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Suicide among male prisoners in France: A prospective population-based study

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ABSTRACT

Background: Suicide rates are high among prisoners but little is known about the precise weight of each risk factor.
Methods: We collected data on the periods of imprisonment of all adult males incarcerated in France between 1 January, 2006 and 15 July, 2009. We used survival analyses from the incarceration to its end, censored by the observation period. We calculated suicide rates and performed a Cox model to assess the link between prisoners' imprisonment characteristics and suicide risk.
Results: Overall, 301,611 periods of imprisonment were observed and 353 suicides were recorded. The suicide rate was 17.9 suicides per 10,000 person-years (95% CI: 16.1–19.9). The hazard ratio (HR) of suicide risk was high for placements in a disciplinary cell (15.7, 95% CI: 10.6–23.5) and varied depending on the main offence (homicide: 7.6, 95% CI: 5.3–10.9, rape: 4.6, 95% CI: 3.2–6.6, other sexual assault: 2.9, 95% CI: 1.9–4.6, other violent offence: 2.1, 95% CI: 1.5–2.8, compared with other offences). HR was lower when visits from relatives were observed (0.4, 95% CI: 0.3–0.5) and higher if a hospitalization was observed (1.6, 95% CI: 1.3–2.0). After conviction, HR halved with respect to the remand period, but there was no difference by sentence length. HR was higher if incarceration occurred after age 30 (1.4, 95% CI: 1.1–1.7). Foreigners tended to have lower risks than French prisoners, with the exception of those incarcerated for rape.
Conclusions: The suicide rate in prison is generally much higher than in the general population. This study has replicated previous international findings, highlighting the impact of the type of offence on suicide risk. Suicide prevention programmes must consider the high risk associated with incarceration for a criminal offence against a person. With regard to the impact of visits from relatives and placements in a disciplinary cell, further work should be conducted from a psychological perspective to examine the effects of physical and social isolation.
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1. Introduction

France is characterized by one of the highest prison suicide rates [1] in Western Europe and prison suicide is a serious concern. The suicide rate among prisoners is much higher than in the general population [1–4] and risk factors are prison-specific. Descriptive studies have indicated that the risk is high immediately after incarceration [5–12], and is also higher during the remand period than after conviction [1,12–14]. Among suicidees, prisoners convicted for violent and sexual offences are over-represented [1,4,5,10–12,15,16], as are those serving long sentences [14–17]. The suicide risk is higher among prisoners who are alone in their cells [7,8,14,18] or placed in disciplinary cells [11,19]. Among sociodemographic factors, there is no general consensus about the effect of age [11,17,19,20], but being male [14] and married [14,16] increase the risk of suicide. Race or ethnicity, also pointed out in the literature [14], is not commonly used in the French context as a sociodemographic factor, but having French nationality may be associated with risk differentials. Finally, mental disorders and suicidal behaviour, which are much more frequent among prisoners than in the general population [21–23], are also strongly associated with suicide risk [7,10,11,13,14,22–25].

These studies present significant limitations, however. First, they often have limited statistical power because suicide is a relatively rare occurrence in small populations. Second, they are largely based on aggregate rather than individual-level data. As a

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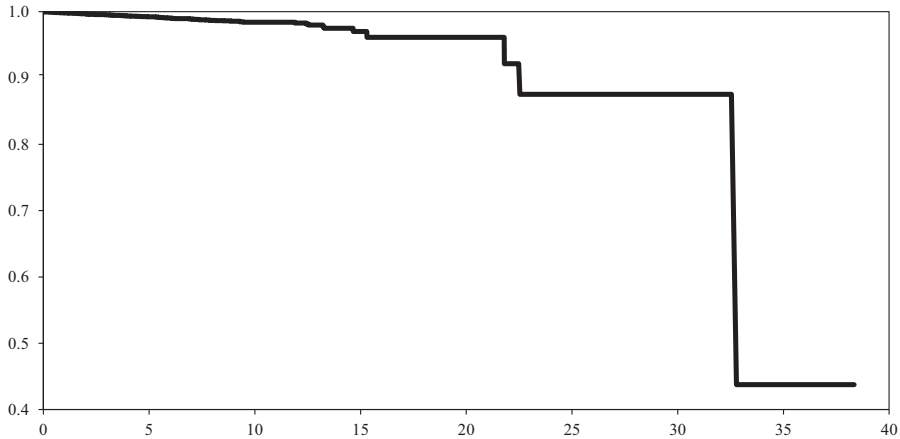

Fig. 1. Survivor function of suicide for adult male prisoners observed in France over the period 1 January, 2006–15 July, 2009.

result, they do not assess the independent contribution of each risk factor to suicide rates since these factors are often interlinked. In this study, we examined suicide risk factors among the entire French prison population over a recent three-and-a-half-year period. We investigated periods of imprisonment of adult males to assess the relative association between suicide risk in terms of the characteristics of their imprisonment.

2. Materials and methods

2.1. Study population

In compliance with French regulations on individual data protection, the French penal administration provided us with data on the 312,595 periods of imprisonment of adult males observed between 1 January, 2006 and 15 July, 2009 in all French prisons. A total of 301,611 periods were analyzed (3.5% were excluded due to missing information on the offence, penal status, date of final conviction or sentence length).

2.2. Data

We selected the reliable and most significant information from among the many types of data available for each period: the inmate's year of birth and nationality; penal information (offence, date of incarceration, date of final conviction and length of prison sentence if any); precise dates of stays in disciplinary cells, hospitalizations (whatever the reason, the location and the duration but with subsequent return to cell) and visits from relatives or friends during the 3.5-year-period of observation. Offences were ranked in five categories and, in cases of multiple offences, the first was selected as the main offence: (1) homicide; (2) rape; (3) other sexual assault; (4) other violent offence; and (5) other offence.

2.3. Statistical analysis

We performed survival analyses from the incarceration start-date to end-date (due to suicide or another event, i.e. release, escape or death from another cause). Data were censored for periods of imprisonment already begun on 1 January, 2006 and those not ended on 15 July, 2009 (Fig. 1). We calculated the mean observed duration of the imprisonment periods and the prison suicide rates, and we identified the association between characteristics and suicide risk using a Cox proportional hazard model. The model fit was tested with the Schoenfeld residuals method [26].

Table 1
Mean duration of periods of adult male imprisonment observed in France over the period 1 January, 2006–15 July, 2009, by main offence.

	Duration of imprisonment periods (censored)	
	Mean (95% CI)	*N*
Main offence		
Homicide	2.00 (1.97–2.03)	7824
Rape	1.80 (1.78–1.82)	14,814
Other sexual assault	0.84 (0.82–0.86)	10,686
Other violent offence	0.66 (0.65–0.67)	66,890
Other offence	0.50 (0.50–0.51)	201,397
Total	0.65 (0.65–0.66)	301,611

Source: French penal administration.

3. Results

From 1 January, 2006 to 15 July, 2009, 301,611 periods were observed with a mean duration of 0.65 years (Table 1). The mean length of the observed periods of imprisonment varied by type of offence, with 2.00 years (95% CI: 1.97–2.03) on average for homicide, 1.80 years (95% CI: 1.78–1.82) for rape, 0.84 years (95% CI: 0.82–0.86) for other sexual assault, 0.66 years (95% CI: 0.65–0.67) for other violent offences, and around six months for other offences.

During the observation period, 353 suicides were recorded over 196,916.8 person-years, giving a rate of 17.9 suicides per 10,000 person-years (95% CI: 16.1–19.9) (Table 2). We measured significant differentials for age at incarceration, with a higher rate for adults above 30 years old (22.1, 95% CI: 19.4–25.2). There was no difference between French prisoners and the others. The suicide rate was high for prisoners places in a disciplinary cell (180.4, 95% CI: 124.6–261.3), for prisoners who had been hospitalized at least once during the observation period (26.4, 95% CI: 22.1–31.6), for those on remand (37.2, 95% CI: 31.7–43.7) and those sentenced to more than 15 years in prison (26.7, 95% CI: 19.2–37.2). It was low for prisoners who received at least one visit from relatives or friends during this period (9.6, 95% CI: 7.7–12.1). The suicide rate was highest for prisoners convicted of homicide (50.5, 95% CI: 40.5–63.0), while rates for rape or sexual assault were equivalent (28.5, 95% CI: 22.7–35.6 and 26.7, 95% CI: 17.9–39.9). The rate for other violent offences was 17.5, 95% CI: 14.0–21.8, and the rate was lowest for other offences (9.6, 95% CI: 7.8–11.7).

In the multivariate analysis, with the exception of nationality, all covariates remained significantly associated with suicide risk: the highest hazard ratio (HR) was for placement in disciplinary cell versus an ordinary cell (15.7, 95% CI: 10.6–23.5). The HR varied considerably depending on the main offence. Compared to other offences it was 7.6, 95% CI: 5.3–10.9 for homicide, 4.6, 95% CI: 3.2–6.6 for rape, 2.9, 95% CI: 1.9–4.6 for other sexual assault, and 2.1, 95% CI: 1.5–2.8 for other violent offences. HR was low when at least one visit from relatives or friends was observed (0.4, 95% CI: 0.3–0.5) and high when at least one hospitalization was observed (1.6, 95% CI: 1.3–2.0). During the remand period, HR was twice as high as after conviction, but there was no difference by sentence length. HR was higher for prisoners above 30 years old at incarceration (1.4, 95% CI: 1.1–1.7).

Table 2
Frequencies, number of suicides, suicide rate and hazard ratio (Cox model on suicide risk) for adult male prisoners in France over the period 1 January, 2006–15 July, 2009.

	Person-years	Suicides	Suicide rate p 10,000 (95% CI)	Hazard ratio HR	p-v
Total	196,916.8	353	17.9 (16.1–19.9)		
Age group at incarceration[a]					
18–29 years	98,722.5	136	13.8 (11.7–16.3)	1.0 (ref)	
30 years and older	98,194.3	217	22.1 (19.4–25.2)	1.4 (1.1–1.7)	0.006
Nationality					
French	157,973.2	284	18.0 (16.0–20.2)	1.0 (ref)	
Other	38,943.6	69	17.7 (14.0–22.4)	0.9 (0.7–1.2)	0.477
Placement in disciplinary cell					
Regular cell	195,365.0	325	16.6 (14.9–18.6)	1.0 (ref)	
Disciplinary cell	1551.8	28	180.4 (124.6–261.3)	15.7 (10.6–23.5)	0.000
Hospitalization during obs.					
None	150,739.8	231	15.3 (13.5–17.4)	1.0 (ref)	
At least one	46,177.0	122	26.4 (22.1–31.6)	1.6 (1.3–2.0)	0.000
Visit from relatives during obs.					
None	117,939.1	277	23.5 (20.9–26.4)	1.0 (ref)	
At least one	78,977.7	76	9.6 (7.7–12.1)	0.4 (0.3–0.5)	0.000
Period and duration of the sentence					
Remand period	39,777.6	148	37.2 (31.7–43.7)	2.1 (1.5–2.9)	0.000
Period after conviction[a]	157,139.2	205	13.1 (11.4–15.0)		
Sentence <1 year	44,153.2	56	12.7 (9.8–16.5)	1.0 (ref)	
Sentence 1–4 years	63,008.6	70	11.1 (8.8–14.0)	1.1 (0.7–1.6)	0.739
Sentence 5–14 years	36,865.2	44	11.9 (8.9–16.0)	0.8 (0.5–1.5)	0.509
Sentence ≥15 years	13,112.2	35	26.7 (19.2–37.2)	1.4 (0.7–2.8)	0.394
Main offence					
Homicide	15,635.5	79	50.5 (40.5–63.0)	7.6 (5.3–10.9)	0.000
Rape	26,708.1	76	28.5 (22.7–35.6)	4.6 (3.2–6.6)	0.000
Other sexual assault	8982.2	24	26.7 (17.9–39.9)	2.9 (1.9–4.6)	0.000
Other violent offence	44,114.1	77	17.5 (14.0–21.8)	2.1 (1.5–2.8)	0.000
Other offence	101,476.8	97	9.6 (7.8–11.7)	1.0 (ref)	
				Global test	0.000
				Model fit	49%

Source: French penal administration.
Notes: Obs, observation; p-v, probability-value; Ref, reference category for the Cox model.
[a] The large groupings were defined after observation of smaller groupings (Annex 1).

Interactions between these different characteristics were studied and extracts from different models presenting some significant hazard ratios are presented in Annex 2. Most of the interactions do not affect the main results, except for the nationality and the main offence: foreigner prisoners tend to have lower risks of suicide than French nationals, except if they have been imprisoned for rape. Some other interactions are interesting to report: the remand period is a much more risky period for the prisoners who were incarcerated above age 30; the experience of a recent hospitalization is more notably linked to suicide for sentenced detainees than for the remand inmates; receiving recent visits decreases the risks much more during the remand period than after sentencing.

4. Discussion

For male prisoners observed in French prisons from 2006 to mid-2009, we found a significant impact of placement in disciplinary cell, type of main offence, visits from relatives or friends, period (remand or after conviction), experience of a recent hospitalization and age at incarceration, especially during the remand period. Foreigners tend to have a lower suicide risk than French prisoners, except if they are in prison for rape. The sentence length was not associated with risk differentials. Our results are valid for an adult male prison population in a specific country, and we assume that they are also valid for most of developed countries and may be compared with other international studies.

In this study, we highlight the major role of placement in disciplinary cells, adding a precise measure of suicide risk differentials over time between placement in a disciplinary cell and in a regular cell. Stays in a disciplinary cell mean physical isolation but they also concern prisoners who have been involved in prison disturbances, probably revealing difficulties in adapting to the prison environment [27]; such difficulties are probably more frequent among prisoners who suffer from mental health disorders. The absence of recent visits from relatives and friends is strongly associated with higher suicide risks, a confirmation of what has been observed in the UK [28,29]. This characteristic could be considered as a factor of social support [30]. Mental health problems are linked to social isolation, and as for the placement in a disciplinary cell, it is possible that persons with mental health disorders are likely to receive fewer visits from relatives or friends than the others. It may strengthen the powerful link observed in this study. However, the covariates used here only provide a suspected link between social and physical isolation and suicide in prison, and further qualitative research is needed to assess this link. Regarding the impact of age, as we proceeded via a survival analysis, we used age at incarceration which differs from age at suicide. As in previous studies the latter is generally used, it is difficult to compare our results with others. We have the same difficulty in discussing the role of the nationality since other studies usually look at ethnic/racial differentials.

Our results also verify the strong correlation between criminal profile and suicide risk [14]. This study shows that the nature of the

main offence which led to imprisonment is of primary importance in prison suicide, especially compared to sentence length.

Our study has several limitations, however. First, the 353 suicides included all the deaths resulting from suicidal acts committed by persons registered as prisoners. Whatever the context, in prison or in the general population, the intentionality of deaths from external causes (injuries, homicides and suicides) is not always clearly determined. In the French population for instance, this uncertainty leads to an underestimation of suicide mortality (around 10%) [31], but data were not available to address this question in French prisons. Records of stays in punishment cell may also be under-reported in the database. As the analysis was focused on differentials, these two limitations should not have an impact, however. Second, the data we used are from administrative files and were not collected specifically for this study. In theory, wide-ranging data were available, such as marital status, number of children or educational level. However, as they are declarative – noted down by the clerk at the time of prison entry – they were of poor quality. For this reason, we selected the most reliable data: those related to prisoner management. Third, it has been shown that a strong association exists between mental disorders, alcohol or drug addiction, suicidal behaviour and suicide [7,10,11,13,14,22–25]. Health information is not available and suicide attempts are not systematically notified in the administrative files. A single characteristic, hospitalizations (whatever the reason, the location and the duration but with subsequent return to cell), served as a proxy for health status and, even though it does not specifically characterize mental health disorders, it clearly showed a strong association with suicide. In England and Wales, a large share of prisoners who committed suicide in the early 2000s had previously spent time in prison in-patient facilities, although not necessarily psychiatric ones [10]. In that study, the authors emphasized the need to distinguish between acute and longer-term risk. In France, the link between suicide and hospitalization is stronger among convicted prisoners than remand inmates. This finding strengthens the distinction between two periods of risk, i.e. the initial remand period characterized by acute risk due to the shock of imprisonment [32], followed by the period after sentencing when the prisoners still need to be monitored, especially after been discharged from health facilities. Fourth, hospitalizations and visits from relatives occurring before 1 January, 2006 were not known. However, we assume that the observed events remained relevant for characterizing the prisoners' current situation, and they were indeed significantly associated with suicide for sentenced prisoners. Fifth, more generally, events occurring since incarceration and even experiences prior to it, such as traumatic events, previous incarceration or suicidal behaviour, could shed light on the reasons for suicide [27]. Suicidal behaviour may actually have existed before the incarceration and be linked to the offence, as has been observed for prisoners who commit a crime against a relative [33]. Sixth, the administrative files recorded a unique ID for each period of imprisonment, so we could not identify multiple stays of a single individual during the observation period. The fact that our unit of analysis is the period of imprisonment and not the individual increases the significance of the result. However, almost all the results are significant at $p < 0.001$ and we assume that taking into account the individuals rather than the periods would not have greatly impacted the results.

5. Conclusions

This study was conducted on the entire population of male adults in French prisons during a recent period, providing robust results. We used survival analysis to measure some suicide risk factors. We confirm previous findings, and add some more precise measurements of relative risks over time, controlled by the other characteristics, and examine how they may interact. This study has highlighted the impact of the type of offence. Suicide prevention programmes must consider the major suicide risk associated with incarceration for a criminal offence against a person. With regard to the impact of visits from relatives and placements in a disciplinary cell, further work should be conducted from a psychological perspective to examine the effects of physical and social isolation.

Conflict of interest statement

The authors declare no conflicts of interest.

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Annex 1. Frequencies, number of suicides and suicide rate by age group at incarceration, period and duration of the sentence for adult male prisoners in France over the period 1 January, 2006–15 July, 2009.

	Person-years	Suicides	Suicide rate p 10,000 (95% CI)
Age group at incarceration			
18–19 years old	14,094.2	20	14.2 (9.2–22.0)
20–24 years old	47,391.7	70	14.8 (11.7–18.7)
25–29 years old	37,236.6	46	12.4 (9.3–16.5)
30–34 years old	27,882.3	54	19.4 (14.8–25.3)
35–39 years old	22,647.1	54	23.8 (18.3–31.1)
40–44 years old	17,622.0	43	24.4 (18.1–32.9)
45–49 years old	12,511.8	24	19.2 (12.9–28.6)
50–54 years old	7974.5	19	23.8 (15.2–37.4)
55 years and older	9556.6	23	24.1 (16.0–36.2)
Period and duration of the sentence			
Remand period	39,777.6	148	37.2 (31.7–43.7)
Period after conviction	157,139.2	205	13.1 (11.4–15.0)
Sentence <6 months	21,965.4	27	12.3 (8.4–17.9)
Sentence 6–11 months	22,187.8	29	13.1 (9.1–18.8)
Sentence 1 year	28,016.4	27	9.6 (6.6–14.1)
Sentence 2–3 years	23,361.0	32	13.7 (9.7–19.4)
Sentence 4–5 years	17,256.1	20	11.6 (7.5–18.0)
Sentence 6–9 years	16,764.9	15	8.9 (5.4–14.8)
Sentence 10–14 years	14,475.3	20	13.8 (8.9–21.4)
Sentence 15–19 years	5965.4	16	26.8 (16.4–43.8)
Sentence ≥20 years	7146.8	19	26.6 (17.0–41.7)

Annex 2. Hazard ratio (Cox model on suicide risk) for adult male prisoners in France over the period 1 January, 2006–15 July, 2009 – interaction effects (extracts).

	Hazard ratio HR	p-v
Model interaction period and main offence		
Remand period and homicide	2.3 (1.1–4.7)	0.021
Remand period and rape	1.9 (1.0–3.8)	0.056
Remand period and other sexual assault	2.3 (0.9–5.8)	0.069
Remand period and other violent offence	1.3 (0.6–2.5)	0.479
Detainee and other offence	1.0 (ref)	
Model interaction nationality and infraction		
French	1.0 (ref)	
Other nationality	0.6 (0.4–1.0)	0.040
Other nationality and homicide	1.3 (0.6–2.8)	0.519
Other nationality and rape	2.8 (1.3–5.9)	0.006
Other nationality and other sexual assault	2.2 (0.8–6.3)	0.143
Other nationality and other violent offence	1.8 (0.8–3.9)	0.152
French and other offence	1.0 (ref)	

Annex 2 (*Continued*)

	Hazard ratio HR	p-v
Model interaction age at incarceration and period		
On remand	1.2 (0.8–1.8)	0.354
Sentenced	1.0 (ref)	
30 and older and on remand	2.3 (1.5–3.7)	0.000
Younger than 30 and sentenced	1.0 (ref)	
Model interaction hospitalization during obs. and period		
None hospitalization and sentenced	1.0 (ref)	
At least one hospitalization and on remand	0.6 (0.4–1.0)	0.030
Model interaction visit from relatives during obs. and period		
None visit and sentenced	1.0 (ref)	
At least one visit and on remand	0.4 (0.2–0.7)	0.000

All models are controlled by age group at incarceration, nationality, placement in disciplinary cell, hospitalization, visit, period and main offence.

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