

# A national case–control study of risk factors among prisoners in England and Wales

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Received: 4 May 2012 / Accepted: 20 November 2012 / Published online: 12 December 2012  
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## Abstract

**Purpose** To examine risk factors for suicide among prisoners in a national population.

**Methods** The Ministry of Justice identified all suicides occurring in prisons in England and Wales between 2005 and 2008. Two hundred and twenty suicides were matched to 220 living controls on age, gender, date of reception into prison and establishment type. Relative risks for clinical, custodial, service–response and socio-demographic characteristics were estimated using conditional logistic regression models.

**Results** Having a history of violence and several indicators of past or current psychiatric illness were strong predictors at univariate level. Prisoners who died by suicide were over nine times more likely than controls to have been identified and managed as being at-risk of self-harm/suicide during the prison term. Multivariate analysis identified five mutually independent predictors: previous psychiatric service contact, history of self-harm, single cell occupation, remand status, and non-white ethnicity.

**Conclusions** Suicide risk is elevated among certain types of prisoners, and targeted suicide prevention strategies should be developed for the monitoring, care and support

of the high-risk groups that we identified. Further research is needed to determine the causal mechanisms that explain why some prisoners have a higher suicide risk than their peers.

**Keywords** Suicide · Prisoners · Epidemiology · Risk factors · Case–control studies

## Introduction

Suicide is the leading cause of death among prison populations, and increasing attention is being paid to its prevention [1]. Previous studies have shown higher suicide rates than in the general population across developed countries [2–11]. National case–control studies in this area are lacking, except for one conducted in Austria [8]. This reported five independent risk factors: having a history of suicide attempts, being charged with or convicted of a violent offence, having a psychiatric diagnosis, receiving psychotropic medication and being housed in a single cell. A systematic review and meta-analysis synthesised the international literature on this topic [9], although most of the studies identified were case series designs from which robust evidence for independent risk factors could not be discerned. Of the 34 studies reviewed, only 8 were case–control studies with randomly selected or matched control groups, and the samples for these studies were small (median 69.5 cases).

## Aims of this study

We aimed to conduct the first national clinical case–control study of recent suicides among prisoners in England and Wales, examining and quantifying risk factors for suicide in this population. England and Wales has one of the highest

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imprisonment rates in Western Europe [12], and its prison suicide rate averaged 71 per 100,000 prisoners for the 3 years prior to the end of 2010 [13]. This article advances our previously reported 9-year case-series study of prison suicide to identify descriptive characteristics and time trends within a large cohort dataset [14]. The current study was designed to further extend the evidence-base for this topic by tackling a different research question, using a nested case–control study design to discern independent risk factors for suicide among prisoners. Our statistically powerful investigation examined more than three times as many cases as the median number in the case–control studies included in the previous meta-analysis [9]. We hypothesised that increased suicide risk in prisoners would be associated with being on remand (i.e. imprisoned with a court appearance or trial pending), being charged with or convicted of a violent offence, being located in single cell accommodation, having a history of alcohol/drug misuse, having a history of self-harm/suicide attempts, and having a psychiatric illness.

## Materials and methods

### Ethical approval

This was granted by the Multi-Centre Research Ethics Committee, Her Majesty's Prison Service, and the Patient Information Advisory Group at the Department of Health.

### Key definitions

Epidemiological studies of suicide conducted in the UK include cases in which the Coroner returned an open verdict. The majority of open verdicts related to unnatural deaths where the intent of the deceased could not be proven. In the UK, it is commonly believed that most of these deaths among adults are probable suicides [15]. In studies of prison suicide in England and Wales, the term 'self-inflicted death' is often used. This broader definition includes suicide and open verdicts, and also deaths by hanging or self-strangulation regardless of the coroner's verdict [16]. Prison establishments in England and Wales can house a combination of prisoners including those remanded into custody from the courts, those convicted but awaiting sentence, those sentenced and serving a prison sentence, and immigration detainees. Prisons are categorised according to the age, gender and security classification, or average level of risk posed by their prisoners, i.e. their 'establishment type'.

### Study design

We obtained a national consecutive case series of 220 prison suicides that occurred between 1st March 2005 and

31st August 2008. Cases were prisoner deaths identified as being self-inflicted. These deaths were notified by the prisons to the Ministry of Justice and from there to the Centre for Mental Health and Risk at the University of Manchester. For each suicide case, a prisoner was eligible to be selected as a control if he/she was alive on the day of death. In this nested case–control study, a proportion of the controls may have subsequently died by suicide whilst in prison. However, according to the principles of incidence density sampling, these people were still eligible for selection as a living control because they were members of the time-specific risk set of their matched case [17].

Controls were matched for gender, age, establishment type and date of reception into prison. These matching criteria were chosen due to their potential confounding effects, as indicated from previous research [7–9]. There are differences between establishment types that may include 'closed' as opposed to 'open' conditions and the security, control and environmental context that follows accordingly [18]. The different types of establishment also convey information about the characteristics of those that they house [19]. We matched on establishment type to account for unmeasured confounding variables that could not be controlled for between different types, such as the prison environments in high security versus 'open' prisons. Each control was obtained via the Ministry of Justice, with unbiased selection from a random sample of the total prisoner population having stratified for the matching variables.

### Measurement of potential risk factors

On an equivalent basis for all suicide case and control subjects, the Ministry of Justice provided the following information: self-reported ethnic group, offence charged with or convicted of, custodial status (remand, sentenced, convicted and awaiting sentencing or immigration detainee), sentence length (if applicable), and whether they were being monitored by the prison's self-harm/suicide 'at-risk' system.

Questionnaires were sent to prisons and completed by discipline and clinical personnel, with reference to prisoner custodial and clinical records for both cases and controls. Potential predictors were selected a priori according to previous research findings [2, 7–9]. The questionnaires included; details of the suicide case (such as method and time of death); socio-demographics; social contacts and visits; participation in education, work and activities; discipline during the prison term; events preceding the suicide (case) or the date on which the matched case died (control); reception medical screening assessment; psychiatric diagnosis and clinical management; drug and alcohol misuse; previous self-harm; and healthcare treatment while in prison.

## Statistical analyses

All analyses were performed using Stata Intercooled software [20]. The sample size of 220 cases and 220 controls provided 90 % power to detect a statistically significant (two-sided  $\alpha = 0.05$ ) difference in exposure prevalence of 25 % in cases versus 12.5 % in controls (OR 2.3). Separate matched design calculations were also conducted and these showed that the level of power was similar, with and without accounting for matching effects. To compare exposure prevalence between cases and controls, univariate conditional logistic regression analyses were conducted to investigate the association between each explanatory variable and risk of suicide.

To examine independent predictors, multivariate models were initially generated using backwards elimination procedures. These interim analyses were performed to include explanatory variables with  $P$  values of  $<0.10$ . This higher significance level cut-off was applied to reduce the likelihood of missing important confounders not identified in the univariate analysis. The explanatory variables categorised in the ‘service–response’ domain were deemed to be essentially tautological in that they represented a response to risk factors for suicidal behaviour by discipline and healthcare staff in the prisons. Therefore, the variables from the other three domain-specific models only were fitted in a final multivariate model to identify factors independently associated with suicide. Again a backwards elimination approach was adopted, with the significance level for retaining explanatory variables in the final model set at the conventional  $P < 0.05$  level. There were few missing data in the explanatory variables. Variables entered into the final multivariate model were required to have a minimum 90 % completeness of data, and the final multivariate level contained 90 % of all cases and control subjects. We also checked to ensure there were no sparse data and resulting instability in our multivariate models [21].

## Results

### Descriptive analyses and univariate models

Of the 220 cases, 208 (95 %) were male. The median age was 33 with a range of 15–67 years. The most common method of death was by hanging or self-strangulation 202 (92 %). Seventy-eight (35 %) prisoners died within 28 days of reception into prison. The univariate conditional logistic regression models are shown in Tables 1 and 2, and are described separately by domain.

### Socio-demographic domain

Cases were significantly more likely than controls to be unemployed or receiving long-term statutory sickness benefit prior to prison, although  $<50$  % of all case and control subjects were included in this model. There was also a higher proportion of prisoners of non-white ethnicity among the cases, although this association did not reach significance ( $P = 0.06$ ).

### Custodial/offending domain

The strongest associations were with being a remand status prisoner, occupying a single cell, and history of violence. Being currently charged with or convicted of a violent offence also predicted suicide, but not as strongly as was seen with history of violence. This was also the case with prisoners who were charged with or convicted of murder, manslaughter or attempted murder. Having no social visits was also associated with higher suicide risk, although data for this variable were available on 122 matched case–control sets when restricted to greater than 28 days in prison custody, and, therefore, it was not considered for inclusion in the multivariate analyses. There were no significant differences in proportions between cases and controls in relation to being in prison for the first time or serving a life sentence.

### Clinical domain

Particularly strong associations were found for previous psychiatric admission, history of self-harm, any previous psychiatric service contact, any psychiatric diagnosis and receipt of psychotropic medication at reception. Highly significant associations were also found for mental health problems identified at reception and history of alcohol misuse, but there was no significant association with history of drug misuse.

### Service–response domain

While in prison, suicide cases were predictably much more likely to have had concerns documented regarding mental health problems by an external agency and noted at reception, to have been referred to a psychiatrist, and to have been monitored on the prisons self-harm/suicide ‘at-risk’ system.

### Multivariate modelling

The domain-specific multivariate models are not presented in detail, as these were conducted as interim analyses. The predictors that were significant in the custodial/offending

**Table 1** Univariate models of factors associated with higher suicide risk in the socio-demographic and custodial/offending domains

Domain explanatory variable	Completeness of data ( %) <sup>a</sup>	Suicides n ( %)	Controls n ( %)	Odds ratio (95 % CI)	P value
Socio-demographic domain					
Married	90 (80)	53 (26)	40 (21)	1.52 (0.88–2.64)	0.13
Unemployed or long-term statutory sickness	70 (49)	121 (77)	86 (57)	3.00 (1.41–6.38)	0.004
Non-white ethnicity	100	42 (19)	28 (13)	1.67 (0.97–2.86)	0.06
Custodial/offending domain					
History of violence	97 (95)	92 (44)	48 (22)	3.00 (1.85–4.86)	<0.001
Charged with/convicted of a violent offence	99 (99)	74 (34)	54 (25)	1.63 (1.05–2.52)	0.03
Charged with/convicted of murder/manslaughter/attempted murder	97 (95)	37 (17)	22 (11)	2.07 (1.09–3.92)	0.03
Serving a life sentence	100	33 (15)	27 (12)	1.55 (0.72–3.30)	0.26
Remand status	100	73 (33)	34 (15)	4.25 (2.27–7.97)	<0.001
Occupying a single cell	97 (95)	157 (72)	103 (49)	3.09 (1.93–4.94)	<0.001
First time in prison	85 (73)	46 (26)	49 (25)	1.00 (0.62–1.62)	1.00
No social visits during prison term (>28 days in prison)	85 (55)	52 (26)	31 (18)	2.33 (1.27–4.27)	0.01
Adjudication/s during prison term	97	74 (35)	64 (29)	1.37 (0.85–2.19)	0.19

<sup>a</sup> Two complete percentages are given in this column. The first figure is the percentage completeness among all subjects in the dataset, irrespective of case–control matching; the figure shown in parentheses is the percentage completeness in the univariate conditional logistic regression model, with further subjects dropped because both subjects in each case–control matched pair must have complete data for that variable to enable inclusion in the model

**Table 2** Univariate models of factors associated with higher suicide risk in the clinical and service–response domains

Domain explanatory variable	Completeness of data ( %) <sup>a</sup>	Suicides n ( %)	Controls n ( %)	Odds ratio (95 % CI)	P value
Clinical domain					
Mental health problems identified at reception	100	109 (50)	65 (30)	2.47 (1.61–3.77)	<0.001
Receiving psychotropic medication on entry	100	81 (37)	34 (15)	3.94 (2.27–6.82)	<0.001
History of self-harm	97 (95)	114 (54)	42 (19)	6.21 (3.53–10.93)	<0.001
History of alcohol misuse	100	79 (36)	52 (24)	1.84 (1.20–2.84)	0.005
History of drug misuse	100	101 (46)	100 (45)	1.02 (0.69–1.51)	0.92
Previous mental health service contact	100	104 (47)	39 (18)	4.82 (2.86–8.13)	<0.001
Previous psychiatric inpatient admission	96 (91)	54 (26)	14 (6)	7.83 (3.35–18.32)	<0.001
Psychiatric diagnosis	96 (92)	101 (49)	42 (19)	4.47 (2.64–7.56)	<0.001
Service–response domain					
Mental health concerns documented at reception	100	65 (30)	11 (5)	7.75 (3.71–16.18)	<0.001
Self-harm/suicide ‘at risk’ document opened	100	118 (54)	31 (14)	9.70 (5.06–18.60)	<0.001
Referred to psychiatrist during prison term	100	95 (43)	30 (14)	4.82 (2.86–8.13)	<0.001

<sup>a</sup> Two complete percentages are given in this column. The first figure is the percentage completeness among all subjects in the dataset, irrespective of case–control matching; the figure shown in parentheses is the percentage completeness in the univariate conditional logistic regression model, with further subjects dropped because both subjects in each case–control matched pair must have complete data for that variable to enable inclusion in the model

domain multivariate model were history of violence ( $P = 0.001$ ), remand status ( $P < 0.001$ ) and single cell occupancy ( $P < 0.001$ ); those that were significant in the clinical domain model were history of self-harm

( $P < 0.001$ ), previous psychiatric service contact ( $P = 0.02$ ) and current psychiatric diagnosis ( $P = 0.009$ ). Non-white ethnicity was also carried forward from the socio-demographic domain as the univariate  $P$  value for

this variable was  $<0.1$ . No other variables from this domain were included in the final modelling process due to high levels of missing data.

The final multivariate model is presented in Table 3, with the following variables indicated as being mutually independent predictors of higher suicide risk: history of self-harm, occupying a single cell, remand status, non-white ethnicity and previous psychiatric service contact.

The higher suicide risk associated with non-white ethnicity was an unexpected result, given that it was previously reported as being protective in an international systematic review [9]. We, therefore, attempted to identify potential confounders that may have explained our result, focusing on socioeconomic status and psychiatric illness as the two most likely candidates. We first adjusted for being unemployed or on long-term statutory sickness benefit prior to imprisonment, but this did not yield a meaningful result due to high levels of missing data (crude OR 0.8; adjusted OR 0.7; with both models fitted using only 216 of the total sample of 440 cases and controls). There was little missing data for the psychiatric illness indicators, but any psychiatric diagnosis, and primary diagnosis of schizophrenia and other delusional disorders or of an affective disorder, showed no discernible confounding effect.

The exposure prevalence for suicides and controls for the five mutually independent predictors of risk can be found in Table 1. The cumulative prevalence of the risk factors for suicides and controls was calculated and compared; 74 % of suicides had exposure to 2 or more independent risk factors compared to 30 % of controls; 43 % of suicides had 3 or more compared to 9 % of controls; 12 % of suicides had 4 or more compared to 1 % of controls. One percent of suicides had exposure to all five independent risk factors compared to none of the controls.

## Discussion

### Main findings

We conducted the first national investigation of suicide risk among the recent prison population of England and Wales. The strongest univariate associations, with odds ratios indicating a relative risk of three or greater, included

history of violence, history of self-harm, being on remand, occupying a single cell and several indicators of current or past psychiatric illness. The socio-demographic data available to us were somewhat limited but, with a high level of missing data, we found an elevated risk among prisoners who were unemployed or on long-term statutory sickness benefit before imprisonment. Those of non-white ethnicity were found to have a modestly elevated risk. Our multivariate analysis evaluated associations from three domains of explanatory variables: ‘socio-demographic’, ‘custodial/offending’ and ‘clinical’. The final model identified five mutually independent predictors: history of self-harm, single cell occupation, remand status, non-white ethnicity and prior psychiatric service contact.

### Comparison with existing literature and interpretation

Higher prevalence of serious mental illness [22], and of substance misuse and dependence [23], are likely to explain elevated suicide risk seen among prisoners.

A national case–control study was conducted in Austria [8]. Its main limitation was that it examined suicides over approximately a quarter of a century and important changes in the management of prisoners and in clinical service provision may have occurred during this time. Cases and controls were matched on characteristics including prison status, and, therefore, the influence of this potentially important variable on the outcome could not be determined. There was also missing documentation and recording of information, particularly for controls which may have introduced selection bias, while also reducing statistical power.

Previous research has demonstrated particularly elevated suicide risk among prisoners on remand [7, 11]. We found that this was a strong independent risk factor. Remand prisoners are a complex subgroup with many experiencing feelings of loss and foreboding, having the uncertainty of judicial procedure or outcome looming, and the future unknown [11, 24]. Mechanisms that increase risk among remand prisoners could include withdrawal and detoxification from drugs or alcohol, separation from family or loved ones and loss of employment [25]. Studies have shown that remanded prisoners differ from those who are sentenced with regard to certain key risk factors, including psychiatric illness and a history of suicidality [1].

**Table 3** Multivariate model of factors independently associated with higher suicide risk

	Independent predictor	Adjusted odds ratio (95 % CI)	P value
Multivariate conditional logistic regression model fitted using 396/440 of all subjects, i.e. 90 % data completeness	History of self-harm	5.03 (2.52–10.05)	<0.001
	Occupying a single cell	3.70 (2.00–6.86)	<0.001
	Remand status	3.28 (1.49–7.21)	0.003
	Non-white ethnicity	2.56 (1.22–5.37)	0.01
	Previous mental health service contact	2.38 (1.24–4.54)	0.009

A history of self-harm was also found to be a strong independent risk factor. This confirms previous findings, in both community [26] and prison settings [8–10]. Contact with psychiatric services prior to prison was also much more likely in cases than controls, highlighting the importance of psychiatric illness risk factors for suicide in prison and replicating existing research findings [7–11, 27–30]. Comparison with previous research in terms of the prevalence of reported psychiatric illness in prisoner suicides is problematic due to differences between study populations and other sources of methodological variation.

Compared to controls, cases were more likely to be located in single cell accommodation, which again supports previous research [7–10]. Being located in a single cell may confer increased risk due to the characteristics of these particular prisoners, and exacerbation of these factors by the isolated environment within which they are placed. Mental health deterioration could occur in response to environmental stressors such as limited social interaction or the sensory restriction placed upon such individuals. Being in a single cell may be an ‘access to means’ risk factor, in that the prisoner has the time and privacy to attempt suicide. However, it may suggest a ‘vulnerable individual’ risk factor, as the prisoner may have been identified as being a potential risk to themselves or others, so have been placed there as part of managing that risk. A combination of these risk factors may be implicated in the causal mechanism. Comparing the characteristics of cases and controls located in single cell accommodation found that suicides were more likely than controls to have had previous mental health service contact, to have been managed under the ‘at-risk’ system during the prison term and to have a history of self-harm. Single cell accommodation is used to minimise disruption and enhance staff safety. Whether or not increased risk is due to the characteristics or the context, those located in single cell accommodation appear to have a ‘double vulnerability’ requiring enhanced and regular monitoring and assessment of their needs.

Previous research has also shown that prisoners and other offenders who are violent are at increased risk of suicide [7–9, 11, 14, 31]. Supporting previous literature, our findings show increased risk of suicide in prisoners with a history of violence and in those who had been charged with or convicted of a violent offence. This association is not specific to the prison population and is known to also exist in the general population, with poor impulse control being a likely mechanism [32, 33]. It appears that these two risks coalesce in certain individuals, and it has been suggested that risk of future violence and suicidal behaviour should be assessed and managed jointly in this group [34–37].

We found that prisoners of non-white ethnicity had a slightly higher risk of suicide than white prisoners. This association was just beyond statistical significance at univariate level, although the apparent effect became stronger in the final multivariate model. Ethnicity has not generally been reported in previous studies of suicide in prison, possibly due to problems of accurate recording [7] and comparisons between countries could be problematic due to ethnic group compositional differences, variation in the treatment and management of ethnic minority prisoners, and definitional variation. A systematic review of risk factors for suicide among prisoners in the UK and USA reported that being from a non-white ethnic group was a protective factor [9]. Our result may reflect a temporary increase in ethnic minority prisoner suicides in England and Wales during the study period, which has been suggested to be related to foreign national prison suicides in 2007 [38]. The number of foreign nationals imprisoned in England and Wales saw a 111 % increase between 1999 and 2009, and a reported ‘spike’ was noted in the number of foreign national suicides in 2007 when, compared with the total prison population, this group were over-represented in prison suicides [39]. Foreign nationals’ custodial experience is likely characterised by unfamiliar cultural practice, language barriers, isolation, limited family or social contact, vague understanding of the judicial system in which they are held, and anxiety surrounding deportation [40]. Such factors may also mean that foreign nationals are disadvantaged in terms of their care and management while in custody, as adherence to prison policies and procedures may prove difficult for staff. As such, accurate risk assessments based on their clinical and offending histories, and their psychosocial circumstances, are likely to be hampered. This may prevent comprehensive risk management plans being developed and operationalised. This suggests that improved suicide prevention measures should target efficient and adequate custodial assessment and support for those who experience a country’s prison system that is unfamiliar.

As explained in the [Materials and methods](#), the associations observed for factors in the service–response domain are somewhat circular in nature, in that they represent a prison staff response to known risk factors. However, there were significant differences between cases and controls with large odds ratios suggesting that staff successfully identified some prisoners at elevated suicide risk, and they initiated documentation or services to highlight this risk. Suicides were over nine times more likely to have been managed under the ‘at-risk’ system than controls suggesting that staff did identify a majority of those at high risk. However, as suicide was the eventual outcome in these cases, this suggests that the long-term management of those individuals requires improvement. The closure of an ‘at-risk’ document

should not signal the end of care for, or heightened vigilance of, these prisoners. Once a prisoner has been identified as being at-risk, they should be regularly assessed. A prisoner's 'risk signature' needs to be developed by prison staff to document early warning signs. However, 46 % of suicides had not been managed under this system during the prison term, suggesting that more improvements in risk assessment and identification are also required.

### Strengths and limitations

Compared with previous descriptive investigations of suicide in prison settings, the main strength of our study was the use of population-based nested case–control methodology. This enabled us to obtain living controls randomly selected from the whole cohort at-risk. Such an approach avoided the limitations of descriptive studies examining only a case series. Our control group was also free of selection bias. The exposure data for this study was entered into the subjects' clinical and custodial records prospectively, before outcome was known; a key design strength that precluded information biases between case and control subjects. The main limitation was reliance on the information that was available to us via routinely collected administrative records. The nature of retrospective studies means that the reliability and validity of the data collected is based on the scope and quality of information available in the records. The proportion of missing data for the explanatory variables was, however, generally low and similar for both cases and controls. Some characteristics or exposures, such as psychiatric diagnosis, could have been subjectively misinterpreted by prison staff. For clinical characteristics, respondents used clinical records rather than standardised assessment tools. This may have resulted in misclassification and an attenuation of some of the observed odds ratios, rather than a systematic information bias between case and control prisoners. Such reliance on clinical records rather than psychiatric assessment measures may also have meant that psychiatric illness was underreported in our study. Previous studies utilising interview-based assessments for psychiatric illness have suggested stronger associations between psychiatric illness and suicide in prisoners [28–30]. A further limitation is that the effect size estimate for remand prisoner status may have been somewhat underestimated due to our decision to match on establishment type. We deemed this additional matching criterion to be necessary, however, as it enabled us to make stronger inferences about risk factors at individual prisoner level.

### Implications

Our findings will inform policymakers, prison staff, and healthcare personnel in their efforts to reduce the incidence

of prison suicide. They suggest the importance of comprehensive clinical assessment of prisoners identified as being at increased risk, including those on remand, those with a history of violence or self-harm, those with a history of mental health service contact, and those held in single cell accommodation. Over two-fifths of the prison suicide cases we examined had three or more of the independent risk factors we identified.

The risk of suicide in prison is low in absolute terms, even among those who have multiple risk factors. As it is recognised that the risk factors identified in this study are common among prisoners, identifying and quantifying these will not determine who is at greatest imminent risk and lacks specificity. A large proportion of suicides had a mental illness, but not all those with a psychiatric disorder complete suicide, suggesting other factors may have more explanatory power that require elucidation [41, 42]. Given that suicide is a rare outcome, the continuum on which it falls would perhaps be more fruitful to investigate as it is assumed that suicidal ideation leads to planning, which then leads to suicidal acts [9, 43, 44]. Further research is now required to understand the causal mechanisms and psychological processes that explain why certain types of prisoners are far more likely to take their own lives [44–53].

**Acknowledgments** The authors thank the Prison Service and NHS staff in establishments in England and Wales, Safer Custody and Offender Policy Group and Offender Management and Sentencing Analytical Service at the MOJ for their assistance. This study was funded by Offender Health at the Department of Health.

**Conflict of interest** L. A. is National Clinical Director for Health and Criminal Justice, England and leads the National Suicide Prevention Strategy. M. P. is Senior Public Health Advisor, Offender Health, Department of Health, England.

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