Assessing the ethics of prison policies to ensure human rights compliance: Suicides and self-inflicted critical events in Italian prisons

Silvia Coretti [a], Silvia Fedeli [a,*], Michele Santoni [b]

[a] *Dipartimento di Economia e Diritto, Facoltà di Economia, Sapienza - Università di Roma, Via del Castro Laurenziano 9, 00161, Roma, Italy*
[b] *Dipartimento di Economia, Management e Metodi Quantitativi, Università degli Studi di Milano, Via Conservatorio 7, 20122, Milano, Italy*

ABSTRACT

Considering self-inflicted critical events (suicides, attempted suicides, self-harm acts, hunger strikes) in Italian prisons as indicators of the respect of inmates' human rights, this study examines their relationship with the characteristics of the Italian prison system between 2016 and 2021, using a unique prison-level dataset covering the 188 national prisons. Both individual panel regressions and seemingly unrelated regressions show that reducing prison overcrowding reduces critical events. The same result is achieved by increasing mandatory treatments (restraint acts) performed discretionally by prison staff. Because the former policy is politically sensitive and difficult/costly to implement, policymakers may prefer to rely on the latter as a "death-avoidance strategy", despite the greater likelihood of violating inmates' human rights. These findings may help explain the increasing use of acts of restraint in Italian prisons in recent times.

1. Introduction

This study examines the relation between self-inflicted critical events (i.e., suicides, attempted suicides, acts of self-harm, and hunger strikes) in Italian prisons and prisons conditions, including the general features of each institute, the prisons' environment, and the prison policies adopted at both prison and political levels.[1] The contribution of this study to the literature is two-fold. First, to the best of our knowledge, this is the first study that analyzes self-inflicted critical events —taken as (negative) indicators of the respect of prisoners' human rights— and prison conditions referred to a unique database including all the available administrative data at prison level covering all the Italian prisons for the period 2016–2021.[2] Second, this is the first empirical study for Italy that explicitly considers questionable mandatory treatments at the discretion of prison staff among the set of policies that can be used to prevent self-inflicted critical events. Our analysis will highlight the trade-offs policymakers may face in adopting alternative policies that have different implications for the need to guarantee the absolute protection of prisoners' human rights.

Prison conditions have been famously interpreted as a sign of the degree of a country's civilization since Beccaria, 1764/2012 as

---

* Corresponding author.
  E-mail addresses: silvia.coretti@uniroma1.it (S. Coretti), silvia.fedeli@uniroma1.it (S. Fedeli), michele.santoni@unimi.it (M. Santoni).
  [1] Prison policies are affected by the law, which can be decided by both the government and the parliament (political level) and prison management/staff with a margin of discretion.
  [2] The extant empirical literature, but for a few notable exceptions (e.g., Huey and McNulty, 2005; van Ginneken et al., 2017), usually employs aggregate prison system data either for single countries or for panel of countries (e.g., Fazel et al., 2017).

well as Voltaire and Dostoevsky. The received view among economists on prisons, however, is different. Notable scholars (for example, Levitt, 2004; Drago et al., 2009) support the view that, in modern criminal justice systems, imprisonment is the most important form of sanction, with prisons having two basic functions. First, prisons incapacitate criminals from committing other crimes by means of the simple mechanical removal of criminals from society. Second, the threat or experience of incarceration deters potential criminals from offending (Becker 1968).

The deterrent effect presumes that individuals change their criminal behavior in response to the severity of prison sentences. Therefore, policymakers often advocate the deterrent role of imprisonment as an effective approach to curb crime. In this context, a third function of prison concerning rehabilitation has often been disregarded.[3] Nevertheless, the rehabilitation function (i.e., the reintegration into society of a convicted person) lies at the core of the modern legal view of punishment (Daems and Robert, 2017). According to this view, the respect of human rights (in particular, the respect for individual dignity) is a precondition for rehabilitation.[4] Indeed, rehabilitation and protection of prisoners' human rights inform both international law-making (see the pronouncements of the European Court of Human Rights [ECHR], 2022) and international standards concerning prison conditions (i. e., the European Prison Rules,Council of Europe, 2006 ; and "The Nelson Mandela rules", United Nations, 2015).

In this respect, legal scholars often maintain that better prison conditions are a prerequisite for both protecting prisoners' human rights and allowing the rehabilitation function to operate effectively (Dolcini, 2012). As Western (2021: 117) states, "… prison conditions … can be understood as measures of what Liebling (2004) calls 'moral performance' that indicate the dignity of incarcerated people and decent treatment by authorities." For instance, overcrowding and poor prison conditions in Italy and elsewhere in Europe (e.g., Belgium and France) have been a target of the rulings of the ECHR since the 2010s.[5] Following an independent but converging action together with the Italian Constitutional Court (and, in 2013, together with the President of the Republic Giorgio Napolitano), the ECHR has actively promoted alternatives to incarceration. Moreover, it has inspired penal law reforms aimed at alleviating the time served in prison, for example, *via* early release,[6] and suggested the introduction of standards for minimum cell size and maximum prison capacity, together with facility renovation and building of new prisons (Cliquennois et al., 2022: 26–27).[7]

Nevertheless, suicide remains a major cause of deaths in prison. Moreover, in Europe and elsewhere, suicides and other self-inflicted critical events are consistently higher for the prison population than in the population at large.[8] Clearly, multifacet factors, including personal/individual and clinical/psychiatric conditions, underlie these phenomena (Favril, 2021). Yet, the reported number of self-inflicted critical events indicates that institutional/structural factors related to prisons' features/environment/climate enter into play. These factors undermine both the ethical performance of governments, and their commitment to guarantee the rehabilitation function of prison and the respect of human rights of prisoners.

As previously mentioned, in this study, we examine the relation between the occurrence of self-inflicted critical events in Italian prisons —taken as negative indicators of the respect of prisoners' human rights— and prisons' conditions, including prisons' policies. Given the number of reported Italian prisons' violations of the "Convention for the Protection of Human Rights and Fundamental Freedoms," in evaluating the results, we shall consider the requirement of the absolute protection of the rights of every person who is unable to decide about their own space, movement, and time. Indeed, the use of questionable policies in prison requires careful consideration and we believe that some lessons can be drawn from the Italian case also for other European countries targeted by the ECHR's rulings.

With this purpose, our analysis identifies three main policies of interest. The <u>first</u> policy concerns the urgent need to reduce

---

[3] A strand of the economics literature analyzes the effects of prison conditions and alternative incarceration practices on crime and recidivism (Roodman, 2017; for a survey). For example, Chen and Shapiro (2007) compared lower security vs. higher security placements; Drago et al. (2011) compared worse vs. better prison conditions; Di Tella and Schargrodsky (2013) compared electronic monitoring vs. traditional prisons; Mastrobuoni and Terlizzese (2022) compared open cells vs. closed cells; and Tobon (2022) compared newer vs. older prison facilities. The key message of this literature is that better prison conditions lower recidivism, although the size of the estimated effects is heterogeneous (see Tobon, 2022). Bhuller et al. (2020) demonstrated that time spent in prison with a focus on rehabilitation can reduce recidivism.

[4] In several European countries, rehabilitation is considered the primary objective of prisons (Harris, 2015), at least as important as incapacitation and punishment. In Italy, these aspects have been embedded in the Italian Constitution of the 1948 other than ordinary laws, such as the Italian Penitentiary Law n. 354 of 26 July 1975 (Fiandaca, 1991; Vassalli, 1983), the Penitentiary Regulation (Presidential Decree n. 230/2000), and the "Gozzini law" n. 663 of 10 October 1986 (regulating the alternatives to detention and incarceration).

[5] The Strasbourg Court, by relying on the violation of Art. 3—right to dignity—of the European Convention of Human Rights and on the Recommendation Rec (2006)of the Committee of Ministers to member states on the European Prison Rules, has fined Italy several times since 2012 for the "inhumane, degrading" state of its prisons (see the "Torreggiani judgment": ECHR, 2022:9).

[6] Law Decree n. 146, 23/12/2013 and Law n. 10, 21/10/2014.

[7] Cliquennois et al. (2022: 9–21) highlighted that the ECHR's jurisprudence traditionally relies on a risk-based approach, which mainly considers individual risk factors and is concerned with risk management strategies aimed at physical prevention of suicide while largely overlooking prison conditions. Consequently, the Strasbourg Court's jurisprudence has prompted several member states to adopt "death avoidance strategies," including coercive measures, such as CCTV surveillance of secure cells. These strategies, according to the authors, paradoxically "infringe human dignity and reinforce detainees' willingness to commit suicide."

[8] In 2012, the suicide rate per 100,000 prisoners was approximately 12 times higher than the corresponding rate for the general population aged 30–49 years in Italy, approximately 8 times higher in France, approximately 6 times higher in England, Wales, and Germany, and approximately 5 times higher in Spain (Fazel et al., 2017: Table 2:249). In Italy, the suicide rate in prison in 2022 was 18 times higher than that for the population outside.

overcrowding in Italian prisons,[9] which are also characterized by personnel shortages. The <u>second</u> policy is related to rehabilitation, for which we shall consider the potential of each institution for rehabilitation activities. The <u>third</u> policy details prison measures used to manage critical situations: that is, the disciplinary isolation measures and acts of restraint.

Given our focus on human rights principles, some clarifications are needed regarding the third group of policies. In Italy, according to Article 32 of the Constitution, no citizen can be obliged to a specific health treatment except by law. Indeed, the standard administration of mandatory medical treatments (in and outside prisons) is allowed only in the event of serious threats to the safety of the individual and others, as being certified by the health authority (Laws 180/1978 and 833/1978): the procedure, which is extremely invasive and involves the intervention of external qualified health personnel, requires formal authorization from the Mayor, followed by validation of the administrative act by the Tutelary Judge. The acts of restraint in prisons, which are similar to compulsory medical treatments, are not regulated by the law. They are rather decided by the prison staff, not necessarily after the evaluation nor in the presence of external health care personnel, nor under the control of the local (not prison's) police force, nor under the approval by an outside authority. Practically, these acts apply not only to individuals who manifest suicide threat, threaten or harm property or persons, refuse to communicate resulting in isolation, refuse therapy or refuse water and food, but also to people who cause inconvenience to others with their behavior. In prisons, acts of restraint are permitted/tolerated in the absence of the strict regulation imposed by Law 833 (Arts. 33–35) and may be motivated by public order reasons by prison staff claiming the prevention of suicidal and self-injurious acts.[10] Acts of restraint may involve the isolation or biomechanical restraint of the inmate in the so-called "smooth room" or "room without furnishings", where the inmate may be forced to undergo medical treatment in the absence of legal safeguards. As for the disciplinary isolation, this measure is regulated by the law.[11] The law provides exclusion from recreational and sports activities for no more than 10 days; isolation in the open air for no more than 10 days; and exclusion from communal activities for no more than 15 days. Exclusion from community activities cannot be sanctioned without written approval from the prison's health officer that the inmate is able to tolerate it.[12] Prisoners excluded from community activities are precluded from communicating with fellow inmates. Moreover, they must undergo constant health monitoring. However, several cases reported by the Italian Guarantor of the Rights of Persons Deprived of Liberty (*Garante nazionale dei diritti delle persone private della libertà personale*) indicate violation, particularly of the maximum time allowed in solitary confinement and daily medical monitoring.

We were granted access to the Italian Department of Prison Administration (DAP) database records on the 188 Italian prisons between 2016 and 2021, *via* the Italian Guarantor of the Rights of Persons Deprived of Liberty.[13] The available data belonged to three macrocategories: (i) general features of the institutes; (ii) critical events, which are further divided into four categories: self-inflicted critical events, critical events against others —other prisoners and prison staff—, evasions from prison or from reward or work permits, drug addiction; (iii) prison policies undertaken at a national political level and within the institutes for both prisoner management and prevention of critical situations. The new database was created by merging these data with data released by the Italian Ministry of Justice concerning detention spaces, namely, comfort of the cells, spaces for visits, and common areas. To the best of our knowledge, our study is the first analysis that uses the universe of prison-level administrative panel data to investigate the role of prison conditions on critical events in Italy.

The remainder of this paper is structured as follows. Section 2 presents a review of the relevant literature. Section 3 describes the dataset. Section 4 illustrates the empirical framework. Section 5 reports the main findings of our empirical analysis of the effects of prison conditions on self-inflicted critical events. Section 6 presents robustness analyses of the empirical results. Section 7 concludes the study.

2. Literature review

As curbing suicides in prison is an important international public health goal (World Health Organization, 2007),[14] substantial literature has been published on this topic (see Favril et al., 2020, for a recent survey on the determinants of self-harm acts in prison). Until recently, there have been two different approaches in the literature that have been seen as alternative to each other. The <u>first</u>

---

[9] As already mentioned, the received view among law scholars is that suicide is positively related to the measures of prison overcrowding. The empirical evidence, however, is mixed (see Section 2 below).

[10] Unlike other countries, there is no clear legal framework for the use of restraint acts both in and outside prisons (Cardano et al., 2020). Prompted by a complaint, the ECHR has recently (17/11/21) asked Italy to clarify the legal basis and legitimacy of physical restraints, and a sentence is expected soon.

[11] Law 354/1975 Art. 39, and d.P.R. 230/2000 Art. 73.

[12] Since the 2000s (Law Decree n. 230/1999), health care in Italian prisons is a responsibility of the National Health Service and, hence, of regional governments (State-Regions Conference Agreement on penitentiary health care, 22/1/2015).

[13] The state fully runs and owns the Italian prison system. DAP is an administrative branch of the Italian national government, as it depends directly on the Ministry of Justice.

[14] For example, European governments have "the positive duty to take reasonable measures to prevent suicide in prisons under Article 2 [right to life]" of the European Convention of Human Rights, Candler et al. (2011: 54). Murphy and Whitty (2015) critically evaluated the use of summary statistics to measure the quality of life in prison.

importation approach (see Marzano et al., 2016, and Zhong et al., 2021, for surveys) advocates that suicides in prison are positively correlated with individual clinical factors, such as histories of suicidal behavior, alcohol or substance abuse, psychiatric illness, and personality traits of aggression and impulsivity (the latter provoking "behavioral disinhibition") as well as with individual socio-demographic factors, such as social exclusion, economic disadvantage, and problematic family relationships.[15] The second *deprivation approach* argues that the experience of deprivation in prison acts as a stressor, which may trigger inmate suicide. This approach underscores the contribution of environmental factors that are related to prison conditions, such as the level of occupancy of cells and overcrowding (e.g., Huey and McNulty, 2005), turnover of the prison population (e.g., van Ginneken et al., 2017), and bullying and assault (e.g., Blaauw et al., 2001); and to prison regimes and practices, such as high security levels provoking social isolation, time spent out *vs.* time spent in cell (Stephenson et al., 2021), forced idleness, the absence of purposeful activities—education, work, antibullying initiatives—, the limited access to rehabilitation programs (e.g., Leese et al., 2006), solitary confinement or accommodation in a single cell (e.g., Frottier et al., 2007), absence of family and social visits, and lack of social links with the outside world (e.g., Duthe et al., 2013).[16]

When considering the correlation between suicides and prison conditions, the extant literature finds mixed results.[17] In a meta-analysis based on the data from 20 high-income countries between 2011 and 2014, Fazel et al. (2017) reported a negative association between the prison suicide and incarceration rates,[18] but no association between suicide rates and other prison conditions, including crowding rates, the ratio of prisoners to prison staff, prison population turnover ratios, mean cost per prisoner per day, the prison health care system type, and the mean length of imprisonment. However, a major limitation of this approach is the use of country-level data, which are known to have measurement errors (which may be enhanced by cross-country comparisons) and a limited number of observations (which reduces the statistical power of the analysis).

Empirical studies based on the prison-level data usually find that higher overcrowding,[19] the lack of purposeful activities, and/or higher prisoner turnover are positively associated with a higher likelihood of prison suicides, although these variables are typically mutually exclusive factors. A possible explanation for these findings is that each prison-level variable is, to some extent, an alternative proxy of one or several dimensions of both the moral climate of prison and quality of prison life (Liebling, 2004, 2011). If the moral climate/quality of life in prison affects the level of distress in an inmate, factors that reduce prisoners' well-being *via* deprivation of goods and services (e.g., by reducing the opportunities for meaningful and stable social interactions among prisoners and between prisoners and staff) will increase the likelihood of a prison suicide. [20] Huey and McNulty (2005), by using the US Census Bureau data for over 1100 US prisons in 1990 and 1995, showed that overcrowding affects prison suicide directly as well as by making less salient the impact of different levels of prison security (a proxy for deprivation) on suicide likelihood. By employing a set of controls, the authors found that the log-odds of observing at least one prison suicide (a dummy dependent variable) in 1995 was higher in prisons with higher overcrowding, irrespective of the prison security level.

Leese et al. (2006)'s multivariate analysis of prisons in England and Wales during 2000–2002 demonstrated that high levels of purposeful activities were associated with a significant reduction in the per-1000-prisoners per prison-year rate of self-inflicted death (a broader concept than suicide). As expected, binary measures of overcrowding and assault rates were each positively correlated with the regressand. However, they became statistically insignificant once controlling for the prison security level.

van Ginneken et al. (2017), considering a longer time-span (2000–2014) dataset for 132 prisons in England and Wales, showed that when prison size, prison security levels, and ownership (i.e., public *vs.* private) were controlled for, overcrowding was positively correlated with the rate of suicides. When prison function (i.e., local prisons, which receive remand and short-sentenced prisoners, *vs.* training prisons) was added to the analysis, overcrowding became statistically nonsignificant. However, when a measure of prison population turnover was added, prison function also became nonsignificant, such that the turnover rate was a key determinant of the suicide rate. The intuition is that prisons with higher turnover rates have a more unstable quality of prison life, making it difficult to establish meaningful social interactions among prisoners as well as between prisoners and staff, and weakening the rehabilitative function of prisons. Moreover, higher turnover is associated with a relatively larger share of new prisoners, who are considered to be more at risk of suicide for criminological reasons.

---

[15] The economics of suicide empirical literature has focused on the general population. It has suggested that measures of economic disadvantage are positively associated with suicide rates. Based on aggregate data, a few studies showed that higher unemployment rates increase the suicide rate (e.g., Reeves et al., 2012, Phillips and Nugent, 2014; for the USA), although Chen et al. (2012) found evidence of publication bias. By employing individual-level data, Dow et al. (2020) documented that a higher US federal minimum wage lowers nondrug suicides among less-educated adults.

[16] Both the importation and deprivation approaches identify criminological factors as predictors of suicide in prison. These include the high level of violence of the offense, the custody phase (i.e., the immediate period after imprisonment as in Bukten and Riksheim Stavseth, 2021, and the early phase of long-term or life sentences), the judicial status (i.e., the pretrial/remand status), and the lack of prison experience (Radeloff et al., 2021).

[17] Rogan (2018) noted that the extant empirical literature has overlooked the impact of proxies for rehabilitation and human-rights compliance (including suicide prevention policies) on prison conditions and, hence, on suicide rates.

[18] These authors noted that more serious offenders, who have personal traits that are known to be associated with high suicide risk (e.g., they committed violent crimes), are overly represented in the prison population in countries with lower incarceration rates than in countries with higher incarceration rates, where high-risk inmates are more diluted across the prison population (Fazel et al., 2017: Table 3: 951).

[19] On the contrary, Fazel et al. (2017: 946) found that lower overcrowding may hide a widespread use of solitary confinement, which is a well-known mental stressor and suicide risk factor.

[20] For Liebling (2004, 2011), see also Liebling et al. (2005), the moral climate of prison can be summarized by the way in which the staff treats prisoners. In fact, prisoner–staff relationships depend on the "levels of respect, fairness, and humanity shown toward prisoners by staff," which affect the main drivers of distress, that are, "how safe the prison felt" and "how trust and power flowed through the institution."

Most existing empirical analyses examine institutional and individual factors as separate correlates of suicide rates. However, Dye (2010) presented a multivariate binomial negative regression model based on cross-sectional data for 1082 US state prisons in 2000, where prison conditions (i.e., dummies for location, security level, and overcrowding, measured either as overcapacity or as the presence of a court order to reduce inmate numbers; the number of special programs available to inmates; and the degree of violence) and prison inmate *composition* (i.e., gender and age dummies; the proportion of white inmates; and the proportion of inmates receiving mental health care) were considered jointly as correlates of prison suicide rates. By controlling for prison size (proxied by the average daily population of inmates), age of the facility, private *vs.* public ownership, and the general suicide rate by state, Dye (2010) showed that the relevant variables —i.e., security levels (especially), a measure of overcrowding, the violence rate, and the share of prisoners receiving mental care services—were each positively correlated with the suicide rate at statistically significant levels. A shortcoming of this approach is that, owing to its cross-section nature, it can neither clearly distinguish between individual and institutional factors nor establish clear causation links.

Most previous studies are based on data from the US or UK, with a few exceptions for Continental Europe. Regarding Italy, the empirical literature on suicide and acts of self-harm is typically descriptive, with a few exceptions, primarily adopting a statistical-epidemiologic focus, for example, by computing relative risk ratios and mainly using aggregate national data.[21] Castelpietra et al. (2018) made a unique attempt to link individual to prison data. The authors used the official DAP records for 2010–2016 linking prison characteristics with individual characteristics of prisoners incarcerated in each of the 16 prisons of the two North-East Italian regions of Friuli-Venezia Giulia and Veneto. However, as suicide is rare, there were not enough observations in their sample to perform meaningful econometric analysis, which was instead performed by considering suicide attempts. Binomial regression estimates suggested that male gender, average age approximately 30, and prison security levels were the best predictors of suicide attempts, whereas overcrowding was not statistically significant. Their analysis of risk factors demonstrated different determinants for completed suicides, which were more frequently observed for foreign-born prisoners, violent crimes, and overcrowded prisons.

Referring to a unique dataset that includes all the available information per institute on the general features of the prisons, critical events (i.e. suicides, attempted suicides, self-harm acts, hunger strikes), composition of inmate population, prison staff, and prison policies between 2016 and 2021, we shall examine the relation between the occurrence of self-inflicted critical events in Italian prison and prisons' conditions, including prisons' policies. We shall highlight the implications for policymakers of adopting alternative policies —which have different implications for the respect of human rights of prisoners— that can be relevant for other European countries facing similar problems.

3. Data

We were granted access to the Italian DAP database records on the universe of the 188 Italian prisons between 2016 and 2021, *via* the Italian authority Guarantor of the Rights of Persons Deprived of Liberty. The core of our database is represented by the self-inflicted critical events (our dependent variables) that occurred in prison during the time horizon considered. These events include suicides, suicide attempts, self-harm acts, and individual and collective hunger strikes. Table 1 reports the critical events officially recorded at the national level by year.

The number of suicides grew steadily between 2016 and 2018 (+30% per year); since then, it has fluctuated around the average. Both the number of attempted suicides and self-harm acts have been increasing since 2016, whereas the number of individual and collective hunger strikes showed a reduction until 2017 and grew afterward, until 2020.

Following the extant literature (see Section 2), for the subsequent empirical analysis, we have organized the dataset into three main groups of variables as follows.

The first group of variables captures time invariant features, concerning the type of prison (correctional facility or detention house), its geographical location, reachability, capacity, and the number of places available. In the Italian prison system, there are basically two types of institutes: first, the detention house (*Casa circondariale*, CC), which is predominantly reserved for detained defendants waiting for their first trial and offenders serving sentences of under five years (including residual sentence time); and, second, the correctional facility (*Casa di reclusione*, CR), which is reserved for inmates with final and longer sentences. The allocation of inmates to institutes is strongly influenced by a territorial criterion. On the one hand, the Italian Criminal Procedure Code of 1988 (see Art. 8) establishes territorial competence for the local court where the offense has been committed. This implies that detained defendants awaiting trial should be allocated to the detention house that is closer to the competent local court (each town hosting a local court must also have a detention house). On the other hand, the Italian Penitentiary Law (see also DL October 2, 2018 n. 123), based on Arts. 29 and 31 of the Italian Constitution, establishes that inmates, unless for specific reasons, should be assigned to prisons either located as close as possible to the town of their family's residence or to the town where their social ties live or to prisons where the criminals turn themselves in. Exceptions include personal and environmental impediments (e.g., related to inmate security, health care needs, and prison overcrowding, see Drago et al., 2011: 108–110, for a full description of the prison assignment mechanism) or prisoners with sentence of imprisonment mainly related to acts of terrorism or organized crime.[22]

---

[21] Taggi et al. (1998); Tatarelli et al. (1999); Preti and Cascio (2006); Cinosi et al. (2013); for sociological approaches see Manconi and Boraschi (2006), and Buffa (2012).

[22] Inmates subject to the 41-bis special detention regime (749 in January 2023) are allocated by the Ministry of Justice to one of the twelve prisons with maximum security sections. In 2019, the ECHR asked Italy to reform the special regime by considering it incompatible with human rights principles.

Table 1
Self-inflicted critical events in Italian prisons (2016–2021).

Year	N. of inmates	Suicides		Attempted suicides		Self-harm acts		Hunger strikes	
		Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)
2016	54,472	36	0.07	982	1.8	8381	15.4	10,230	18.8
2017	53,975	47	0.09	1097	2.03	9206	17.1	7225	13.4
2018	59,495	61	0.1	1180	1.98	10,232	17.2	7625	12.8
2019	60,607	53	0.09	1490	2.46	11,190	18.5	8040	13.3
2020	60,607	61	0.1	1474	2.43	11,285	18.6	8233	13.6
2021	54,026	54	0.1	1621	3.00	11,037	20.4	7558	14

Our sample comprises 140 (74.47%) detention houses, CC, and 48 (25.53%) correctional facilities, CR.[23] Of these institutes, 48% are located in a suburban or rural area, but about 80% are reachable by public transport facilities. The average number of regular places is about 250 per prison; of these, on average, about 12 places per prison are unavailable to host inmates. As a result, the number of available places is lower than the one established by law and could ultimately lead to overcrowding of cells. In addition to size, the comfort of the cells and availability of spaces dedicated to training or recreational activities are different.

The second group of variables is related to the indicators of the climate/environment in prison depending on prisoners' behavior and composition. Institutes differ regarding gender composition and nationality and proneness to drug addiction of the population, which can mirror the social, economic, and crime differences across the national territory. At the aggregate level, in 2021, the population of prisons in Italy comprised 54,134 inmates. Of these, less than 5% were women, 28.12% were drug addicted, and 31.48% were foreigners. In this context, numerous critical events in prisons were related to acts of violence against other prisoners and/or prison staff. These include assaults and scuffles (8063 in 2021), injuries (1087 in 2021), attempted murders (6 in 2021), homicides (1 in 2021), and threatening (i.e., insulting prison guards [5201] or other inmates [1113], including bullying episodes). Furthermore, critical events include evasions either from prison (7 in Italy in 2021) or from prize or work permits (7 and 23, respectively, in 2021 at the national level). Table 2 reports the number of addicted inmates, evasions, and critical events against other inmates and prison's staff that occurred in our sample from 2016 to 2021. In particular, the last column highlights the sum of crimes in prison, including brawls, violence against guards, violence against other inmates, assaults, injuries, attempted murders, murders, and scuffles. Although evasions exhibited a stable trend over time, barring evasions from prison that peaked in 2020, violent episodes increased over time. Such episodes increased by 43% from 2016 to 2021, which reflects the worsening situation of discomfort and discontent within the facilities.

The third group of variables is related to prison policies decided at both the national and prison levels (i.e., determined by the behavior of prison staff and police). These policies include the (absence of) action to reduce overcrowding, the personnel management, the prisoners' space management, the rehabilitation of prisoners, and the incapacitation of inmates from committing other crimes by preventing and reducing potential offense to others (with an extension of this function to inmates with respect to Becker, 1968) and to themselves.

Two relevant issues characterizing Italian prisons are related to the high crowding rate and personnel shortage observed in the data. The *crowding rate* is obtained yearly as the ratio between the inmates housed in a given prison and the *places available* in the same prison, where the places available are computed as the difference between the regular and unavailable places. Table 3 reports the arithmetic average of the crowding rate in the institutes considered in the dataset and its maximum value found in the considered years. On average, the crowding rate in Italian prisons exhibited an increasing trend from 2016 to 2020, reporting a reduction in 2021. This decrease is likely associated both with the urgent measures introduced in 2020 by the Italian government to reduce overcrowding and contain the spread of the COVID-19 virus in prison (Decree-Laws No. 18, March 17, 2020 and No. 269 No. 137, October 28, 2020), and with the changed attitude of the supervisory courts to grant inmates temporary alternatives to detention for health reasons under the existing laws. However, the national panorama is extremely heterogeneous as it appears by comparing the maximum crowding rate found in the year and the national average value per year (respectively, the third and second columns of Table 3). In 2016, the maximum crowding rate recorded equaled 2.9 and decreased over time until reaching 2.05 in 2021.

Regarding the personnel shortage, based on the size of the inmate population in the previous year and considering the expected number of new entries, the number of regular units of personnel defined by law is usually higher than the number of units actually in force.

Table 4 describes the availability of prison personnel in the observed time span. Planned staff is the personnel assigned by law to the prison considering the size of prison's population. Managed staff is the number of personnel units managed by the prison. The personnel in force is the actual number of units employed considering those seconded to other institutes. The personnel shortage (gap) is measured as the difference between the planned staff and the staff in force. A gap between the planned and available personnel is observed for the overall time period, peaking at 6897 units in 2017 and subsequently decreasing until 2020. However, a new increase in the gap (approximately 600 units) is observed in 2021 owing to an overall decrease in the staff managed by the prisons.

---

[23] Of these, three detention houses and two correctional facilities only host female inmates. One institute includes a correctional facility as well as a detention house section.

Table 2
Drug addicted inmates, evasions, and crimes in Italian prisons (2016–2021).

Year	Drug addicted Inmates		Evasions from Prison		Evasions from work permits		Evasions from semi-release		Crimes in prison	
	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)
2016	14,127	25.9	1	0.002	23	0.042	14	0.026	17,048	31.3
2017	14,657	27.2	18	0.033	9	0.017	14	0.026	19,116	35.4
2018	16,622	27.9	4	0.007	14	0.024	21	0.035	21,151	35.6
2019	16,884	27.9	9	0.015	20	0.033	24	0.04	24,377	40.2
2020	16,884	27.9	81	0.134	3	0.005	8	0.013	22,717	37.5
2021	15,224	28.2	7	0.013	7	0.013	6	0.011	24,435	45.2

Note: For number of inmates refer to Table 1.

Table 3
Prisons' crowding rate in Italian prisons (2016–2021).

Year	Arithmetic average of the crowding rate (by institute)	Crowding rate (maximum value)
2016	1.183	2.908
2017	1.227	2.692
2018	1.271	2.831
2019	1.300	2.564
2020	1.300	2.564
2021	1.141	2.052

Table 4
Overall prisons' staff in Italian prisons (2016–2021).

Year	Planned staff (A)		Managed staff (B)		Staff in force (C)		Gap (A-C)	
	Abs. Number	Units/inmate (%)	Abs. Number	Units/inmate (%)	Abs. Number	Units/inmate (%)	Abs. Number	Units/inmate (%)
2016	37,181	68.26	33,159	60.87	31,908	58.58	5273	9.68
2017	41,253	76.43	35,743	66.22	34,356	63.65	6897	12.78
2018	37,181	62.49	33,810	56.83	31,610	53.13	5571	9.36
2019	37,181	61.35	33,774	55.73	32,619	53.82	4562	7.53
2020	37,181	61.35	33,708	55.62	32,545	53.70	4636	7.65
2021	37,181	68.82	33,159	61.38	31,908	59.06	5273	9.76

Note: For number of inmates refer to Table 1.

Table 5
Prisons' measures to manage critical situations in Italian prisons (2016–2021).

Year	Procedures of infraction for noncompliance		Acts of restraint of inmates		Disciplinary isolation measures	
	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)	Abs. Number	N./inmate (%)
2016	4349	8.0	436	0.80	2184	4.00
2017	6089	11.3	474	0.88	1927	3.56
2018	7672	12.9	722	1.21	2336	3.93
2019	8681	14.3	798	1.31	1899	3.13
2020	9106	15.0	1013	1.67	1500	2.48
2021	12,367	22.9	1017	1.88	1341	2.48

Note: For number of inmates refer to Table 1.

The third group of variables includes data on policies undertaken within the institute to manage or prevent critical situations. Table 5 reports their count between 2016 and 2021. The procedures of infraction for noncompliance (12,367 at the national level in 2021) are punishment measures toward inmates adopted in case of noncompliance with obligations or rules; for these procedures, we observed a constant increase over time. More critical measures are disciplinary isolation measures (1341 in 2021) and prisoners' restraint acts (1017 in 2021).

The usage of restraint acts to handle critical or risky behaviour of prisoners increased steadily and remarkably over time. In fact, their count more than doubled from 2016 to 2021. In the same time span, there was a constant decrease in the usage of disciplinary isolation measures as if the latter were progressively replaced by restraint acts.

Finally, other aspects reflecting the institutes' policies are the number of inmates per room (approximately 2 on average with a maximum of 7 all over the period), which also reflects the decisions upon the management of spaces, and the possibility of exploiting

spaces to perform rehabilitation activities (only one third of prisons had this possibility in 2021). The summary and statistics of the main data of our dataset are presented in Appendix (Table A1).

4. Empirical framework

We focus on the relation between the occurrences of critical events in prison: *y* denotes one of the outcome variables, and *X,* a set of explanatory variables of interest. A simple model for exploring this situation is as follows:

$$y_{j,it} = \beta_{j0} + \sum \beta_{jit} X_{jit} + \sum \alpha_{jt} t + \varepsilon_{jit}, j = 1, 2, 3, 4. \quad i = 1, 2, ..., N_j; \quad t = 1, 2, ..., T \tag{1}$$

where j = 1,.., 4 indicates the specific outcome variables, $i = 1, 2, …, N_j$ indicates prisons, and t = 1, 2, …, T indicates years. Our empirical strategy <u>first</u> aims to quantify, by an equation-by-equation application of panel random effects estimates, the relationships between the occurrences of each self-inflicted critical event in prison, y, depending on the three groups of variables, X, that may have affected it and common time shocks across prisons (i.e., we estimate the four separate equations for each j defined for a sample of $N \times T$ prisons). <u>Second,</u> we estimate a seemingly unrelated regression (SUR) system by applying Aitken's generalized least-squares procedure to the system of equation (1), for j = 1, …, 4.

We decided for panel random effects rather than fixed effects panel estimation because our research question aims at studying the relation between self-inflicted critical events in Italian prisons and the Italian prison conditions. Prison conditions are characterized by numerous time invariant variables, which are very often considered by the extant literature. With fixed effect panel estimation, all these variables would be omitted, and this would be very disappointing for at least three relevant factors that are invariant over time: (1) "type of institute" (i.e. correctional facility, CR, or detention house, CC); (2) "places available" that we use as a control for dimension; (3) "rehabilitation activities" in terms of available prison space for rehabilitation, which is the only proxy available to indicate the potential for rehabilitation activities in each institute. On this basis, we prefer random effects panel estimation. The fact that the Hausman test for both suicides and attempted suicides favors random effects rather than fixed effects further supports our choice.[24]

A further issue affecting our empirical strategy has to do with the choice between panel random effects and probabilistic models. On the one hand, probabilistic models might be preferred with reference to infrequent self-inflicted events, especially suicide, because linear models might not provide efficient estimates in the presence of variables that have many zeros. On the other hand, <u>none</u> of our dependent variables is, *per se,* a binary variable, not even suicides. This variable, which is equal to zero 890 times on 1128 over the sample period, takes a maximum annual value for some individual prisons equal to 4. This information would be lost if we transformed the dependent variable into a binary one. The same would occur for all the other self-inflicted critical events for which the maximum annual value is much higher (and the number of zeros is very low). Nevertheless, Section 6 will report the results of probit estimates for suicides, where variables are both expressed in levels and normalized by the number of inmates. Section 6 will also report random effects panel estimates for the same variable normalized by the number of inmates. The fact that, *mutatis mutandis,* we shall find quite consistent estimates with the two methodologies (standardized or not) reassures us about the robustness of the results obtained.

As for the three groups of variables, X, from which we select the significant ones for each individual equation, we carefully apply the general-to-specific methodology - an approach for empirical modeling due to Hendry (1983) and widely used in empirical works.[25] This methodology helps by increasing the degrees of freedom of the estimate and its precision. In our context, it also helps by reducing the likelihood of results being driven by the correlation between regressors. Hence, we first estimate a base model for each dependent variable by removing the variables that are not statistically significant from the set of regressors depicting all the main features of each prison (i.e, all the time invariant variables of the first group, see Section 3). We report only the effect of each variable that is statistically significant, always controlling for the type and dimension of each institute. In other words, the general-to-specific process is carefully conducted in three steps. For each statistically nonsignificant variable, we first test the significance of the exclusion starting with the least significant. Where the null hypothesis that the variable is statistically significant is rejected, we omit it from the set of regressors. Subsequently, we test the individual significance of the remaining variables. We continue to omit each variable where the null hypothesis that the variable is statistically significant is rejected. Once this base model is created for each dependent variable, we augment the set of variables of the second group by adding those that capture the institute's environment based on prisoners' behavior and proceed with the general-to-specific exercise. Finally, we consider the third group of variables capturing prison policies decided both at the government and prison levels. The final reduced-form models might not have the same set of regressors to be considered when comparing results across the different indicators.

However, mixing temporal and cross-sectional data might lead to violations of the standard least-squares assumption of error independence (Avery, 1977). In a single model comprising multiple linear equations, it is often unrealistic to expect that the equation errors would be uncorrelated. A set of equations that has contemporaneous cross-equation error correlation (i.e., the error terms in the regression equations are correlated) is called a seemingly unrelated regression (SUR) system: the equations seem unrelated, but they are related through the correlation in the errors (Baltagi, 2001). Error structures of the individual equation (1), for j = 1,..4, can be characterized by panel heteroskedasticity, panel autocorrelation, and contemporaneous correlation. Hence, as an additional check of

---

[24] The Hausman's test was $\chi^2(13) = 4.62$ (p-value = 0.98) for suicides and $\chi^2(13) = 5.86$ (p-value = 0.95) for attempted suicides.

[25] Based on Monte Carlo simulation, the general-to-specific methodology has been shown to have desirable proprieties for model selection (see Hoover and Perez, 1999).

our baseline estimates, we estimate a SUR model to the entire system (Avery, 1977).

Aitken's procedure for SUR is a two-stage process. In the first stage, least-squares estimates are calculated equation by equation and a disturbance covariance matrix is obtained. In the second stage, the Aitken estimates are obtained by fitting the first-stage covariance matrix into the second-stage equation.[26] If errors are correlated across equations, the SUR approach allows correcting least-squares estimates for this correlation. To test whether the SUR approach is justifiable, we analyze the correlation matrix of the residuals. We observe the independence of residuals and the related Breusch–Pagan test. It refers to the correlation of error terms between equations. It is a test following a χ^2 distribution with k degrees of freedom. If the test statistic has a p value smaller than the defined threshold, the null hypothesis of independence is rejected. Therefore, we estimate the parameters of our set of regression equations using those as independent variables that are obtained through the equation-by-equation application of least squares. Furthermore, the hypothesis that all regression equation coefficient vectors are equal, based on data, results from the application of the general-to-specific process discussed above. If this hypothesis cannot be rejected, there will be no aggregation bias. Within the estimation framework, a test of the equality of regression coefficient vectors and, thus, of the absence of an important type of aggregation bias is applied.[27] Under such conditions, the SUR coefficient estimators are at least asymptotically more efficient.

Regarding the three groups of variables considered and our hypotheses' testing, the first group refers to the time invariant structural characteristics of the institute, which are not fully under the direct control of the local prison. We always control for the type of institute (i.e., correctional facility or detention house) and the number of places potentially available. Moreover, we test for the inclusion of a set of dummy variables that capture causes of stress for inmates being related to: prison location (i.e., urban area and reachability); the presence of cell amenities (i.e., rooms with hygienic services, rooms for disabled inmates, hygienic services with door, rooms with autonomous lightning, and rooms with electric plugs); the presence of facilities, such as interview rooms, outdoor areas for interview, playrooms, sport fields, gyms, and canteens (see Appendix, Table A1). Regarding the two time invariant control variables maintained in all the specifications of the model, we make the following predictions: **(i)** for the variable *type of institution*, as long as inmates with a pretrial/remand status are known to be at a greater risk of committing suicides (see Radeloff et al., 2021) in addition to other self-inflicted actions, and given that they are predominantly hosted in detention houses, we would expect a higher likelihood of observing prison suicides and possibly other self-inflicted critical events in a detention house rather than a correctional facility, other things being equal, although other features of correctional facilities (such as a higher level of prisoner surveillance and the presence of inmates at the initial stages of long-term detention periods; see, for example, Bukten and Riksheim Stavseth, 2021) may operate as offsetting factors. **(ii)** For the variable *places available* that controls for the dimension of each institute, as long as bigger prisons are often associated with a more anonymous environment, which deteriorates the moral climate of the prison (Liebling, 2004), we would expect a higher likelihood of observing a critical event in bigger than smaller prisons.

The second group of variables captures the institute's environment depending on prisoners' behavior. The variables tested are the following: *crimes in prison*, proxying the degree of crime within each institution, *evasions* (for any reason) capturing the discomfort internal to the prison, *drug addicted prisoners* signalling the composition of the prison population inclined toward higher risk subjects (see Zhong et al., 2021).

The third group of variables captures prison policies decided at the government and prison levels. This set includes the *crowding rate*, which measures prison conditions that are affected by policy choices primarily taken at a central level. Notice that the crowding rate is always considered in the empirical literature, mainly in the deprivation approach, as a correlate, although with controversial results, of suicides in prisons (see Section 2). Certainly, the crowding rate is determined, among other factors, by criminal laws and the quality and number of prisons that are available in a country. These factors are determined by the national government and parliament. Legal scholars often identify a low level (i.e., close to unity) of the crowding rate as a precondition for the prison rehabilitation function to operate properly, making the crowding rate a key policy target to be monitored by governments willing to comply with human rights principles (see ECHR, 2022). Therefore, increased crowding rates should be associated with deterioration in the prison climate, which should enhance the stress levels within the prison and make critical events more likely to occur. To avoid endogeneity issues or simultaneous/self-causality likely occurring between the crowding rate and suicides simply because the increase of deaths due to suicides reduces the overcrowding in prison, in the estimate, we refer to the *crowding rate corrected for suicide*.[28] The variable *crowding rate corrected for suicide* is obtained by adding the number of suicides in each institute each year to the numerator of the crowding rate. This correction changes the observed crowding rate only to the third decimal digit (see Table A1).

Among the variables determined at the central level, we also consider the issue of personnel shortage by including a variable *personnel* per *inmate* computed as the ratio between the number of personnel in force and the number of inmates. A reduction in the level of this variable has potentially a two-fold effect on self-inflicted critical events. First, less personnel per inmate implies stronger pressures on the prison staff to control and manage a given number of inmates. In turn, this may deteriorate the relations between prison staff and inmates, in addition to increasing the time spent in a cell by inmates. Second, less personnel per inmate means a lower degree of direct control by staff on prisoners, which may encourage the more disruptive inmates, incurring in more bullying cases to weaker inmates and more disruptive behaviour.[29] Both effects are likely to lead to an *increase* in observed self-inflicted critical events, other things being equal.

---

[26] See Zellner (1962).

[27] Notice that, as long as our specification of the SUR model will contain the same explanatory variables in each equation, the estimates presented in Table 10 will be equivalent to single equation pooled OLS estimates with time dummies.

[28] We thank Arye Hillman for noticing this potential source of simultaneous causality in a former version of this study.

[29] We thank an anonymous referee for suggesting us this interpretation.

Furthermore, the third group of variables comprises strategies decided in a discretionary way by the prison management to avoid critical events. They cover *acts of restraint, solitary confinement measures*, and *procedures of infraction*. In the group of variables decided by the prison management, we also consider the variable *inmates* per *room* taken as a measure of prison spaces' management by part of the staff that may influence inmates' sense of isolation (but also their fear of crowding).

Finally, the variable representing the policies of prison management allowing the *possibility of rehabilitation activities* is a binary time invariant variable, which captures whether specific spaces within each institution are potentially available (but not necessarily used as such) for rehabilitation activities, such as professional training, labs, and workshops. In particular, the dummy used takes on the value of 1 in the presence of both vocational/professional (e.g., for education and job training) and recreational (e.g., school rooms, library, and theater) facilities inside prisons that may capture the extent of commitment to the rehabilitation function, while taking on the value of 0 otherwise.

5. Empirical results

Tables 6–9 report the results of single equation, random effects estimates for the period examined for each self-inflicted critical event. Regarding the base model in Column (a), the two crucial structural control variables, the type of institute and number of places available, enter with the expected sign and are statistically significant in almost all specifications. In particular, self-inflicted critical events are increased in a detention house (CC) with respect to a correctional facility (CR). Provided that pretrial inmates are hosted predominantly in detention houses, this result is consistent with the findings of the criminological literature that the pretrial status of inmates enhances the risk of suicides (or more generally, self-inflicted critical events) in prison. Moreover, bigger prisons are significantly associated with a higher number of self-inflicted critical events. As suggested by Liebling (2004), this might be due to the fact that bigger prisons are associated with a more anonymous environment, which reduces social interactions between prisoners and staff, and deteriorates the moral climate of the prison. However, the impact of the prison dimension, in particular for suicides, although significant, is close to zero, which contains the relevance of prisons' dimensions for suicides. Indeed, in Italian prisons, for the overall period, critical events are not concentrated in big prisons, and the median for suicides is in prisons with a number of places roughly equal to 318 (i.e., half of critical events occur in small-to medium-sized prisons).[30]

The results of the base model in Column (a) of Tables 6–9 are stable and consistent across all models estimated over the entire period (Columns (b)–(d) in each table), where the set of regressors relevant in Columns (a) is augmented by other mentioned characteristics. In particular, in Columns (b), we consider the group of variables broadly capturing the prison environment/climate as determined by prisoners' actions against other inmates or prison staff. In Columns (c), we augment the model with a group of regressors capturing the effects of policy measures. In Columns (d), we add time fixed effects to the model of Columns (c) to capture common time shocks across prisons, such as the COVID-19 pandemic and changes in national legislation not controlled for by our policy variables.

The results of the extended version of Columns (d) in Tables 6–9 are noteworthy. The control for prison size, as proxied by the number of *places available*, is always significant and enters with positive sign. Once the variables from groups 2 and 3 are added to the regression, the *detention house dummy* remains significant at the 1% significance level and positively signed for all the critical events, but for suicides. The variable *crimes in prison* is positively correlated with the self-inflicted critical events in all specifications of Tables 6–9, and the estimated effects are statistically significant. This suggests that violent crimes deteriorate the climate inside the prison increasing inmates' level of distress and the likelihood of observing self-inflicted critical events. The *crowding rate corrected for suicides* is always statistically significant. The estimated sign is positive for all the dependent variables: an increase in the crowding rate is associated with a higher number of self-inflicted critical events at the prison level. This result confirms both the legal view that overcrowding should be reduced for better prison conditions, and the empirical results for the US (Huey and McNulty, 2005) and England and Wales (van Ginneken et al., 2017).

As for prison policies, prisoners' *restraint acts* lower the number of suicides at the 5% significance level; however, they are not statistically significant for the other self-inflicted critical events. Disciplinary *isolation measures* are significant at the 5% significance level, entering with a negative sign both for attempted suicides and hunger strikes (Columns (c)), but their significance is reduced to the 10% significance level for the former, and it disappears for the latter once year fixed effects are introduced (Columns (d)). Disciplinary *procedures of infraction* for noncompliance behavior of inmates enter with a positive sign and are statistically significant for attempted suicides and self-harm acts at the 1% and 5% significance levels, respectively. *Personnel* per *inmate* and the *number of inmates* per *room* enter with a negative sign in all the regressions, although the former is statistically significant at the 1% level for suicides and self-harm acts only, whereas the latter is statistically significant for suicides and attempted suicides only at the 5% level. This suggests that, on the one hand, a properly staffed prison will lower pressures on prison staff, contributing to improve both the prison climate and control of more disruptive inmates; on the other hand, an increase in the number of inmates per room, controlling for overcrowding, may act as a protective factor (see also below). Finally, the dummy variable representing the *possibility of rehabilitation activities* is significant at the 5% level, with positive sign, for hunger strikes, although the standard error is large.

---

[30] Notice that there are no very large prisons (say, with more than 2000 inmates) in Italy. The biggest prison (Poggioreale in Naples) has 1501 places available. Overall, there are only 6 institutes with slightly more than 1000 places available. The median for prisons' size is 182 inmates. The maximum number of places available in the Italian prison system is 47,138 inmates, which translates into an average of 250 available places per institution. Notice further that, in the sample period, the maximum crowding rate was observed in the San Vittore prison in Milan, which has 444 places available.

Table 6
Panel Random-Effects estimates.[A] Dependent variable: Suicides.

VARIABLES	(a)	(b)	(c)	(d)
	Structural characteristics of the institute	Institutes' environment	Prison policies	Prison policies (time fixed effects included)
Detention house (CC)	0.1625***	0.0721**	0.0624	0.0653
	(0.040)	(0.033)	(0.045)	(0.045)
Places available	0.0010***	0.0006***	0.0006***	0.0006***
	(0.000)	(0.000)	(0.000)	(0.000)
Crimes in prison		0.0011***	0.0011***	0.0011***
		(0.000)	(0.000)	(0.000)
Crowding rate[B]			0.1778***	0.1722***
			(0.052)	(0.052)
Personnel per inmate			−0.0006***	−0.0006***
			(0.000)	(0.000)
Inmates per room			−0.0359**	−0.0372**
			(0.017)	(0.0173)
Prisoners' restraint acts			−0.0013**	−0.0014**
			(0.001)	(0.001)
Isolation measures			0.0004	0.0005
			(0.001)	(0.001)
Procedures of infraction			−0.0002	−0.0002
			(0.000)	(0.000)
Rehabilitation activities			0.0494	0.0499
			(0.050)	(0.051)
Constant	−0.0892**	−0.0435	−0.1900***	−0.2384***
	(0.036)	(0.027)	(0.066)	(0.070)
Year fixed effects	NO	NO	NO	YES
Observations	1128	1128	1092	1092
Number of institutes	188	188	186	186
Overall R-squared	0.1721	0.2316	0.2416	0.2447
Wald chi squared (p value)	64.85 (0.000)	116.76 (0.000)	219.36 (0.000)	261.73 (0.000)

Note A. Robust standard errors adjusted for clusters in institute are presented in parentheses.
***$p < 0.01$, **$p < 0.05$, and * $p < 0.1$.
Note B. The crowding rate is corrected for suicides.

In Table 10, we estimate the parameters of a set of regression equations (corresponding to the extended version reported in Column (d) of Tables 6–9) with the SUR model.[31] The reported regression coefficient, under certain conditions, is asymptotically more efficient. The Wald test for joint significance improves in all the columns of Table 10. The Breusch–Pagan test of independence shows a chi statistics equal to 472.789 (p-value = 0.00), implying that the correlation across the error terms of our equations is statistically significant, which, in turn, justifies the SUR approach. Most estimated coefficients are similar to those presented in Tables 6–9 in terms of size, sign, and significance. The discrepancies are outlined as follows.

Considering *attempted suicides* as a dependent variable (Column (b) of Table 10), the coefficient of *crowding rate* is still positive with respect to Column (d) of Table 7, but it is no longer significant in the SUR model. Moreover, *restraint acts*, *isolation measures*, and *personnel per inmate* are all highly significant (at the 1% level), entering with the same negative sign. The latter result is interesting because a unit increase in personnel per inmate reduces the average amount of attempted suicides (equal to 6.95 per year at the mean sample value) by 2.2 units. In fact, more personnel per inmate make it easier for prison staff to control and build relationships with prisoners, which can help prevent attempted suicides. In addition, an understaffed prison is likely to not engage in rehabilitation activities, keeping inmates incarcerated in cells for longer, thereby deteriorating the moral climate of the prison. According to the sociological literature, this feature is associated with higher feelings of deprivation and loss of control among prisoners, which, in turn, can trigger critical events. Finally, an understaffed prison may encourage violent behaviour and bullying of some inmates against others and staff.

Referring to *self-harm* episodes (Column (c) of Table 10), the dummy for the institute type is no longer significant with respect to Column (d) of Table 8, whereas the two variables expressing prison policies are all significant at the 5% significance level or less with a negative sign, except for *procedures of infraction* for noncompliance, which takes on a positive sign. The effect of the *crowding rate* is noteworthy here. The reduction of 10 percentage points (i.e., 0.1 in the estimates) of the crowding rate reduces the number of self-harm acts by 2.31 with respect to the sample mean of 54.37. In addition, the dummy for *rehabilitation activities* is statistically significant and enters with a negative sign.

Concerning *hunger strikes* (Column (d) of Table 10), the number of *inmates per room* becomes negatively significant at the 1% level, whereas the *procedures of infraction* variable gains significance, entering with the same positive sign observed in the individual regression (Column (d) of Table 9). The estimated coefficient (15.29) of the crowding rate is interpreted as follows: a reduction of the

---

[31] The statistical significance of the estimates presented in Table 10 is unaffected by the clustering of standard errors by institute.

Table 7
Panel Random-Effects estimates.[A] Dependent variable: Attempted suicides.

VARIABLES	(a)	(b)	(c)	(d)
	Structural characteristics of the institute	Institutes' environment	Prison policies	Prison policies (time fixed effects included)
Detention house (CC)	5.4989***	2.6877***	2.5589***	2.6246***
	(0.836)	(0.571)	(0.768)	(0.757)
Places available	0.0216***	0.0087***	0.0097***	0.0099***
	(0.004)	(0.003)	(0.003)	(0.003)
Crimes in prison		0.0343***	0.0307***	0.0297***
		(0.005)	(0.005)	(0.005)
Crowding rate[B]			1.6834**	1.7884**
			(0.839)	(0.834)
Personnel per inmate			−0.0101	−0.0092
			(0.008)	(0.008)
Inmates per room			−0.5573**	−0.5244**
			(0.2305)	(0.2285)
Prisoners' restraint acts			−0.0164	−0.0192
			(0.017)	(0.017)
Isolation measures			−0.0407**	−0.0322*
			(0.016)	(0.017)
Procedures of infraction			0.0167***	0.0150***
			(0.006)	(0.006)
Rehabilitation activities			0.6370	0.6864
			(0.981)	(0.977)
Constant	−2.5616***	−1.1383	−2.1502**	−2.9799***
	(0.814)	(0.711)	(1.001)	(1.047)
Year fixed effects	NO	NO	NO	YES
Observations	1128	1128	1092	1092
Number of institutes	188	188	186	186
Overall R-squared	0.3104	0.5141	0.5508	0.5517
Wald chi squared (p value)	68.44 (0.000)	102.37 (0.000)	233.88 (0.000)	293.43 (0.000)

Note A. Robust standard errors adjusted for clusters in institute are presented in parentheses.
***$p < 0.01$, **$p < 0.05$, and * $p < 0.1$.
Note B. The crowding rate is corrected for suicides.

crowding rate equal to 0.1 (i.e. 10 percentage points) would lower the number of hunger strikes by 1.53 with respect to the sample mean, which is 319. As before, the dummy for *rehabilitation activities* is positively statistically significant. Regarding self-harm acts and hunger strikes, the role of the dummy for rehabilitation activities is ambiguous. This variable captures the structural prison features that potentially enable rehabilitation, but that are not necessarily associated with real ongoing rehabilitation activities. This might signal a deteriorated prison climate where rehabilitation facilities, albeit present, are underused, which may trigger conditions for hunger strikes to be observed. However, as long as hunger strikes, even when undertaken individually, are a form of protest against prison conditions, the positive association of rehabilitation facilities and hunger strikes may actually signal a "success" of the rehabilitation function in making prisoners more aware of their individual and collective rights. The opposite occurs for self-harming, which is lowered by the presence of rehabilitation activities.

Finally, regarding *suicides,* all the results of the individual estimation (Column (d) of Table 6) are confirmed in Table 10 (Column (a)), with the exception of *personnel per inmate* that is no longer significant with the SUR estimation. This means that the significance of *personnel per inmate* in the individual estimates was likely driven by correlation in the error terms. Almost all the coefficients in Table 10 have the same size as in Table 6. The *crowding rate corrected for suicides* remains significant at the 1% level with the expected positive sign. The result that the number of inmates per room enters significantly with a negative sign, as if a higher number of inmates per cell lowered suicides, is puzzling and apparently contradicts the result of the crowding rate. In principle, the number of inmates per cell is also a measure of "social density" (see Cox et al., 1984) that would have the same effect as the crowding rate. However, because we cannot control for the cell space, it is possible that the number of inmates per cell is capturing the protecting effects that multiple occupancy of a cell exerts relatively to occupation of a single cell, where the latter is usually found to be associated with an increased risk of suicide (e.g., Zhong et al., 2021: p. e167). In other words, one extra person per room might not create problems of coexistence among prisoners, and problematic individual cases could be easily managed by the prison staff by means of simple cell exchanges of a few people. However, if the entire prison is crowded, all common spaces are and prisoners' open-air hours (and access to all common facilities) can become a nightmare.

The estimates of Column (a) of Table 10 confirm that a higher number of *acts of restraint* is associated with a lower number of suicides (at the 5% significance level). This result suggests that acts of restraint, while clashing with the respect for the rights of individuals deprived of liberty, can be seen by prison authorities as a successful strategy to avoid suicides. Being forms of control that do not fully respect human rights, using these policies introduces an ethical dilemma for public authorities, which may be keener to implement them if their performance was measured referencing the number of suicides.

From both Column (d) of Table 6 and Column (a) of Table 10, the results suggest the extent of trade-off faced by policymakers and

Table 8
Panel Random-Effects estimates.[A] Dependent variable: Self-harm acts.

VARIABLES	(a)	(b)	(c)	(d)
	Structural characteristics of the institute	Institutes' environment	Prison policies	Prison policies (time fixed effects included)
Detention house (CC)	41.6959***	19.9211***	14.7789***	14.8776***
	(6.653)	(4.806)	(4.756)	(4.715)
Places available	0.1671***	0.0668***	0.0886***	0.0882***
	(0.028)	(0.021)	(0.022)	(0.022)
Crimes in prison		0.2657***	0.1996***	0.2003***
		(0.045)	(0.031)	(0.031)
Crowding rate[B]			22.2248***	21.3566***
			(5.452)	(5.664)
Personnel per inmate			−0.0782**	−0.0784***
			(0.031)	(0.030)
Inmates per room			−2.135	−2.1238
			(1.9642)	(0.278)
Prisoners' restraint acts			−0.1052	−0.1104
			(0.072)	(0.071)
Isolation measures			−0.1321	−0.1282
			(0.133)	(0.130)
Procedures of infraction			0.1284**	0.1281**
			(0.061)	(0.062)
Rehabilitation activities			−7.4597	−7.5350
			(7.438)	(7.515)
Constant	−18.5851***	−7.5609**	−25.2119***	−24.4195***
	(6.195)	(3.820)	(6.975)	(7.528)
Year fixed effects	NO	NO	NO	YES
Observations	1128	1128	1092	1092
Number of institutes	188	188	186	186
Overall R-squared	0.3163	0.6293	0.6418	0.6424
Wald chi squared (p value)	66.55 (0.000)	171.22 (0.000)	253.92 (0.000)	291.12 (0.000)

Note A. Robust standard errors adjusted for clusters in institute are presented in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Note B. The crowding rate is corrected for suicides.

prison authorities. A reduction in the crowding rate by 10 percentage points (i.e., 0.1 in the estimates) would lower the number of suicides by 0.0165 units (0.0172 in Table 6) with respect to the mean of the sample that is 0.28 per prison, other things being equal. Given the average crowding rate of the sample over the considered period of 1.24, reducing the average to 1.00 (i.e., absence of overcrowding with a reduction in the crowding rate of 0.24) would reduce suicides by 14.3% (i.e., suicides would fall by 0.24*0.165 = 0.04 units relative to the mean sample value of 0.28). However, an increase in the number of acts of restraint is more effective. The increase by 100 units of acts of restraint (not very high over the total prisons) would lower suicides by approximately 0.15, that is, nearly half suicides (by reducing 0.15 the average suicides of approximately 0.28 per year), other things being equal. This fact possibly explains the increase in the total number of restraint acts that is more than doubled in the period considered (Table 4).

6. Robustness check

This study uses a unique data set covering the universe of Italian prisons between 2016 and 2021. However, the empirical analysis has some limitations.

First, there is an issue of reliability of the data related to likely under-reporting or missclassification of critical events, in particular for suicides.[32] More specifically, some cases of suicide could be reported as "natural deaths", or "deaths to be ascertained".

Therefore, as a robustness check for the estimates of suicides, we re-run the base case model, considering as alternative dependent variable: the *sum of suicides and deaths to be ascertained* (Column (a) in Table 11); the *sum of suicides and natural deaths* (Column (b) in Table 11); and the *sum of suicides, deaths to be ascertained and natural deaths* (Column (c) in Table 11). All the models include year fixed effects. In order to handle possible cross causality, in each column the crowding rate has been adjusted by the number of deaths considered in the dependent variable. Comparing Column (d) in Tables 6 and 11 and it turns out that the sign, size (especially for Columns (a) and (b) of Table 11) and significance of all estimated coefficients is similar, with the notable exception of both acts of restraint, losing significance in Table 11, and inmates per room, no longer significant in Column (c) of Tables 11 and i.e. for the widest definition of suicides.

Second, there is an issue related to the small number of suicides observed in the sample, as already pointed out in Section 3. Because of the presence of many zeros, linear estimates of suicides would be biased. For this reason, columns (a) and (c) in Table 12 present a

---

[32] We thank an anonymous referee for suggesting us this test.

Table 9
Panel Random-Effects estimates.[A] Dependent variable: Hunger strikes (individual and collective).

VARIABLES	(a)	(b)	(c)	(d)
	Structural characteristics of the institute	Institutes' environment	Prison policies	Prison policies (time fixed effects included)
Detention house (CC)	13.3467**	11.3987**	13.2693**	11.9087**
	(5.333)	(5.412)	(5.410)	(5.335)
Places available	0.1316***	0.1226***	0.1079***	0.1061***
	(0.019)	(0.020)	(0.021)	(0.021)
Crimes in prison		0.0238*	0.0255**	0.0302**
		(0.013)	(0.012)	(0.012)
Crowding rate[B]			12.4508***	14.7918***
			(4.647)	(4.655)
Personnel per inmate			−0.0239	−0.0110
			(0.034)	(0.031)
Inmates per room			−3.199	−2.9839
			(2.050)	(2.026)
Prisoners' restraint acts			0.0060	0.0213
			(0.040)	(0.039)
Isolation measures			0.1185**	0.0855
			(0.055)	(0.057)
Procedures of infraction			−0.0061	0.0049
			(0.012)	(0.013)
Rehabilitation activities			15.1229**	14.8421**
			(6.711)	(6.611)
Constant	0.4349	1.4212	−10.8612*	−1.5657
	(5.537)	(5.484)	(6.541)	(6.898)
Year fixed effects	NO	NO	NO	YES
Observations	1128	1128	1092	1092
Number of institutes	188	188	186	186
Overall R-squared	0.4132	0.4425	0.4725	0.4949
Wald chi squared (p value)	51.63 (0.000)	75.76 (0.000)	124.12 (0.000)	189.69 (0.000)

Note A. Robust standard errors adjusted for clusters in institute are presented in parentheses.
***p < 0.01, **p < 0.05, and * p < 0.1.
Note B. The crowding rate is corrected for suicides.

probit specification of the model for suicides using, respectively, levels and standardization by the number of inmates hosted in each prison, each year.[33]

In the exercise of Column (a), we construct a dummy variable for suicides that equals 1 when one or more suicides have been reported in the institute during the year, and zero otherwise. The yearly number of observations equal to zero for the *dummy suicides* is reported at the bottom of Table 12. We regress the *suicide dummy variable* on the same independent variables considered in Column (d) of Table 6. For the sake of comparability, we do not report coefficients, but the marginal effect of each explanatory variable on the probability of observing suicide. For most of the variables, the level of significance, the sign, and to a large extent also the size, correspond to those reported in Column (d) of Table 6. The only exception is represented by the effect of the dummy variable *detention house*, which remains positive but now is significant at the 10% level. Column (c) in Table 12 reports the results of the probit specification using standardized variables. Both the dependent and independent variables are normalized by the number of inmates hosted in each prison, each year. As a result, these variables are now measured in terms of unit per 100 inmates. The controls of places available enter in level. Again, marginal effects are reported. Results are comparable to those in Column (a) of Table 12 in terms of significance, sign and size, with the exception of personnel per inmate and prisoner's restraint acts, which lose significance in the standardized model.

Finally, in Column (b) of Table 12, we apply again the linear specification of the model reported in Column (d) of Table 6 by standardizing the variables by the number of inmates hosted in each prison, each year.[34] The results are confirmed, with the following exceptions. The number of *places available* (as one would expect) and the number of *inmates per room* are no longer significant compared to the results in Column (d) of Table 6 and Column (a) of Table 10. The *restraint acts* are no longer significant, but other policing measures, namely *isolation measures* and *procedures of infraction* become significant with the same sign found in Column (d) of Table 6.

Third, there is an issue related to the assumption of linear relation between self-inflicted critical events and regressors. However, some regressors may affect critical events in a nonlinear way. For example, one may expect diminishing returns in reducing prison

---

[33] For the other self-inflicted critical events, the proportion of zero events observed is much lower than for suicides (78.19%): 23.23 for attempted suicides, 10.99% for self-harm acts, and 6.38% for hunger strikes. Probit estimates for the other outcome variables are available from the authors upon request.
[34] This exercise has been also applied to the other dependent variables considered in our analysis, namely attempted suicides, self-harm acts and hunger strikes. Results are available from the authors upon request.

Table 10
Seemingly unrelated regression model.[A]

VARIABLES	(a) Suicides	(b) Attempted suicides	(c) Self-harm acts	(d) Hunger strikes
Detention house (CC)	0.0622	2.7388***	4.7172	5.1708*
	(0.041)	(0.550)	(3.585)	(2.690)
Places available	0.0006***	0.0092***	0.0480***	0.0833***
	(0.000)	(0.001)	(0.008)	(0.006)
Crimes in prison	0.0012***	0.0359***	0.3388***	0.0985***
	(0.000)	(0.002)	(0.012)	(0.009)
Crowding rate[B]	0.1653***	0.7413	23.1316***	15.2984***
	(0.051)	(0.680)	(4.432)	(3.326)
Personnel per inmate	−0.0005	−0.0222***	−0.0836*	−0.0252
	(0.001)	(0.007)	(0.047)	(0.036)
Inmates per room	−0.0377**	−0.9899***	−3.9481***	−4.4884***
	(0.019)	(0.2553)	(1.6636)	(1.2485)
Prisoners' restraint acts	−0.0015**	−0.0276***	−0.3934**	−0.0728
	(0.001)	(0.01)	(0.065)	(0.049)
Isolation measures	0.0004	−0.0555***	−0.1310**	−0.0478
	(0.001)	(0.009)	(0.061)	(0.046)
Procedures of infraction	−0.0002	0.0130***	0.0852***	0.0413***
	(0.000)	(0.002)	(0.014)	(0.011)
Rehabilitation activities	0.0485	0.8115	−6.4874**	13.6971***
	(0.038)	(0.509)	(3.313)	(2.486)
Year fixed effects	YES	YES	YES	YES
Constant	−0.2272***	−1.0054	−18.1032***	6.0768
	(0.079)	(1.050)	(6.841)	(5.135)
Observations	1092	1092	1092	1092
R-squared	0.24	0.56	0.68	0.54
Wald chi squared (p value)	354.18 (0.000)	1393.58 (0.000)	2314.34 (0.000)	1268.59 (0.000)
Breusch-Pagan test	472.789			
(p value)	(0.000)			

Note A. ***p < 0.01, **p < 0.05, and * p < 0.1.
Note B. The crowding rate is corrected for suicides.

overcrowding and reducing crime in prison.[35] Therefore, we explicitly tested for the possibility of nonlinear effects by including the square of the mentioned variables into Equation (1). We did not find any significant effect for any outcome variable. Furthermore, we experimented with interaction terms among the relevant regressors, which resulted to be nonsignificant in numerous cases. The crowding rate was interacted both with the number of inmates per room to capture protective effects of cell sharing and with personnel per inmate to capture the effects of stressed-out prison staff. Crimes in prison was interacted with personnel per inmate to capture the potential crime-reducing effects of increased security in prison associated with higher staff density. No interaction term was statistically significant for suicides. The interaction term between crowding rate and inmates per room was significant for attempted suicides, but it entered with the same negative sign as inmates per room that, in turn, became nonsignificant. Regarding self-harm acts, the interaction terms of crowding rate and personnel per inmate were negatively statistically significant, but making personnel per inmate and crowding, respectively, nonsignificant. Hunger strikes were negatively correlated with the interaction of crowding and personnel per inmate, suggesting the possibility that increasing staff in an overcrowded prison may offset the positive impact of crowding on hunger strikes. Finally, when considering crimes in prison interacted with personnel per inmate, no effect was detected for suicides. Other critical events were significantly affected with a negative sign by this interaction term, but the size of the estimated parameters was always close to zero. The details of these analyses are available from the authors upon request.

Fourth, because we did not have access to information on the personal characteristics of the individual inmates jailed in each prison—we lack this information even aggregately at the prison level—we may have run into a problem of omitted variables and/or simultaneous causality, leading to biased estimates. For instance, we corrected for the simultaneous causality of overcrowding and suicides (if everybody suicides, overcrowding disappears), but we did not have information on the composition of prison population by nationality. Suppose that individuals of certain foreign nationalities are at higher risk of suicide because they come from war zones and that their national enclaves are concentrated in specific Italian cities,[36] whose (potential) criminals converge in overcrowded prisons. For the same percentage of arrests by the nation of origin, our analysis would overestimate the effect of overcrowding on suicides and suicide attempts. Notably, we do not even have evidence that overcrowded prisons host a larger share of suicide-prone foreign nationals. However, to partially control for this potential source of bias, we used available data on the composition of the inmate population between national and foreign citizens in each prison as well as the share of foreign citizens entering each prison, each year.

---

[35] We thank Daniel Schiffman for suggesting us this hypothesis.

[36] We have no data to support this hypothesis. In fact, Italian authorities tend to follow the European principle of allocating asylum seekers (mainly from war zones; see Zimmerman and Stutzer, 2022 for Switzerland) proportionally across local jurisdictions.

Table 11
Robustness check for under-reporting of the number of suicides. Panel random effects.[A]

VARIABLES	(a)	(b)	(c)
	Suicides *plus* deaths to be ascertained	Suicides *plus* natural deaths	Suicides *plus* deaths to be ascertained *plus* natural deaths
Detention house (CC)	0.0659	0.0653	0.0859
	(0.051)	(0.051)	(0.133)
Places available	0.0007***	0.0007***	0.0026***
	(0.000)	(0.000)	(0.000)
Crimes in prison	0.0013***	0.0013***	0.0021***
	(0.000)	(0.000)	(0.001)
Crowding rate [B]	0.1758***	0.1806***	0.2542***
	(0.057)	(0.057)	(0.091)
Personnel per inmate	−0.0007***	−0.0007***	−0.0022**
	(0.000)	(0.000)	(0.001)
Inmates per room	−0.0382*	−0.0388*	−0.0295
	(0.020)	(0.020)	(0.037)
Prisoners' restraint acts	0.0001	0.0001	−0.0026
	(0.001)	(0.001)	(0.002)
Isolation measures	0.0003	0.0003	0.0082*
	(0.002)	(0.002)	(0.004)
Procedures of infraction	−0.0001	−0.0001	−0.0007
	(0.000)	(0.000)	(0.001)
Rehabilitation activities	0.0251	0.0257	−0.0260
	(0.056)	(0.056)	(0.105)
Constant	−0.2180***	−0.2222***	−0.6264***
	(0.082)	(0.082)	(0.163)
Year fixed effects	YES	YES	YES
Observations	1092	1092	1092
Number of institutes	186	186	186
Overall R-squared	0.2581	0.2584	0.4899
Wald chi squared	271.77	272.1	302.88
(p value)	0.00	0.00	0.00

Note A. Robust standard errors adjusted for clusters in institute are presented in parentheses.
***$p < 0.01$, **$p < 0.05$, and * $p < 0.1$.
Note B. The crowding rate is corrected for suicides and for the number of deaths considered in each column.

These variables were not statistically significant.[37] Other potential sources of omitted-variable bias can be found in the missed information at the prison level on the share of inmates committing violent crimes or under psychiatric treatment and even on the composition by the gender, nationality, and age of those inmates who have already committed self-inflicted critical events. However, we were not granted access to this information.

Finally, we argued that rehabilitation constitutes a fundamental prison function and the presence of rehabilitation activities may help improve living conditions and prison climate. However, the proxy variable that we used may not appropriately measure the extent of rehabilitation activities. Therefore, not knowing either the number of prisons actually engaged in rehabilitation activities or the number of prisoners involved, our analysis may be unable to identify the real effects of rehabilitation on self-inflicted critical events.

7. Conclusions

This study aimed to assess the ethics of prison policies by analyzing the relation between suicides and other self-inflicted critical events in Italian prisons —taken as indicators of human rights compliance— and the characteristics of the Italian prison system. We used the universe of administrative data from the 188 institutes that comprise the national prison system from 2016 to 2021.

What emerges from our study is a conflict between two important needs. First, prison has both a deterrent and incapacitating role for criminals. Second, prison must serve a rehabilitative function coupled with the need to protect physically and emotionally weak people without depriving them of their individual rights, especially the right to one's dignity and the right to physical and mental integrity. This is particularly important for individuals who do not have control over their own space, movement and time.

The study focused on three sets of explanatory variables. The first set of variables included general or structural features of the institutes. The second set included prison-specific environmental factors that could impact the prison climate, but which are not entirely within the control of prison authorities. The third set captured factors more directly associated with prison policies.

The primary findings of the empirical analysis are the following.

Prisoners' criminal acts, which signal a violent and degraded environment in prisons, are associated with an increase in the number of self-inflicted critical events. These effects occur consistently across all model specifications. Furthermore, in part due to some limitations associated with the proxy used, we find an ambiguous effect of the possibility of rehabilitation structurally offered by the

---

[37] This analysis was part of the general-to-specific exercise as well as of a separate test. The results are available from the authors upon request.

Table 12
Robustness check on the model's specification for suicides.[A]

VARIABLES	Absolute values	Values standardized by the nr. Of inmates	
	(a) Probit model°	(b) Linear model	(c) Probit model°
Detention house (CC)	0.0717*	0.0132	0.0857**
	(0.039)	(0.025)	(0.035)
Places available	0.0004***	−0.0000	0.0004***
	(0.000)	(0.000)	(0.000)
Crimes in prison	0.0004***	0.0009***	0.0006**
	(0.000)	(0.000)	(0.000)
Crowding rate[B]	0.141***	0.0869**	0.1639***
	(0.038)	(0.036)	(0.043)
Personnel per inmate	−0.0004***	−0.0088**	−0.0512
	(0.000)	(0.004)	(0.063)
Inmates per room	−0.0381**	−0.0155	−0.0371**
	(0.017)	(0.010)	(0.018)
Prisoners' restraint acts	−0.0008***	−0.0028	−0.0026
	(0.000)	(0.002)	(0.003)
Isolation measures	0.0001	0.0058***	−0.0002
	(0.000)	(0.001)	(0.002)
Procedures of infraction	−0.0001	−0.0011***	−0.0003
	(0.000)	(0.000)	(0.001)
Rehabilitation activities	0.037	0.0027	0.0348
	(0.032)	(0.020)	(0.030)
Constant	−2.272**	−0.0270	−2.3742***
	(0.029)	(0.042)	(0.397)
Year fixed effects	YES	YES	YES
Observations	1092	1092	1092

Number of zero suicides per institute					
Year	2016	2017	2018	2019	2020	2021
Level (% per institute)	157 (83.51)	154 (81.91)	144 (76.60)	149 (79.26)	139 (73.94)	147 (78.19)

Note A. Robust standard errors adjusted for clusters in institute are presented in parentheses.
***p < 0.01, **p < 0.05, and * p < 0.1.
Note B. The crowding rate is corrected for suicides.

Italian prisons on some critical events (a significant positive relation with hunger strikes and a significant negative relation with self-harm acts). The effect of rehabilitation potentials on suicides or suicide attempts is nonsignificant. Prisoner restraint acts and disciplinary isolation measures, which are discretionary and highly invasive actions taken by prison authorities to discipline inmates, are always significant (jointly or individually), but for hunger strikes. Acts of restraint reduce the number of suicides, attempted suicides, and self-harm acts, while isolation measures lower the incidence of attempted suicides and self-harm acts. This may occur, for example, because prison authorities may force inmates to remain in solitary confinement in secure cells under close monitoring, often resorting to pharmacological interventions. Hence, these measures can be considered examples of repressive but effective "death/critical event-avoiding strategies" adopted by prison management.[38] Finally, a reduction in prison overcrowding contributes to curbing self-inflicted critical events.

Our analysis suggests that policymakers may perceive a trade-off between reducing prison crowding and increasing disciplinary measures to lessen self-inflicted critical events, and more specifically suicides.

Are these alternative policies equally feasible?

Regarding the crowding rate, the first answer would be positive, although very demanding/costly and feasible in the long term only: simply build new prisons.[39] Nevertheless, if one considers the last available data contained in the recent report to the Italian Parliament by the Guarantor of the Rights of Persons Deprived of Liberty,[40] there is a second possibility. It is also quite demanding, but it is easier to implement in the short term and maybe less expensive for taxpayers. As of June 2022, there were 54,786 people registered in Italian prisons (corresponding to 53,793 people actually present), 38,897 of whom were serving their sentence, whereas the others (approximately 28% of the total) were lacking a final sentence. As many as 1319 people were in prison for the execution of sentences of less than one year, and an additional 2473 people were serving sentences of one to two years. Hence, part of the required reduction in the prison crowding to curb suicides could be "simply" achieved by commuting prison time for some of these prisoners into electronic

---

[38] In this respect, an aspect that deserves future investigation is related to the paucity of psychological and psychiatric support in detention facilities for self-inflicted critical events (see National Guarantor, 2022: 8–9, for a discussion). In 2017, the Italian Parliament voted a delegated law reforming the penitentiary system (Law n. 103/2017). The delegated law included a request of enhancing psychiatric care in prison. However, the (Conte I) government with the Decree Law n. 123/2018 declined to implement this policy.

[39] Historically, Italy has extremely low prison expenditure among developed countries. (see Bethencourt, 2022, Fig. 2.3).

[40] https://www.garantenazionaleprivatiliberta.it/gnpl/pages/it/homepage/pub_rel_par/.

monitoring or probation. Moreover, this decision would not require the introduction of new legislation but a discretionary choice by part of the judiciary. In fact, the Italian penitentiary law establishes that, within four years of conviction time, a convicted person can benefit potentially of out-of-prison execution of a final sentence.[41] The decision, however, rests with the judiciary (and particularly supervisory courts), which makes the exercise of this benefit conditional on prediction by courts of successful probation time for the prisoner being released. In addition, Italy's pretrial detention is excessive and leads to long wait times before final sentencing, compared with other European countries (see Aebi et al., 2022, Tables 8 and 31).[42] In several cases, the judiciary could apply alternative measures, such as home arrest and the requirement to report on a periodic basis to the police (Marietti, 2015). In fact, Italian prisons often present themselves as a place of a long "waiting time" that elapses between what has been committed and the path, including sanctions, that consequently must be taken. And this impacts the rehabilitation function of penal execution as well: a sentence executed after numerous years ends up taking on a completely different appearance from the one that would have it oriented toward re-education and reintegration.[43]

Therefore, there is a significant risk that public authorities will prioritize policies that violate the human rights of prisoners over those that aim to improve prison conditions: adopting more acts of restraint remains an easier policy to implement in the short term. Nonetheless, the reluctance of politicians to tackle prison overcrowding perpetuating the imprisonment of individuals serving short sentences, given the overcrowding level, may hide deeper problems of the criminal law system in Italy or of inadequacy of the political class.[44] Whatever the case, in this context, the constitutional purpose of punishment aimed at social reintegration becomes empty.

> "In order that punishment should not be an act of violence perpetrated by one or many upon a private citizen, it is essential that it should be public, prompt, necessary, the least of the possible under the given circumstances, proportionate to the crimes, dictated by the laws."

> (Cesare Beccaria, 1764/2012, p.149)

Declaration of competing interest

Data availability

Data will be made available on request.

Acknowledgments

Appendix

The summary and statistics of the main data of our dataset are presented in Table A1. Mean values for continuous variables are computed over the 188 institutes over the 6-year time span; thus, values are meant per prison per year.

---

[41] See Art. 47 of Law n. 354 of July 26, 1975, and subsequent updates, including several Constitutional Court sentences. More recently, Art 1 of Law n. 199 of November 26, 2010 allows home detention for the execution of residual sentences not exceeding 18 months, with the exclusion of serious crimes and serial offenders.

[42] In 2021, the share of inmates placed on remand custody was 30% in Italy vs. a European median of 21%. The average length of custody was 7.6 months vs. a European median of 4.5 months. Notice that Italian figures include both pretrial inmates and inmates who are waiting for the outcome of their appeal or for the third grade of judgment.

[43] The National Guarantor (2022) has been questioned by cases of sentences involving events that occurred many years ago and involved people who in the meantime had been fully reintegrated into society, without committing any crime and with actions that testified to new awareness.

[44] Moreover, this is reflected in the absence of tools for understanding the possibilities of social regulation, effective legal support, and a support network to avoid execution in prison of short prison sentences.

Table A1
Descriptive statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
General features					
Detention house (dummy)	1128	0.74	0.44	0	1
Correctional facility (dummy)	1128	0.26	0.44	0	1
Urban area (dummy)	1128	0.48	0.50	0	1
Reachability (dummy)	1128	0.89	0.31	0	1
Regular rooms (level)	1128	169.96	165.14	9.00	936.00
Unavailable rooms (level)	1128	11.51	26.76	0.00	201.00
Rooms with hygienic services (percentage)	1121	8.86	2.1	0.00	40.35
Rooms for disabled inmates (level)	1128	2.11	4.00	0.00	26.00
Hygienic services with door (level)	1128	160.48	159.12	0.00	914.00
Rooms with autonomous lightning (level)	1128	124.68	151.49	0.00	936.00
Rooms with electric plugs (level)	1128	105.69	145.69	0.00	936.00
Interview rooms (level)	1128	3.37	2.94	1.00	15.00
Outdoor areas for interview (level)	1128	0.71	0.60	0.00	3.00
Playrooms (level)	1128	0.43	0.53	0.00	2.00
Sports fields (level)	1128	1.05	0.98	0.00	7.00
Theaters (level)	1128	0.70	0.50	0.00	2.00
Labs (level)	1128	1.81	1.90	0.00	14.00
Gyms (level)	1128	1.84	2.21	0.00	15.00
Workshops (level)	1128	0.59	0.97	0.00	5.00
Libraries (level)	1128	1.66	1.26	0.00	8.00
School rooms (level)	1128	6.52	5.46	0.00	29.00
Places of worship (level)	1128	1.52	1.13	0.00	8.00
Canteens (level)	1119	0.28	0.83	0.00	5.00
Prison's population					
Male inmates (level)	1121	292.93	297.16	0.00	2296
Female inmates (level)	1121	13.21	36.24	0.00	399
Total inmates (level)	1121	306.14	305.22	1.34	2296
Foreign inmates (level)	1121	102.85	117.77	0.00	661
Drug addicted inmates (level)	1121	84.21	112.04	0.00	1046
Entries in the year (level)	1121	117.84	204.91	0.00	1783
Drug addicted inmates entered in the year (level)	1121	42.09	94.49	0.00	1097
Foreign inmates entered in the year (level)	1121	49.74	110.61	0.00	1180
Prison's staff					
Planned staff (level)	1092	205.74	183.05	0.00	1250
Staff in force (level)	1092	172.97	157.95	20.00	1252
Staff shortage (level)	1090	−32.73	42.62	−354.00	92
Personnel per inmate (level)	1090	1.823981	29.89	0.27	925.09
Critical events					
Suicides (level)	1128	0.28	0.60	0.00	4
Attempted suicides (level)	1128	6.95	10.42	0.00	95
Self-harm acts (level)	1128	54.37	79.56	0.00	721
Individual hunger strikes (level)	1128	43.05	50.16	0.00	319
Individual and collective hunger strikes (level)	1128	43.36	50.34	0.00	319
Deaths to be ascertained (level)	1128	0.06	0.29	0	5
Natural deaths (level)	1128	0.44	0.98	0	10
Scuffles (level)	1128	40.88	61.27	0.00	675
Injuries (level)	1128	5.80	11.29	0.00	137
Murder attempts (level)	1128	0.02	0.21	0.00	4
Homicides (level)	1128	0.01	0.11	0.00	2
Brawls (level)	1128	0.28	0.73	0.00	8
Threats/insults to prison guards (level)	1128	16.30	32.51	0.00	249
Threats/insults to other inmates (level)	1128	4.24	9.56	0.00	94
Total crimes in prison (level)	1128	114.22	159.87	0.00	1476
Evasions from prison (level)	1128	0.11	2.16	0.00	72
Evasions from reward permit (level)	1128	0.18	0.56	0.00	6
Evasions from necessity permit (level)	1128	0.02	0.24	0.00	6
Evasions from work permit (level)	1128	0.07	0.37	0.00	8
Evasions from semirelease (level)	1128	0.08	0.51	0.00	11
Evasions from internship leave (level)	1128	0.11	0.84	0.00	16
Prison policy					
Acts of restraint of inmates (level)	1128	3.95	22.39	0.00	394
Procedures of infraction for noncompliance (level)	1128	42.78	116.23	0.00	1293
Disciplinary isolation measures (level)	1128	9.92	27.56	0.00	241
Inmates turnover (rate)*	1118	0.15	0.90	−19.57	0.99
Inmates per room (level)	1128	2.12	0.88	0.11	6.87
Crowding rate (rate)	1121	1.237	0.358	0.0012	2.907

(continued on next page)

Table A1 (*continued*)

Variable	Observations	Mean	Std. Dev.	Min	Max
Crowding rate (corrected for suicides) (rate)	1121	1.239	0.358	0.0012	2.907
Rehabilitation activities (dummy)	1121	0.33	0.47	0	1

[*] The turnover rate is computed as the sum of annual admissions into prison and releases from prison, divided by the annual prison population. The turnover rate measures the fluctuation of the prison population. Such fluctuations affect the possibility for inmates to establish stable relationships, which, in turn, might affect the occurrence of critical events (van Ginneken et al., 2017). Higher turnover rates mean larger numbers of admissions and releases relative to the size of the average annual population. Our sample is characterized by an increasing turnover rate starting from 2018. The data are only available starting from 2017, as the number of departures is determined by the difference with respect to the sum of presences of the previous year and the entries during the year.

References

Aebi, M.F., Cocco, E., Molnar, L., Tiago, M.M., 2022. *SPACE I - 2021* – Council of Europe Annual Penal Statistics: Prison Populations. Council of Europe. https://www.coe.int/en/web/prison/space. (Accessed 26 April 2023).

Avery, R.B., 1977. Error components and seemingly unrelated regression. Econometrica 45, 199–209. https://doi.org/10.2307/1913296.

Baltagi, B.H., 2001. Econometric Analysis of Panel Data, second ed. Wiley, New York.

Beccaria, C., 1764/2012. Dei delitti e delle pene,. Castelvecchi, Roma.

Becker, G.S., 1968. Crime and punishment: an economic approach. J. Polit. Econ. 76, 169–217.

Bethencourt, C., 2022. Crime and social expenditure: a political economic approach. Eur. J. Polit. Econ. 75, 102183 https://doi.org/10.1016/j.ejpoleco.2022.102183.

Bhuller, M., Dahl, G.B., Løken, K.V., Mogstad, M., 2020. Incarceration, recidivism, and employment. J. Polit. Econ. 128, 1269–1324. https://doi.org/10.1086/705330.

Blaauw, E., Winkel, F.W., Kerkhof, A.J.F.M., 2001. Bullying and suicidal behavior in jails. Crim. Justice Behav. 28, 279–299. https://doi.org/10.1177/0093854801028003002.

Buffa, P., 2012. Il suicidio in carcere: la categorizzazione del rischio come trappola concettuale ed operativa. Rassegna Penit. Criminol. 1, 7–118. https://www.rassegnapenitenziaria.it/cop/741125.pdf. (Accessed 26 April 2023).

Bukten, A., Riksheim Stavseth, M., 2021. Suicide in prison and after release: a 17 national cohort study. Eur. J. Epidemiol. 36, 1075–1083. https://doi.org/10.1007/s10654-021-00782-0.

Candler, J., Holder, H., Hosali, S., Payne, A.N., Tsang, T., Vizard, P., 2011. Human rights measurement framework: prototype panels, indicator set and evidence base. Equality and Human Rights Commission Research report 81. https://www.equalityhumanrights.com/sites/default/files/research-report-81-human-rights-measurement-framework.pdf. (Accessed 26 April 2023).

Cardano, M., Algostino, A., Caredda, M., Gariglio, L., Pardini, C., 2020. La contenzione del paziente psichiatrico. Un'indagine sociologica e giuridica. Il Mulino, Bologna.

Castelpietra, G., Egidi, L., Caneva, M., Gambino, S., Feresin, T., Mariotto, M., Balestrieri, M., De Leo, D., Marzano, L., 2018. Suicide and suicides attempts in Italian prison epidemiological findings from the "Triveneto" area, 2010–2016. Int. J. Law Psychiatr. 61, 6–12. https://doi.org/10.1016/j.ijlp.2018.09.005.

Chen, M.K., Shapiro, J.M., 2007. Do harsher prison conditions reduce recidivism? A discontinuity-based approach. Am. Law Econ. Rev. 9, 1–29. https://doi.org/10.1093/aler/ahm006.

Chen, J., Choi, Y.J., Mori, K., Sawada, J., Sugano, S., 2012. Socio-economic studies on suicide: a survey. J. Econ. Surv. 26, 271–306. https://doi.org/10.1111/j.1467-6419.2010.00645.x.

Cinosi, E., Martinotti, G., De Risio, L., Di Giannantonio, M., 2013. Suicide in prisoners: an Italian contribution. Open Criminol. J. 6, 18–29. https://doi.org/10.2174/1874917801306010018.

Cliquennois, G., Snacken, S., van Zyl Smit, D., 2022. The European human rights system and the right to life seen through suicide prevention in places of detention: between risk management and punishment. Hum. Right Law Rev. 22, 1–28. https://doi.org/10.1093/hrlr/ngab023.

European Prison Rules, 2006. Council of Europe. https://rm.coe.int/european-prison-rules-978-92-871-5982-3/16806ab9ae. (Accessed 26 April 2023).

Cox, V., Paulus, P., McCain, G., 1984. Prison crowding research: the relevance for prison housing standards and a general approach regarding crowding phenomena. Am. Psychol. 39, 1148–1160. https://doi.org/10.1037/0003-066X.39.10.1148.

Daems, T., Robert, L., 2017. Europe in Prisons. Palgrave Macmillan, London.

Di Tella, R., Schargrodsky, E., 2013. Criminal recidivism after prison and electronic monitoring. J. Polit. Econ. 121, 28–73. https://doi.org/10.1086/669786.

Dolcini, E., 2012. Carcere, surrogati del carcere, diritti fondamentali. Ricordando Vittorio Grevi. Riv it dir e proc pen. 55, 33–49.

Dow, W.H., Godøy, A., Lowenstein, C., Reich, M., 2020. Can labor market policies reduce deaths of despair? J. Health Econ. 74, 102372 https://doi.org/10.1016/j.jhealeco.2020.102372.

Drago, F., Galbiati, R., Vertova, P., 2009. The deterrent effects of prison: evidence from a natural experiment. J. Polit. Econ. 117, 257–280. https://doi.org/10.1086/599286.

Drago, F., Galbiati, R., Vertova, P., 2011. Prison conditions and recidivism. Am. Law Econ. Rev. 13, 103–130. https://doi.org/10.1093/aler/ahq024.

Duthe, G., Hazard, A., Kensey, A., Shon, J.L., 2013. Suicide among male prisoners in France: a prospective population-based study. Forensic Sci. Int. 233, 273–277. https://doi.org/10.1016/j.forsciint.2013.09.014.

Dye, M.H., 2010. Deprivation, importation, and prison suicide: combined effects of institutional conditions and inmate composition. J. Crim. Justice 38, 796–806. https://doi.org/10.1016/j.jcrimjus.2010.05.007.

Guide on the Case-Law of the European Convention on Human Rights, 2022. ECHR. Prisoners' rights. https://www.echr.coe.int/Documents/Guide_Prisoners_rights_ENG.pdf. (Accessed 26 April 2023).

Favril, L., 2021. Epidemiology, risk factors, and prevention of suicidal thoughts and behaviour in prisons: a literature review. Psychol. Belg. 61, 341–355. https://doi.org/10.5334/pb.1072.

Favril, L., Rongqin, Y., Hawton, K., Fazel, S., 2020. Risk factors for self-harm in prison: a systematic review and meta-analysis. Lancet Psychiatr. 7, 682–691. https://doi.org/10.1016/S2215-0366(20)30190-5.

Fazel, S., Ramesh, T., Hawton, K., 2017. Suicide in prisons: an international study of prevalence and contributory factors. Lancet Pshychiat 4, 946–952. https://doi.org/10.1016/S2215-0366(17)30430-3.

Fiandaca, G., 1991. Il 3 comma dell'art. 27. In: Branca, G., Pizzorusso, A. (Eds.), Commentario Della Costituzione. Zanichelli, Bologna, p. 223 (and ff).

Frottier, P., König, F., Matschnig, T., Seyringer, M.-E., Frühwald, S., 2007. Suicide prevention in correctional institutions: the significance of solitary cell accommodation. Int. J. Prison. Health 3, 225–232. https://doi.org/10.1080/17449200701520206.

Guarantor, National, 2022. Relazione del *Garante nazionale dei diritti delle persone private della libertà personale* al Parlamento, 21 giugno 2022. https://www.garantenazionaleprivatiliberta.it/gnpl/pages/it/homepage/pub_rel_par/. (Accessed 26 April 2023).

Harris, T., 2015. Changing Prisons, Saving Lives: Report of the Independent Review into Self-Inflicted Deaths in Custody of 18–24 Year Olds (The Harris Review). Her Majesty's Stationery Office, London. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/439859/moj-harris-review-web-accessible.pdf. (Accessed 26 April 2023).

Hendry, D.F., 1983. Econometric modelling: the 'consumption function' in retrospect. Scot. J. Polit. Econ. 30, 193–220. https://doi.org/10.1111/sjpe.12021.

Hoover, K.D., Perez, S.J., 1999. Reply to our discussants. Econom. J. 2, 244–247. https://doi.org/10.1111/1368-423X.00031.

Huey, M.P., McNulty, L.T., 2005. Institutional conditions and prison suicide: conditional effects of deprivation and overcrowding. Prison J. 85, 490–514. https://doi.org/10.1177/0032885505282258.

Leese, M., Thomas, S., Snow, L., 2006. An ecological study of factors associated with rates of self-inflicted death in prisons in England and Wales. Int. J. Law Psychiatr. 29, 355360 https://doi.org/10.1016/j.ijlp.2005.10.004.

Levitt, S.D., 2004. Understanding why crime fell in the 1990s: four factors that explain the decline and six that do not. J. Econ. Perspect. 18, 163–190. https://doi.org/10.1257/089533004773563485.

Liebling, A., 2004. Prison and Their Moral Performance: A Study of Values, Quality and Prison Life. Oxford University Press, Oxford.

Liebling, A., 2011. Moral performance, inhuman and degrading treatment and prison pain. Punishm. Soc. 13, 530–550. https://doi.org/10.1177/1462474511422159.

Liebling, A., Durie, L., Stiles, A., Tait, S., 2005. Revisiting prison suicide: the role of fairness and distress. In: Liebling, A., Maruna, S. (Eds.), The Effects of Imprisonment. Willan Publishing, Cullompton, pp. 209–231.

Manconi, L., Boraschi, A., 2006. 'Quando hanno aperto la cella era già tardi perché…'. Suicidio e autolesionismo in carcere, 2002-2004 Rivista Italiana di Sociologia 117–148. https://doi.org/10.1423/21761. XLVII.

Marietti, S., 2015. Alternatives to Prison in Europe: Italy. European Prison Observatory. Antigone NGO. http://www.prisonobservatory.org/alternatives/ALTERNATIVES%20TO%20PRISON%20IN%20EUROPE.%20ITALY.pdf. (Accessed 26 April 2023).

Marzano, L., Hawton, K., Rivlin, A., Smith, E.M., Piper, M., Fazel, S., 2016. Prevention of suicidal behavior in prisons: an overview of initiatives based on a systematic review of research on near-lethal attempts. Crisis 37, 323–334. https://doi.org/10.1027/0227-5910/a000394.

Mastrobuoni, G., Terlizzese, D., 2022. Leave the door open? Prison conditions and recidivism. Am. Econ. J. Appl. Econ. 14, 200–233. https://doi.org/10.1257/app.20190038.

Murphy, T., Whitty, N., 2015. Prison suicide: a role for human rights indicators? Prison Serv. J. 222, 29–34. https://doi.org/10.1186/s40352-018-0075-4.

Phillips, J.A., Nugent, C.N., 2014. Suicide and the Great Recession of 2007–2009: the role of economic factors in the 50 states. Soc. Sci. Med. 116, 22–31. https://doi.org/10.1016/j.socscimed.2014.06.015.

Preti, A., Cascio, M.T., 2006. Prison suicides and self-harming behaviours in Italy, 1990-2002. Med. Sci. Law 46, 127–134. https://doi.org/10.1258/rsmmsl.46.2.127.

Radeloff, D., ten Hövel, M., Brennecke, G., Stoeber, F.S., Lempp, T., Kettner, M., Zacher, H., von Klitzing, K., Bennefeld-Kersten, K., 2021. Suicide after reception into prison: a case control study examining differences in early and late events. PLoS One 16, e0255284. https://doi.org/10.1371/journal.pone.0255284.

Reeves, A., Stuckler, D., McKee, M., Gunnell, D., Chang, S.-S., Basu, S., 2012. Increase in state suicides in the USA during economic recession. Lancet 380, 1813–1814. https://doi.org/10.1016/S0140-6736(12)61910-2.

Rogan, M., 2018. Human rights approaches to suicide in prison: implication for policy, practice and research. Health Justice 6, 1–11. https://doi.org/10.1186/s40352-018-0075-4.

Roodman, D., 2017. The Impacts of Incarceration on Crime. Open Philanthropy Project, San Francisco, CA. Technical report. https://www.openphilanthropy.org/files/Focus_Areas/Criminal_Justice_Reform/The_impacts_of_incarceration_on_crime_10.pdf. (Accessed 26 April 2023).

Stephenson, T., Leaman, J., O'Moore, E., Tran, A., Plugge, E., 2021. Time out of cell and time in purposeful activity and adverse mental health outcomes amongst people in prison: a literature review. Int. J. Prison. Health 17, 54–68. https://doi.org/10.1108/IJPH-06-2020-0037.

Taggi, F., Tatarelli, R., Polidori, G., Mancinelli, I., 1998. Il suicidio nelle carceri in Italia: uno studio epidemiologico (1996-1997). Rassegna Penit. Criminol. 1, 197–214. http://www.rassegnapenitenziaria.it/cop/24848.pdf. (Accessed 26 April 2023).

Tatarelli, R., Mancinelli, I., Taggi, F., Polidori, G., 1999. Prison suicides in Italy in 1996-1997. Eur. Psychiatr. 14, 109–110. https://doi.org/10.1016/S0924-9338(99)80727-5.

Tobon, S., 2022. Do better prisons reduce recidivism? Evidence from a prison construction program. Rev. Econ. Stat. 104, 1256–1272. https://doi.org/10.1162/rest_a_01007.

United Nations, 2015. Standard Minimum Rules for the Treatment of Prisoners (The Nelson Mandela Rules). https://www.unodc.org/documents/justice-and-prison-reform/GA-RESOLUTION/E_ebook.pdf. (Accessed 26 April 2023).

van Ginneken, E.F.J.C., Sutherland, A., Molleman, T., 2017. An ecological analysis of prison overcrowding and suicide rates in England and Wales, 2000–2014. Int. J. Law Psychiatr. 50, 76–82. https://doi.org/10.1016/j.ijlp.2016.05.005.

Vassalli, G., 1983. Il dibattito sulla rieducazione. Rassegna Penit. Criminol. 4, 437–482. http://www.rassegnapenitenziaria.it/cop/47168.pdf. (Accessed 26 April 2023).

Western, B., 2021. Inside the box: safety, health and isolation in prison. J. Econ. Perspect. 35, 97–122. https://doi.org/10.1257/jep.35.4.97.

World Health Organization, 2007. Preventing Suicide in Jails and Prisons. WHO, Geneva. https://apps.who.int/iris/handle/10665/43678. (Accessed 26 April 2023).

Zellner, A., 1962. An efficient method of estimating seemingly unrelated regressions and tests of aggregation bias. J. Am. Stat. Assoc. 57, 348–368. https://doi.org/10.2307/2281644.

Zhong, S., Senior, M., Yu, R., Perry, A., Hawton, K., Shaw, J., Fazel, S., 2021. Risk factors for suicide in prisons: a systematic review and meta analysis. Lancet Public Health 6, e164–e174.

Zimmerman, S., Stutzer, A., 2022. The consequences of hosting asylum seekers for citizens' policy preferences. Eur. J. Polit. Econ. 73, 102130 https://doi.org/10.1016/j.ejpoleco.2021.102130.