By gender, estimate the effective number of individuals (in terms of community-equivalent suicide risk) for whom prisons have a duty of care as 10 times the number of opioid-dependent inmates plus the number of non-opioid user inmates. Apply the gender and age-appropriate national suicide rates to work out the expected number of prison suicides.

Results The Scottish Prison Service can expect 7.1 suicides per annum, and annual totals up to 12 without exacerbation of suicides due to incarceration. For the Prison Service in England and Wales, 19.3 suicides per annum can be expected in prisons, and annual totals may range up to 28 without indicating incarceration; the total of self-inflicted deaths was 47 in 1993–94.

Conclusions Prisons cannot prevent all suicides. An alert may be warranted if prison suicides exceed 12 per annum in Scotland, or 28 in England and Wales.

Declaration of interest None.

Liebling (1996) has criticised naive statistical approaches to prison suicide which do not adequately account for the vulnerability profile of prisoners, including previous psychiatric contact, major drink or drug problems and unstable employment history; see also Lewis & Sloggett (1998), and Platt *et al* (1988) on the striking relationship between parasuicide and social class. Recently, and importantly, Harris & Barraclough (1998) have reviewed the age and gender-adjusted excess mortality of mental disorder, with one section devoted to the high excess mortality, including from suicide, associated with opioid use. Opioid users' deaths from suicide were 10 times as numerous as expected on the basis of age and gender (95% CI for standardised mortality ratio: 7.8 to 12.65). Prison surveys do not routinely ask about social class, but they do ask about drugs use; see Wozniak *et al* (1998), Gore & Bird (1998) and Singleton *et al* (1998). Statistical approaches to estimating the expected number of suicides in prison should account for the high prevalence of drug dependence among inmates, as we illustrate in assessing suicides in Scottish prisons, and in prisons in England and Wales.

METHOD

First, willing anonymous salivary HIV/hepatitis C (WASH) surveillance studies were conducted in nine establishments of the Scottish Prison Service in 1991–96. When linked to a self-completion risk factor questionnaire which asked about history of injection drug use, the studies were acceptable to prisoners: 86% (2546 of 2972) of adult prisoners and 99% (583 of 587) of young offenders took part. One-third of adult male prisoners reported a history of injecting drug use (32%: 719 of 2256), as did 46% (58 of 127) of female prisoners; 18% (99 of 556) of male young offenders did likewise; see Gore & Bird (1999). WASH studies did not ask directly about opioid use, whether by injection or non-injection routes. Therefore, in using WASH surveillance data to estimate the proportion of inmates who have a history of opioid use, we assume – as did Gore *et al* (1999) – that half as many more prisoners as those who report having ever injected drugs may be non-injection users of opioids.

NEW STATISTICAL APPROACH TO PRISON SUICIDES

To estimate the expected number of suicides in Scottish prisons per annum, we therefore use WASH surveillance data to estimate, as above, the proportion of inmates who have a history of opioid use; and Harris & Barraclough's (1998) review of the standardised mortality ratio for suicide in opioid users, together with (a) the age distribution of Scottish adult inmates, based on Barlinnie (Bird *et al*, 1995) and Cornton Vale Prisons (Gore *et al*, 1997), respectively Scotland's largest prison for adult males and only prison for women (age distribution does not differ greatly between injectors and non-injectors), (b) approximate numbers at lock-up of male young offenders, adult males and females based on the 1997–98 Report by the Chief Inspector of Prisons for Scotland (1998), and (c) death rates per 100 000 for suicide and self-inflicted injury from the 1996 Annual Report of the Registrar General for Scotland (1997).

Table 1 summarises the basic calculations. To obtain an upper bound on the community-equivalent expected number of suicides per annum in Scottish prisons after taking opioid dependence into account, our calculations are repeated (see Tables 3 and 4) using the multiplier 12.65 (instead of 10.0), which is the upper 95% confidence limit of the standardised mortality ratio for suicide in opioid users as reported by Harris & Barraclough (1998). To obtain a conservative or lower limit, we revert to the multiplier 10.0 and omit inflation by 1.5 to infer from prevalence of injectors to prevalence of opioid users (see Tables 3 and 4).

An estimate of the community-equivalent expected number of suicides per annum by prisoners in England and Wales is also worked out on the basis of

https://doi.org/10.1192/bjp.175.1.50 Published online by Cambridge University Press

the age distributions and opioid dependence reported by Singleton *et al* (1998) for male remand, male sentenced and female prisoners, an assumed total of 60 000 inmates, and the age-specific suicide rates for men and women in England and Wales as reported by Office of Population, Censuses and Surveys (1995).

RESULTS

Table 1 summarises WASH surveillance data: that 18% of Scotland's 950 male young offenders have a history of injecting drug use, from which we infer that 27% (1.5 × 18%) have a history of opioid use. Thus, of 950 male young offenders, we expect that 257 (27% of 950) have a history of opioid use. Each of these 257 opioid-dependent young offenders has 10 times the suicide risk of his non-opioid using counterpart, so that – in terms of suicides at the community rate – the Scottish Prison Service has in its care effectively 3263 young males, and 31 159 individuals in total.

On the basis of the age distributions of inmates in Scotland's largest male prison, Barlinnie, and sole female prison, Cornton Vale, the lower panel of Table 1 shows the likely age distribution of these 31 159 individuals (29 863 male and 1296 female) for whom the Scottish Prison Service has an effective duty of care. For example, 38% of adult males and 47% of adult females would be aged 20–24 years. The third column of Table 1 shows the suicide rate as 16 per 100 000 males in Scotland aged 15–24 years, and thus an expected 2.14 (13 × 371 × 16/100 000) suicides per annum among the effective 13 371 (3263+10 108) male inmates aged 15–24 years. Taking account of the opioid dependence and age distribution of both male and female inmates, the Scottish Prison Service can expect 7.1 suicides per annum. Annual totals may range from 2 to 12 without being indicative of exacerbation of suicide rate due to incarceration. Recent high numbers of female suicides in Scottish prisons were rightly alarming against negligible expectation, as shown in Table 1.

An upper limit of 8.8 is obtained for the expected number of suicides per annum in Scottish prisons when the multiplier 12.65, which is the upper 95% confidence limit given by Harris & Barraclough (1998), is used instead of 10.0 to take account of prisoners' opioid dependence (see Tables 3 and 4). Annual totals may then range up to 14 without being indicative of exacerbation of suicide rate due to incarceration.

Several critical assumptions in the above analysis need to be emphasised:

(a) lacking direct data, we have assumed – as validated to an extent by Gore *et al* (1999) – that opioid users number 1.5 times the number of inmates with a history of injecting drug use;

(b) we have assumed that the age distribution found in cross-sectional surveys is valid here, but it is likely to be biased slightly towards the older age of longer sentenced inmates,

(c) we have assumed that the injector prevalence found in cross-sectional surveys is valid here, although – because of length-biased sampling – it may be a slight underestimate if a history of injection drug use is less common in longer than in shorter sentenced inmates.

The first of these assumptions has the greatest impact on our analysis. If a lower multiplier than 1.5 were appropriate, the expected number of suicides would be correspondingly lower, and suicide alerts or alarms should be triggered at lower annual totals than 12 or 14. To check how influential assumption (a) is, we recomputed the central estimate for suicides per annum in Scottish prisons by taking the percentage

Table Ia Central estimates for expected suicides per annum in Scottish prisons

	Male young offenders	Adult males	Females	Total
Number of inmates	950	5000	180	6130
IDUs[1] (%)	18%	32%	46%	
Opioid users (%) (1.5 × IDU percentage)	27%	48%	69%	
Non-users	693	2600	56	
Opioid users	257	2400	124	
Effective number of inmates=non-users+10 × opioid users[2]	693+2570=3263	2600+24 000=26 600	56+1240=1296	Effective total=31 159 (5 times actual)

1. IDU, intravenous drug user.
2. Because standardised mortality ratio is 10 times greater for opioid users, their effective number – in terms of suicides at the community rate – is 10 times their actual numbers.

Table Ib Applied age-group distributions for inmates and suicide rates by gender

Age group	Males: number (% of adults)	Expected suicides (suicide rate per 100 000)	Females: number (% of adults)	Expected suicides (suicide rate per 100 000)
15–19	3263 (young offenders)	2.14 (16)	609 (47%)	0.04 (6)
20–24	10 108 (38%)			
25–29	7714 (29%)	3.83 (32)	259 (20%)	0.04 (9)
30–34	4256 (16%)		207 (16%)	
35–54	4522 (17%)	1.04 (23)	220 (17%)	0.02 (8)
Total		7.01		0.10

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of opioid users as equal to (not 1.5 times, as in Table 1) the percentage of inmates with a history of injection drug use. This lower, conservative limit for the expected number of suicides in Scottish prisons as a reflection of the communities served works out at 5.2 (see Tables 3 and 4). Annual totals could then only range up to nine without this being indicative of exacerbation of suicide rate due to incarceration.

Table 2, which presents the central analysis for prisons in England and Wales, is based on inmates' age distributions and opioid dependence, as reported by Singleton *et al* (1998), an assumed total of 60 000 inmates, and the lower age-specific suicide rates for men and women in England and Wales (Office of Population, Censuses and Surveys, 1995). The calculations, rounded to the nearest five inmates, are shown separately for male remand, male sentenced and female prisoners.

In terms of community-equivalent suicide risk, the Prison Service in England and Wales has in its care effectively 40 080 male remand, 118 320 male sentenced and 9850 female prisoners or 168 250 individuals in total. Thus, taking account of the opioid dependence and age distribution of its inmates, the Prison Service can expect 19.3 suicides per annum in England and Wales. Annual totals may range from 10–28 without being indicative of exacerbation of suicide rate due to incarceration.

DISCUSSION

Operational implications for the Scottish Prison Service

In 1994–95 (16 suicides) and again in 1996–97 (17 suicides), the annual total of suicides in Scottish prisons exceeded 14. Operationally, the Scottish Prison Service might consider that an annual total of suicides which exceeds 12 (most conservatively, nine) should trigger an investigative alert, and one which exceeds 14 should clearly trigger an alarm. Female suicides are largely unexpected (about one in five years): the sad history of such deaths at Cornton Vale Prison certainly justified the far-ranging, imaginative report on women in prison by HM Chief Inspectors of Prisons and of Social Work for Scotland (1998).

HM Chief Inspector of Prisons for Scotland (1998) has also drawn attention to the fact that although remand prisoners number at most a fifth of the prison population, they are disproportionately represented among suicides, with 52 of the 92 suicides since 1986 having been remand prisoners. Ideally, therefore, our analysis should be repeated for Scotland's remand and convicted prisoners separately, as was possible for England and Wales.

Scotland's largest prison, Barlinnie

Meanwhile, the press (e.g. "Fewer remands 'could cut prison suicides' and Cornton Vale cell-death probe begins", *Aberdeen Press & Journal*, 23 July 1998), as well as HM Chief Inspector of Prisons for Scotland (1998), has highlighted the exceptional throughput of remand and convicted prisoners at Scotland's largest prison, Barlinnie. Applying the above methodology specifically to Barlinnie, where 36% of inmates have a history of injecting drug use (Bird *et al*, 1995), and where the average daily population (HM Chief Inspector of Prisons for Scotland, 1998) was around 1240 in 1997–98, the expected number of suicides annually is 1.8 (details available from author). Annual totals may range from 0 to 4 without being indicative of exacerbation of suicide rate due to incarceration.

Table 2a Central estimates for expected suicides per annum in prisons in England and Wales

	Male remand	Male sentenced	Females	Total
Number of inmates (guide)	12 000	45 150	2850	60 000
Opioid users (%)	26%	18%	27%	
Non-users	8880	37 020	2080	
Opioid users	3120	8130	770	
Effective number of inmates=non-users +10.0 × opioid users[1]	8880+31 200=40 080	37 020+81 300=118 320	2080+7770=9850	Effective total= 168 250 (3 times actual)

1. Assuming standardised mortality ratio is 10 times greater for opioid users, their effective number – in terms of suicides at the community rate – is 10 times their actual number.

Table 2b Age-group distributions for inmates and suicide rates by gender

Age group	Male remand: number (% of all male remand)	Expected suicides (suicide rate per 100 000)	Male sentenced: number (% of all male sentenced)	Expected suicides (suicide rate per 100 000)	Females: number (% of all females)	Expected suicides (suicide rate per 100 000)
16–20	10 020 (25%)	1.90 (10.8)	18 930 (16%)	4.60 (10.8)	1380 (14%)	0.06 (2.0)
21–24	7615 (19%)		23 665 (20%)		1475 (15%)	
25–29	8415 (21%)	2.15 (14.5)	26 030 (22%)	4.50 (14.5)	2365 (15%)	0.14 (3.2)
30–34	6415 (16%)		18 930 (16%)		2070 (21%)	
35–54 (actually 35 years+)	7615 (19%)	1.17 (15.3)	30 765 (26%)	4.71 (15.3)	2560 (26%)	0.10 (4.0)
Total	40 080	5.22	118 320	13.81	9850	0.30

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Table 3a Upper estimate for expected suicides per annum in Scottish prisons

	Male young offenders	Adult males	Females	Total
Number of inmates	950	5000	180	6130
IDU[1] (%)	18%	32%	46%	
Opioid users (%) (1.5 × IDU percentage)	27%	48%	69%	
Non-users	693	2600	56	
Opioid users	257	2400	124	
Effective number of inmates=non-users+12.65 × opioid users[2]	693+3251=3944	2600+30 360=32 960	56+1569=1625	Effective total=38 529 (6 times actual)

1. IDU, intravenous drug user.
2. Assuming standardised mortality ratio is 12.65 times greater for opioid users, their effective number – in terms of suicides at the community rate – is 12.65 times their actual number.

Table 3b Applied age-group distributions for inmates and suicide rate, by gender

Age group	Males: number (% of adults)	Expected suicides (suicide rate per 100 000)	Females: number (% of adults)	Expected suicides (suicide rate per 100 000)
15–19	3944	2.64 (16)	764 (47%)	0.05 (6)
20–24	12 525 (38%)			
25–29	9558 (29%)	4.75 (32)	325 (20%)	0.05 (9)
30–34	5274 (16%)		260 (16%)	
35–54	5603 (17%)	1.29 (23)	276 (17%)	0.02 (8)
Total		8.68		0.12

Table 4a Conservative lower estimates for expected suicide per annum in Scottish prisons if all opioid users are injectors

	Male young offenders	Adult males	Females	Total
Number of inmates	950	5000	180	6130
IDUs[1] (%)	18%	32%	46%	
Opioid users (%) (1.0 × IDU percentage)	18%	32%	46%	
Non-users	779	3400	97	
Opioid users	171	1600	83	
Effective number of inmates=non-users+10 × opioid users[2]	779+1710=2489	3400+16 000= 19 400	97+830=927	Effective total=22 816 (nearly 4 times actual)

1. IDU, intravenous drug user.
2. Because standardised mortality ratio is 10 times greater for opioid users, their effective number – in terms of suicides at the community rate – is 10 times their actual number.

Table 4b Applied age-group distributions for inmates and suicide rates by gender

Age group	Males: number (% of adults)	Expected suicides (suicide rate per 100 000)	Females: number (% of adults)	Expected suicides (suicide rate per 100 000)
15–19	2489	1.58 (16)	436 (47%)	0.03 (6)
20–24	7372 (38%)			
25–29	5626 (29%)	2.79 (32)	185 (20%)	0.03 (9)
30–34	3104 (16%)		148 (16%)	
35–54	3298 (17%)	0.76 (23)	158 (17%)	0.01 (8)
Total		5.13		0.07

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In 1996–97, however, there were five suicides in Barlinnie, and so the alert that was made by HM Chief Inspector of Prisons for Scotland (1998) was both prompt and appropriate.

Effective number for whom prisons have a duty of care

Another important operational consideration follows from the above analyses, namely that in terms of community-equivalent suicide risk, the Scottish prisons have an effective duty of care – on a daily basis – for 4–6 times as many individuals as they actually hold, that is for 23 000–38 000 individuals (see Tables 3 and 4). Medical, nursing and prison officer support for suicide prevention should therefore be provisioned on the basis (see Table 1) of a community-equivalent population of over 30 000 rather than the Scottish prisons' average occupancy of just over 6000. This accords with a 1991 finding that in Canadian federal correctional institutions the suicide rate was four times that found in the general Canadian population (Rowan, 1996). In Scottish prisons in recent years, there has been exacerbation above the community-equivalent suicide risk only in 1994–95 and 1996–97.

CLINICAL IMPLICATIONS

- In terms of suicide risk, UK prisons have a duty of care for, in effect, three times as many individuals as they actually hold.
- The Scottish Prison Service can expect 7.1 suicides per annum, and up to 12 without implying an exacerbation of suicide rate due to incarceration; corresponding figures for England and Wales are 19.3 and 28.
- Investigation of prison suicides may be triggered if they exceed 12 per year in Scotland, or 28 in England and Wales.

LIMITATIONS

- Expected numbers of prison suicides and alert trigger levels are underestimates because prisoners' other mental health problems besides opioid dependence have not been taken into account.
- Direct estimates of the prevalence of opioid dependence in Scottish prisoners were not available, and had to be inferred from prevalences of injection drug use.
- Full account of uncertainty has not been presented but, as illustrated for Scotland, uncertainty increases the number of prison suicides that may take place before an alert should be triggered (from 12 to 14 in Scotland).

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(First received 26 October 1998, final revision 20 January 1999, accepted 28 January 1999)

Expected prison suicides in England and Wales

With its lower reported prevalence of opioid dependence, the Prison Service in England and Wales has an effective duty of care for about three times as many individuals as are actually held. Taking account of the opioid dependence of its inmates, but without allowance for other mental health problems, the Prison Service in England and Wales can expect 19.3 suicides per annum, and annual totals may range up to 28 without being indicative of exacerbation of suicide rate due to incarceration. However, according to Neal (1996), 1986 is the most recent year in which the annual total of prison suicides was 29 or less in England and Wales. The total of self-inflicted deaths was reported as 47 in 1993–94 by the Director of Health Care (1995). Neal (1996) conceded that these figures were not encouraging, but a reasoned expectation, as above, against which to put them in context was lacking until now.

Other jurisdictions

It is unreasonable to expect prisons to prevent all suicides, but a statistical measure of how close they come in practice to community-equivalent care for similar populations has some merit. WASH studies during 1997–98 were conducted also in Sweden, Germany, France, Italy, Belgium, Spain, Luxembourg and Portugal under the auspices of the EC Network for HIV/Hepatitis Prevention in Prisons. These studies make our methods applicable also for prisons outside the UK. The Scottish Prison Service, the Inspectorate of Prisons for Scotland, and Ministers of State acted promptly without the benefit of formally derived community-equivalent alert or alarm triggers. Other jurisdictions may, however, find such triggers helpful in exercising their duty of care.

In terms of suicide risk, because of the high proportion of inmates with a history of opioid dependence or injection drug use, all prison services are likely to have responsibility for a population which, on a community-equivalent suicide risk basis, is several times greater than the prisons' real occupancy (in Scottish prisons, 4–6 times greater). Further work is needed to take into account the prevalence of prisoners' other mental health problems which Harris & Barraclough (1998) showed were similarly associated with a high suicide risk.

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