

Impact of the COVID-19 epidemic on mortality in prisons

Alexandra Sánchez (<https://orcid.org/0000-0001-5617-1173>)¹
 Celina Roma Sánchez de Toledo (<https://orcid.org/0000-0003-1121-8411>)²
 Cláudia de Brito (<https://orcid.org/0000-0002-7982-6918>)³
 Eliane de Lima Pereira (<https://orcid.org/0009-0004-1735-5972>)⁴
 Thiago Amorim Tostes (<https://orcid.org/0009-0006-4169-5410>)⁴
 Luiz Antônio Bastos Camacho (<https://orcid.org/0000-0003-4656-1914>)⁵
 Bernard Larouzé (<https://orcid.org/0000-0001-9906-6293>)²

Abstract *Purpose: to assess the impact of COVID-19 on the mortality of people deprived of their liberty (PDL) in the state of Rio de Janeiro and compare the rates observed with those of the general population. Method: quantitative, retrospective study combining the analysis of the 2016-2021 time series of annual mortality rates, cross-sectional study comparing 2016-2017 vs. 2020-2021 and analysis of individual data obtained from primary and secondary sources of information. The standardized mortality ratio between PDL and the general population was estimated for the cause of death categories. Results: historical series showed an annual drop (13%) in mortality from 2016 to 2019, a trend that was inverted in 2020 due to COVID-19, which was responsible for 20% of all deaths. Of the COVID-19 deaths, 54.8% were elderly and/or had co-morbidities. Mortality from COVID-19 was similar between PDL and the general population, but mortality from tuberculosis and HIV remained much higher among PDL. Conclusion: the pandemic was probably a determinant of the downward trend reversal in mortality between 2016 and 2019. Using mortality as an indicator of health and human rights in prisons by health, justice and civil society organizations implies the improvement of information about PDL in the SIM.*

Key words *Prison, COVID-19, Mortality, Co-morbidity, Tuberculosis*

¹ Grupo de Pesquisa “Saúde nas prisões”, Departamento de Endemias Samuel Pessoa, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz. Av. Brasil 4036, sala 914, Manguinhos. 21041-361 Rio de Janeiro RJ Brasil. alexandra.sanchez@fiocruz.br

² Grupo de Pesquisa “Saúde nas prisões”, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz. Rio de Janeiro RJ Brasil.

³ Departamento de Administração e Planejamento, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz. Rio de Janeiro RJ Brasil.

⁴ Ministério Público do Rio de Janeiro. Rio de Janeiro RJ Brasil.

⁵ Grupo de Pesquisa “Saúde nas prisões”, Departamento de Epidemiologia e Métodos Quantitativos em Saúde, Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz. Rio de Janeiro RJ Brasil.

Introduction

Although in Brazilian prisons the conditions of incarceration and the deficiencies of health services result in high morbidity, the subject of a number of papers¹⁻³, mortality, a fundamental indicator of access to health and human rights, has hardly been investigated^{4,5}.

Research carried out in 2016-2017 by our research group⁵ at the National School of Public Health (ENSP), Fiocruz, in collaboration with the Rio de Janeiro Prosecutor's Office (MPRJ), revealed a disturbing situation. Mortality was higher in prisons in the state of Rio de Janeiro (ERJ) when compared to the general population, with an excess of deaths from infectious diseases, especially tuberculosis and HIV infection. Most of these deaths were deemed avoidable, highlighting the technical and organizational limitations of the prison health system.

In this regard, since the start of the COVID-19 pandemic, the expectation of widespread dissemination of SARS-CoV-2 in prisons, whether in high⁶, low⁷ or middle-income countries such as Brazil^{8,9}, has become a major public health concern. A survey carried out in Brasília's prisons found a lower transmission interval for COVID-19 than that estimated for Brazil as a whole. This result corroborates the idea of faster viral spread in the overcrowded and confined environment of prisons¹⁰.

The precarious conditions of incarceration of the approximately 52,000 people deprived of their liberty (PDL) in the state of Rio de Janeiro are common to the majority of Brazilian prisons. Prisons faced the pandemic with a fragile prison health system, limited availability of masks and tests for diagnosis, limited access to water, the impossible social distancing in overcrowded and poorly ventilated collective cells¹¹, delayed vaccinations and a policy of discharging prisoners that was not far-reaching¹².

The official data on COVID-19 deaths in Brazil's prisons, available on the National Prison Department's (DEPEN) COVID-19 Case Monitoring Panel¹³, was based on the compilation of data sent by the state prison administrations. This data is often underestimated since it is limited to deaths confirmed by RT-PCR or rapid antigen testing, which has been very unevenly available throughout the pandemic among the country's prisons, and even less accessible for PDLs than for the general population. The DEPEN Monitoring Panel reported a total of 293 deaths by COVID-19 in prisons across the country and 25

deaths in the state of Rio de Janeiro's prisons in the period from March 2020 to 17/10/2022, the latest update¹³, which suggested substantial underreporting. The limitation of the information available on deaths involving PDL in official databases and statistics, with the need to go back to primary data, had been reported by Sánchez *et al.*⁵.

In this sense, the invisibility of fatalities during incarceration in the Mortality Information System (SIM) makes it extremely difficult to analyze mortality and its causes in the population deprived of liberty⁵. Another factor that contributed to increasing the difficulty in identifying PDL deaths and their causes during the pandemic was the change in the handling of corpses, following the publication of an Ordinance by the National Council of Justice (CNJ) on April 28, 2020¹⁴ and, in the state of Rio de Janeiro, the SEPOL/SEAP/RJ Joint Resolution (Secretariat of Police/Secretary of State for Penitentiary Administration of Rio de Janeiro) dated March 23, 2020¹⁵, which authorized the issuance of death certificates by any health service. The identification of deceased PDL and the necropsy by the Institute of Forensic Medicine (IML) were no longer mandatory. While the former was quickly repealed after strong opposition from human rights organizations, the latter remained in force until March 2022.

Given the inaccuracy of official data on the number and causes of deaths in prisons in the SIM and DEPEN's COVID-19 Panel, and the importance of estimating the impact of the COVID-19 pandemic on PDL mortality, we have extended the study carried out at ENSP/FI-OCRUZ in 2016-2017 on the subject until 2021⁵.

The purpose of this study is to assess the impact of COVID-19 on the mortality of people deprived of their liberty (PDL) in the state of Rio de Janeiro and to compare the rates observed with those of the general population.

We thus seek to support the discussion on strategies for adapting healthcare monitoring, and diseases prevention to prison system peculiarities and to contribute to the implementation of the National Policy for Comprehensive Healthcare for People Deprived of Liberty in the Prison System (PNAISP)¹⁶

Population and methods

This is a quantitative, retrospective survey that combines a component based on the analysis of aggregate data (historical series) and a

cross-sectional study with the collection and analysis of individualized data, including all the deaths of people detained in the Rio de Janeiro State Prison System between 1/1/2016 and 12/31/2021, whether they occurred in the prisons themselves, in prison health units or in off-site health services. The causes of death in 2018 and 2019 were not studied due to the inaccessibility to the health records and medical records needed to ascertain causes of death, as was the case for previous years. The PDL data, including gender and age distribution, was obtained from the Rio de Janeiro State Secretariat for Prison Administration (SEAP). To calculate the annual crude mortality rate, the incarcerated population in June of each year was used as the denominator. The time series of annual all-cause mortality rates from 2016 to 2021 was constructed and the trend calculated using linear regression.

In March 2020, state prisons in the state of Rio de Janeiro housed around 52,000 PDL aged 18 or over, of whom 50,232 were men (96.4%) and 1,868 women (3.6%), 35.7% (18,595/52,100) were awaiting trial. They were distributed in 47 overcrowded prison units (average occupancy rate of 178%, reaching 293% in some prisons)¹⁷, with cells housing up to 150 PDL and limited access to water. Of the total number of PDL, around 760 (1.5%) were > 60 years old¹⁸. The health structure consisted of an outpatient clinic in each prison unit that only relied on nursing technicians, an emergency room and a tuberculosis hospital. The most serious cases were transferred to nearby public hospitals.

To evaluate crude mortality and mortality by cause group in 2020 and 2021, in the midst of the COVID-19 epidemic, the deaths that occurred in these years, as reported by SEAP, were linked to the SIM database using the RecLink II application version 3.1¹⁹ using the name of the deceased, mother's name, date of birth and date of death. The underlying cause and other significant conditions that contributed to death were retrieved from the SIM, and those obtained from consulting health records and which had not been included in part I of the death certificate (contributing causes), were included and coded according to the 10th Revision of the International Classification of Diseases (ICD-10).

Thus, for all deaths recorded in SIM as COVID-19, that is, coded as ICD-B34.2 and U07.1 or U07.2 (markers for deaths with mention of COVID-19 with and without laboratory confirmation) on any of the lines of the Death Certificate (DC), the health records were re-

viewed to collect additional information, such as laboratory test results and the existence of comorbidities. This diagnostic procedure was also applied to deaths declared as severe acute respiratory syndrome (SARS, ICD-10 U04.9), in order to identify deaths from COVID-19 that might not have been reported.

To identify additional cases not recorded in the DC as COVID-19, the laboratory records of RT-PCR tests and antigen research by rapid test (TR-Ag) of the prison emergency room were verified. According to the WHO definition of COVID-19 cases²⁰, updated on 07/22/2022, cases without laboratory confirmation were only considered to be COVID-19 cases when the epidemiological link with a laboratory-confirmed COVID-19 case could be verified.

To assess the impact of COVID-19 on mortality trends, crude mortality rates for 2020 and 2021 were estimated based on the linear trend from 2016 to 2019. The estimated rates were compared with the rates recorded in 2020 and 2021 before and after excluding deaths from COVID-19. Proportional mortality was also estimated for the major groups by major groups: death due to external causes and death due to natural causes. Proportional mortality by ICD-10 chapters in 2020 and 2021 was compared to that found in 2016 and 2017.

Although COVID-19 is included in chapter I of ICD-10, in order to assess the impact of COVID-19 on mortality in prisons, we chose to analyze it separately, both in proportional distribution and in comparison, with the general population.

To compare mortality in the prison population with that of the general population of the state of Rio de Janeiro, adjusting for differences in age distributions, the standardized mortality ratio (SMR) was calculated by the quotient of the observed number of deaths (total and by groups of causes) in the state of Rio de Janeiro's prisons and the sum of the estimated deaths by age group in the prison population, applying the corresponding specific mortality rates in the state's population (<http://sistemas.saude.rj.gov.br/tabnet/deftohtm.exe?sim/obito.def>, accessed on Sep 6, 2019). Deaths due to transport accidents were excluded from the analysis since they are not expected in an incarcerated population and since they were not recorded in this population during the timeframe of the survey. Given the low number of deaths among women prisoners, standardization by age was limited to men. The age groups were defined based on the categories

used by the Pan American Health Organization. The standardized mortality ratio between PDL and the general population was estimated for the cause of death categories.

To analyze the data, SPSS for Windows software, version 20.0 (<https://www.ibm.com/>), and WINPEPI software, version 11.65 (<http://www.brixtonhealth.com/pepi4windows.html>), were used to estimate the 95% confidence limits of the SMR²¹. Mortality rates in the general population were calculated using data from the Brazilian Institute of Geography and Statistics (IBGE) and SIM. Proportional mortality due to external causes and natural causes was calculated according to ICD-10 chapters.

The Research Ethics Committee of the Sérgio Arouca National School of Public Health, Fiocruz (No. 4.168.197) approved the study protocol.

Results

Analysis of the historical series of mortality in the PDL (2016-2021) (Figure 1) shows an average annual drop of 13% until 2019 (525/100,000 in 2016 to 387/100,000 in 2019). However, in 2020 there was a reversal of the downward trend, with a rate of 371/100,000 in 2020 (180 deaths) and 434/100,000 in 2021 (185 deaths). The general mortality rates found in the PDL were higher than expected for 2020 and 2021 (335.7 and 283.9/100,000 respectively). After excluding deaths from COVID-19, the rate observed in the PDL (294/100,000) was lower than expected in 2020 (335.7/100,000), but it rose again (348,000/100,000), exceeding the estimated rate (283.9/100,00) for 2021.

COVID-19 accounted for around 20% of all deaths in 2020 and 2021. The distribution according to ICD-10 chapters (Table 1) shows a substantial reduction in proportional contribution and in the total number of deaths in almost all categories of causes in 2020 and 2021 when compared to 2016 and 2017, except for deaths from undetermined causes, which rose significantly in 2020 compared to 2017, from 5.4% to 18.3% (11 to 33 deaths), with partial reversal in 2021 (15 deaths). It is worth noting that there was a reduction in the prison population, which went from 51,451 in December 2017 to 45,018 and 42,770 in December 2020 and 2021, respectively.

There was a slight reduction in the proportional contribution of infectious diseases (excluding COVID-19), which went from 28.5% in 2016-2017 to 24.3% in 2021 (Table 1). Among

the causes of natural death, diabetes mellitus was cited as an underlying or contributing cause in 9.2% (15/163) of deaths in 2020 and in 7.2% (12/167) in 2021. These proportions had been 7.1% (15/211) in 2016 and 7.8% (18/230) in 2017. Among the deaths due to diabetes in 2020 and 2021, 40% (6/15) and 42% (5/12) respectively, were associated with COVID-19.

Of the 73 deaths from COVID-19, 71 (97.3%) were male and 48 (65.8%) were black or brown. The average age was 47 (range: 22-89 years old), with 28 deaths (38.4%) in the 18-39 age group, 27 (36.9%) in the 40-59 age group and 18 (24.7%) in the 60-89 age group. Although PDL over 60 represented only 1.5% of the prison population, they contributed 25% of deaths by COVID-19. People with comorbidities and/or the elderly accounted for 54.8% of deaths (40/73). Only 2 deaths due to COVID-19 occurred among women prisoners. Of the 73 deaths due to COVID-19, 19.2% occurred in prisons, 67.1% in the prison emergency room and 13.7% in hospitals outside the prison.

Comorbidities known to be associated with severe forms of COVID-19 were found in 49.3% (36/73) of deaths. The most frequently mentioned disease was HIV/AIDS infection (33.3% (12/36)), especially among 18 to 59-year-olds, followed by diabetes mellitus (30.6% (11/36)), especially among those over 60, and cardiovascular diseases (22.2% (11/36)). Tuberculosis was mentioned on the death certificate and/or in the medical records in 19.4% (7/36) of the deaths, in most cases (5/7) associated with HIV infection. Other comorbidities were identified less frequently: asthma, chronic renal failure and morbid obesity.

With regard to the frequency of deaths from infectious diseases (excluding COVID-19), when comparing the 2020-2021 periods with 2016-2017, tuberculosis remained the main cause of death and was found to have been an underlying or contributing cause in 48.8% (21/43) of deaths from infectious diseases in 2020 and 60.0% (30/50) in 2021, followed by HIV/AIDS infection 48.8% (21/43) and 36.0% (18/50) and sepsis 23.3% (10/43) and 15.7% (8/50), respectively.

In 2020 and 2021, mortality rates from COVID-19 were much higher in the PDL over 60 years of age, as well as in the elderly in the general population, compared to the younger age groups (Table 2). However, the elderly represented only 1.7% of the PDL and 18.6% of the general population, whose overall rate was consequently much higher than that of the PDL.

The comparison of mortality between the PDL and the general male population of the state

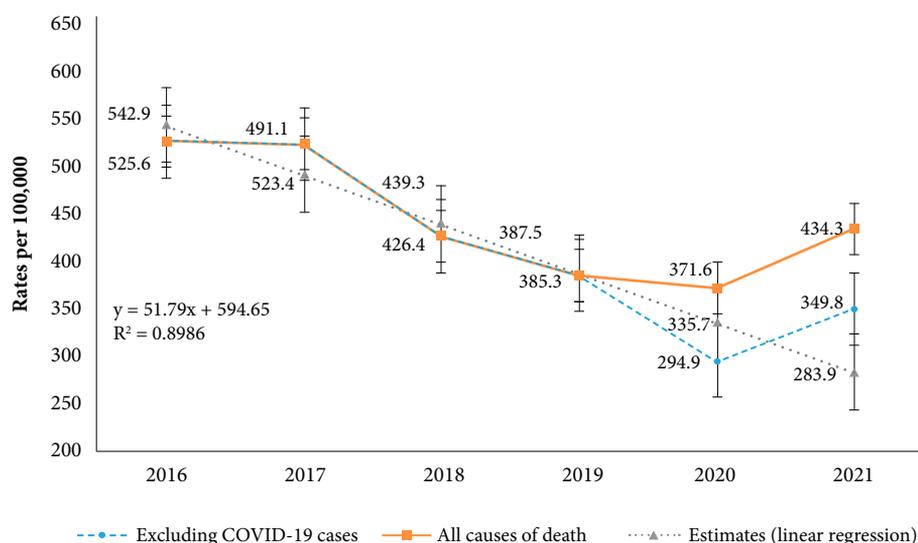


Figure 1. Crude annual mortality rates in the Prison System of the State of Rio de Janeiro, Brazil, for all causes in 2016-2021, for all causes except COVID-19 in 2020-2021, and estimated for all causes in 2020-2021, according to the trend in 2016-2019.

Source: Authors.

Table 1. Proportional mortality according to the underlying cause by chapters of the 10th Revision of the International Classification of Diseases (ICD-10) in persons deprived of liberty in the Prison System of the State of Rio de Janeiro, Brazil. 2016-2021.

Year	2016		2017		2020*		2021*	
I - Infectious and parasitic diseases	70	27.0	80	29.9	37*	20.6	45*	24.3
II - Neoplasms	11	4.3	7	2.6	4	2.2	6	3.2
III - Blood and hematopoietic organ diseases and certain immune disorders	1	0.4	0	0.00	1	0.6	0	-
IV - Endocrine, nutritional and metabolic diseases	10	3.9	13	4.9	6	3.3	4	2.2
V - Mental and behavioral disorders	0	-	1	0.37	0	-	0	-
VI - Nervous system diseases	5	1.9	6	2.2	2	1.1	2	1.1
IX - Circulatory system diseases	47	18.2	69	25.8	25	13.9	25	13.5
X - Respiratory system diseases	34	13.1	21	7.8	13	7	19	10.3
XI - Digestive system diseases	15	5.8	16	6.0	2	1.1	5	2.7
XII - Skin and subcutaneous tissue diseases	1	0.4	1	0.4	1	0.6	3	1.6
XIV - Genitourinary system diseases	3	1.2	5	1.9	2	1.1	7	3.8
XVIII - Symptoms, signs and abnormal findings of clinical and laboratory examinations, not classified in another chapter	14	5.4	11	4.1	33	18.3	15	8.1
XX - External causes of morbidity and mortality**	40	15.4	23	8.6	15	8.3	14	7.6
Covid-19	0	-	0	-	37*	20.6	36*	19.5
Deaths not found in SIM#	8	3.09	15	5.60	2	1.1	4	2.1
TOTAL	259		268		180		185	

* 6 deaths from COVID-19 associated with aids in 2020 and 5 deaths in 2021 were classified as COVID-19.** Excluding transport accidents. # Deaths reported by the State Secretariat of Prison Administration not found in SIM and without accessible death certificate.

Source: Based on data from SIM (Brazilian Mortality Information System) and medical records.

of Rio de Janeiro after standardization by age (Table 3) reveals an overall rate 27% and 23% lower among the PDL respectively in 2020 and 2021 (SMR: 0.73 and 0.77), and mortality due to external causes 80% higher outside prisons (SMR: 0.20 and 0.23, respectively).

However, mortality from infectious diseases was much higher among the PDL (SMR: 2.68 and 3.46 in 2020 and 2021). Among infectious diseases (excluding COVID-19), tuberculosis stands out (Table 4), with a risk of death 6 times and 11 times higher, and HIV/AIDS infection 2 times and 2.5 times higher than that of the general population, respectively in 2020 and 2021. The COVID-19 mortality rate among PDL (Table 2) was similar to that observed in the general population of the state of Rio de Janeiro in 2020, and lower in 2021.

Discussion

This study carried out in the state of Rio de Janeiro's prison system, is the only one published to date with this focus on mortality associated with COVID-19 in Brazilian prisons and provides new information on the impact of the COVID-19 pandemic on mortality in PDLs, as it is not limited to the analysis of aggregated secondary data. The aim is to complement and qualify the information by consulting different non-aggregated primary and secondary sources, seeking greater precision as to the number and

cause of deaths and the circumstances of their occurrence. The findings of this paper reposition COVID-19 mortality rates within this population, which until now had been considered low according to official records. Our paper reveals a significant under-recording of deaths in the DEPEN Monitoring Panel¹⁷ which, according to the number stated for the state of Rio de Janeiro, corresponds to only 1/3 of the COVID-19 deaths that have taken place. The age-specific mortality rates of the population deprived of liberty were comparable to those of the general population, considering the margin of uncertainty of the rates generated with small numerators⁴.

An important outcome of this paper is the demonstration of the negative impact of COVID-19 on the downward trend in mortality observed from 2020 onwards. The reversal of the downward trend continued in 2021, even after excluding deaths from COVID-19, possibly due to the priority given to COVID-19 in care. During the pandemic, prison health services have been heavily affected, with no added structure or human resources to deal with the extra burden generated by the epidemic, with obvious detriment to the diagnosis and monitoring of other diseases, such as tuberculosis, AIDS and diabetes, where the impact on mortality has now become evident. This damage was not exclusive to prison health services, since the drop in tuberculosis incidence rates was also noted in Brazil's general population²². However, the effect of the spread was more evident in prisons, where

Table 2. Number of deaths*, population and mortality rates by COVID-19, population deprived of liberty (PDL) and general population of the state of Rio de Janeiro, Brazil, 2020 and 2021.

		Age group	18-29	30-60	61+	Total
PDL	2020	Population	24,947	21,162	783	46,892
		COVID-19 Deaths	5	23	9	37
		Rate per 100.000	20.0	108.7	1149.4	78.9
	2021	Population	21,291	18,595	688	41,204
		COVID-19 Deaths	6	24	10	40
		Rate per 100.000	28.2	129.1	1453.5	97.1
Population State of Rio de Janeiro	2020	Population	1,548,166	3,592,119	1,172,684	6,312,969
		COVID-19 Deaths	144	4,291	11,303	15,738
		Rate per 100.000	9.3	119.5	963.9	249.3
	2021	Population	1,548,166	3,592,119	1,172,684	6,312,969
		COVID-19 Deaths	258	7341	12912	20511
		Rate per 100.000	16.66	204.36	1101.06	324.90

*Based on data from SIM (Brazilian Information System on Mortality) and health service records.

Table 3. Age-standardized mortality rate in the population deprived of liberty in the prison system of the State of Rio de Janeiro, with reference to the general population of the State of Rio de Janeiro.

ICD-10 Chapters	2020				2021			
	Number of Deaths		SMR*	CI95%	Number of Deaths		SMR	CI95%
	Found	Expected			Found	Expected		
I - Certain Infectious and Parasitic Diseases	37	13.79	2.68	1.82 - 3.55	45	12.99	3.46	2.45 - 4.48
II - Neoplasms	4	19.92	0.20	0.05 - 0.51	6	18.39	0.33	0.12 - 0.71
III- Blood diseases/immune disorders	1	1.17	0.85	0.02 - 4.76	0	1.15	-	0.0 - 3.20
IV - Endocrine, nutritional and metabolic diseases	6	8.70	0.69	0.25 - 1.50	4	7.71	0.52	0.01 - 1.03
V - Mental and behavioral disorders	0	2.78	-	0.0 - 1.33	0	2.65	-	0.0 - 1.39
VI - Nervous system diseases	2	3.06	0.65	0.25 - 1.56	2	3.28	0.61	0.07 - 2.20
IX - Circulatory system Diseases	25	37.41	0.67	0.43 - 0.99	25	34.89	0.72	0.44 - 1.00
X - Respiratory system Diseases	13	13.39	0.97	0.44 - 1.50	19	12.37	1.54	0.92 - 2.40
XI - Digestive system Diseases	2	7.66	0.26	0.10 - 0.62	5	7.42	0.67	0.22 - 1.57
XII - Skin and subcutaneous Tissue diseases	1	0.80	1.26	0.04 - 6.96	3	0.75	3.97	0.83 - 1.17
XIV - Genitourinary system diseases	2	4.34	0.46	0.05 - 1.66	7	4.16	1.68	0.67 - 3.47
XVIII - Symptoms, signs and abnormal findings of clinical and laboratory examinations, not classified in another chapter	33	22.11	1.49	1.03 - 2.10	15	22.91	0.65	0.37 - 1.08
XX - External causes of morbidity and mortality**	15	75.52	0.20	0.10 - 0.30	14	61.82	0.23	0.12 - 0.34
COVID-19	37	35.15	1.05	0.74 - 1.45	36	49.23	0.73	0.49 - 0.97
Deaths not found in SIM**	2	0.49	4.08	0.49 - 14.73	4	0	-	-
Total	180	247.72	0.73	0.62 - 0.83	185	240.44	0.77	0.66 - 0.88

ICD-10: 10th Revision of the International Classification of Diseases. IC95%: 95% confidence range. * SMR: standardized mortality ratio. Standardization by age (men aged between 18 and 89) using the indirect method; ** excluding transportation accidents. ** Deaths reported by the State Secretariat of Prison Administration not found in SIM and without accessible death certificate.

Source: Ministry of Health (Mortality Information System and SUS IT Department).

Table 4. Age-standardized mortality ratio of tuberculosis and HIV/AIDS infection in the population deprived of liberty in the prison system of the State of Rio de Janeiro, with reference to the general population of the State of Rio de Janeiro, Brazil, 2020 and 2021.

	2020				2021			
	Number of Deaths		SMR*	IC95%	Number of Deaths		SMR	IC95%
	Found	Expected			Found	Expected		
Tuberculosis**	21	2.98	7.04	4.03 - 10.05	30	2.38	12.59	8.09 - 17.10
HIV/AIDS infection	1	7.08	2.97	1.70 - 4.29	18	5.08	3.55	1.91 - 5.19

IC95%: 95% confidence range. * SMR: standardized mortality ratio. Standardization by age (men aged between 18 and 89) using the indirect method. ** Including deaths with mention of tuberculosis (underlying and/or contributing cause).

Source: Ministry of Health (Mortality Information System and SUS IT Department).

the transmission of tuberculosis is intensified. The proportional increase in deaths from sepsis (included in Chapter I of ICD-10) and diabetes mellitus, largely associated with COVID-19, also indicates the increase in failures of healthcare.

The gradual decrease in mortality at the beginning of the historical series was the result of improvements in health management in the state of Rio de Janeiro's prisons. Modest advances followed the greater involvement of oversight authorities and civil society organizations, motivated and driven by the alarming mortality rates in 2016-2017, uncovered by the earlier report⁵. The reversal in the trend of the mortality rate may be attributed to COVID-19, since no other major change in health-related issues occurred in the timeframe under review. That shift in trend revealed the failure of an ill structured and fragile prison healthcare system, in a situation of insalubrity and overcrowding, to respond to public health emergencies such as COVID-19.

The comparison between data from 2016-2017 and 2020-2021 shows that, although the overall mortality rate was similar to that of the general population of the state of Rio de Janeiro, mortality from infectious diseases (excluding COVID-19) remained high in the state's prisons, with a risk of death twice as high for PDL. Tuberculosis and HIV/AIDS infection continued in 2021 as the main causes of mortality in prisons, with the risk of death still very high for PDL, but lower than that observed in the 2016-2017 period (SMR: 16.21, IC95%: 12.41-20.08).

On the other hand, mortality from COVID-19 was similar inside and outside prisons, which is different from what has been reported in several US prisons, where rates were around three times higher in the incarcerated population than the general population^{23,24}. However, it is plausible that, in Rio de Janeiro state prisons, COVID-19 have been under-diagnosed. Access to screening tests was more limited than in services that catered to the general population. In the prison system, there was a delay in the availability of the RT-PCR and later TR-Ag, centralization of testing in the prison emergency room and limiting the test to severe cases, as well as the interruption of necropsies. In view of this, the existence of undiagnosed cases of COVID-19 among deaths from undetermined causes observed in 2020 and 2021 must also be taken into account, most of which occurred in prison units and in greater proportion than in previous years.

According to the logic of incarceration that characterizes Brazilian penal policy, the Parole

and Provisional Releases issued by the CNJ's Recommendation No. 62, dated March 17, 2020²⁵, which aimed to reduce overcrowding, were adopted very sparingly. They were limited to PDL who were in open or semi-open prison regimes, with the right to periodic home visits or with work outside the prison walls, i.e. they went out to work during the day and returned to prison at night. These criteria, added to the reduction in the admission of new prisoners during custody hearings in the initial period of the pandemic, had an effect on the reduction of the prison population, which went from 52,013 in March/2020 to 42,770 in December/2021, that is, a reduction of 18%.

However, the elderly and those with diseases considered to be at greater risk of the fatal evolution of COVID-19 were not considered as beneficiaries of provisional liberty, as required by the same CNJ Recommendation No. 62, which could have reduced the number of deaths, since these groups contributed around half of the total number of deaths. Despite the efforts of the Prosecutor's Office and the Public Defender's Office in class actions, only individual cases of "famous" prisoners belonging to these groups have been granted provisional liberty²⁶.

Without the possibility of provisional liberty, the collective isolation of elderly people from various prison units, without prior testing, resulted in an outbreak of COVID-19, with the death of 6 elderly people in a period of 12 days. It was only after this episode, which occurred in April 2020, that the Rio de Janeiro prison system began to use RT-PCR tests for COVID-19 in its emergency unit, but only for severe cases. Access to screening in Brazil's prisons was limited and late, as witnessed by the data made available by the CNJ²⁷, according to which around 34% of PDL in the Federal District, 17% in Mato Grosso, 11% in Goiás, 10% in Mato Grosso do Sul, 7% in Pará and 6% in Pernambuco were screened between April and August 2020, suggesting that there was insufficient testing in that epidemic period. In the state of Rio de Janeiro it was no different, and even after the rapid antigen test was made available to the prison population in September 2020, the actual decentralization of this test only took place in 2022. This may have contributed to the greater transmission of the disease and the delay in identifying and treating cases of COVID-19.

The precariousness of the prison health system was aggravated by the dismissal of health professionals who were elderly or suffered from comorbidities. The measures adopted to limit

the circulation of SARS-CoV-2, such as a 15-day quarantine imposed on those entering the prison system or after any activity outside the prison, such as going to the emergency room inside the prison, for example, limiting transfers between prisons and banning visits, measures that are part of the prison rationale, have not been enough to limit the spread of SARS-CoV-2. These restrictive measures on movement, without the necessary access to screening tests in the prison units themselves, may paradoxically have contributed to a greater spread of the infection and delayed diagnosis, since suspected cases of COVID-19 delayed going to the prison emergency room as long as possible to avoid the inconvenience imposed by mandatory quarantine after returning to the prison unit, in cells with significant overcrowding, unsuitable for this purpose. This, coupled with the centralization of testing, may help to account, in part, for the high percentage (23%) of deaths due to COVID-19 that occurred in prisons in 2021, in the absence of symptomatic testing and contact tracing, a strategy considered to be effective in preventing contagion in environments where social distancing is not possible^{9,10}.

On top of this, elderly PDL and those suffering from comorbidities have not been included in the vaccination schedule for priority groups (the elderly, asylum seekers, etc.) in the general population, which has delayed access to the vaccine for these higher-risk PDL by around six months. This certainly contributed to an excess of deaths in 2021^{12,28,29}.

In addition, as suggested by the increase in mortality in 2021 among PDL, the COVID-19 pandemic may have had an impact on the management of other diseases. In our findings, HIV infection was the most common comorbidity associated with death due to COVID-19, which contrasts with findings in the literature and suggests the unsuitability of antiretroviral treatment. This hypothesis is supported by the findings of a recent meta-analysis³⁰ which revealed an impact of COVID-19 on mortality only in patients whose HIV infection was not under control. In this sense, a systematic review of the literature by Cooper et al.³¹ suggests that people living with HIV/AIDS with a well-controlled disease do not present a greater risk of an unfavorable outcome from COVID-19 than the general population.

Among the limitations of this paper is the fact that it is impossible to estimate COVID-19 lethality due to the unavailability of data on diagnosed cases that survived, the incompleteness of information in healthcare records and the un-

availability of primary data on deaths from tuberculosis and HIV/AIDS infection in 2018 and 2019.

Prison mortality is a fundamental indicator of access to healthcare and human rights and, as such, must be easily accessible to managers, judiciary authorities and civil society in order to be used as a planning, management and inspection tool. However, as evidenced by this paper, the difficulty in locating PDL deaths in SIM does not allow for a systematic and routine assessment of mortality in this population. This implies the necessity of improving information systems at national level in order to identify deaths that occur during incarceration. To this end, a real-time monitoring system for PDL mortality in the state of Rio de Janeiro is being implemented. This is the result, under the coordination of the MPRJ, of cooperation between healthcare, judicial, prison administration, Fiocruz and civil society organizations, especially the Torture Prevention and Response Mechanism/ALERJ.

Conclusion

The findings of this paper reinforce the importance of implementing the PNAISP in the state of Rio de Janeiro with a view to improving health care for PDL, especially for chronic conditions that require ongoing treatment, and any outbreaks and epidemics. It reflects the shortcomings of a fragile and essentially remedial prison health system. More integration between the prison administration and the municipal and state health departments, with a clear definition of the respective responsibilities, is required for the proper functioning of prison healthcare services and the consequent reduction of health imbalances affecting PDL³².

The unsuitability and often late application of healthcare measures, coupled with the limited application of judicial recommendations for release from prison, constitute, particularly in the context of the COVID-19 pandemic, violations of the human rights of this population living under the State's care. This situation is part of a perspective of necropolitics, which is often denounced but has no impact, even in the case of a health emergency. In practice, PDLs remain invisible, whether in the face of a new pandemic such as COVID-19, or in relation to old and well-known diseases such as tuberculosis, which affects more than 10% of people imprisoned in the state of Rio de Janeiro, with a high mortality

rate. Using mortality as an indicator of healthcare and human rights in prisons implies improving the information about PDL in the SIM.

Collaborations

B Larouze, A Sánchez, LAB Camacho and CRS Toledo worked on the design of the study, definition of the methodology, analysis and curation of data and preparation of the manuscript. C Brito, EL Pereira and T Tostes worked on research, curation and data analysis, as well as reviewing the manuscript.

Acknowledgements

Angela Cascão, responsible for the SES/RJ Mortality Information System (SIM) and the Rio de Janeiro State Secretariat for Prison Administration.

Funding

INOVA Fiocruz Strategic Orders Program and the National Council for Scientific and Technological Development (CNPq), Universal Call for Proposals 2021.

Referências

1. Minayo MCS, Constantino P. *Deserdados Sociais: condições de saúde e qualidade de vida dos presos do estado do Rio de Janeiro*. Rio de Janeiro: Editora Fiocruz; 2015.
2. Domingues RMSM, Leal MDC, Pereira APE, Ayres B, Sánchez AR, Larouze B. Prevalence of syphilis and HIV infection during pregnancy in incarcerated women and the incidence of congenital syphilis in births in prison in Brazil. *Cad Saude Publica* 2017; 33(11):e00183616.
3. Busatto C, Bierhals DV, Vianna JS, Silva PEAD, Posuelo LG, Ramis IB. Epidemiology and control strategies for tuberculosis in countries with the largest prison populations. *Rev Soc Bras Med Trop* 2022; 55:e00602022.
4. Liu YE, Lemos EF, Gonçalves CCM, Oliveira RD, Santos ADS, Morais AOP, Croda MG, Alves MLD, Croda J, Walter KS, Andrews JR. All-cause and cause-specific mortality during and following incarceration in Brazil: a retrospective cohort study. *PLoS Med* 2021; 18(9):e1003789.
5. Sánchez A, Toledo CRS, Camacho LAB, Larouze B. Mortalidade e causas de óbitos nas prisões do Rio de Janeiro, Brasil. *Cad Saude Publica* 2021; 37(9):e00224920.
6. Toblin RL, Cohen SI, Hagan LM. SARS-CoV-2 infection among correctional
7. staff in the Federal Bureau of Prisons. *Am J Public Health* 2021; 111(6):1164-1167.
8. Nweze VN, Anosike UG, Ogunwusi JF, Adebisi YA, Lucero-Priso DE.
9. Prison health during the COVID-19 era in Africa. *Public Health Pract (Oxf)* 2021; 2:100083.
10. Sánchez A, Simas L, Diuana V, Larouze B. COVID-19 nas prisões: um desafio impossível para a saúde pública? *Cad Saude Publica* 2020; 36(5):e00083520.
11. World Health Organization (WHO). Preparedness, prevention and control of COVID-19 in prisons and other places of detention [Internet]. 2021. [cited 2022 jul 12]. Available from: <https://www.who.int/europe/publications/i/item/WHO-EU-RO-2021-1405-41155-57257>
12. Gouvea-Reis FA, Oliveira PD, Silva DCS, Borja LS, Percio J, Souza FS et al. COVID-19 outbreak in a large penitentiary complex, April-June 2020, Brazil. *Emerg Infect Dis* 2021; 27(3):924-927.
13. Santos M, França P, Sánchez A. *Manual de Intervenções Ambientais para o Controle da Tuberculose nas Prisões*. Rio de Janeiro: Letra e Imagem; 2012.
14. Simas L, Larouze B, Diuana V, Sánchez A. Por uma estratégia equitativa de vacinação da população privada de liberdade contra a COVID-19. *Cad Saude Publica* 2021; 37(4):e0006822.
15. Brasil. Ministério da Justiça e Segurança Pública do Brasil. Departamento Penitenciário Nacional. Painel de Monitoramento dos sistemas prisionais. Medidas de combate ao COVID-19. [acessado 2023 fev 23]. Disponível em: <https://app.powerbi.com/view?r=eyJrIjoiYTlhMjk5YjgtZWQwYS00ODlkLWg4NDgtZTFhMTgzYmQ2MGVliiwidCI6ImViM-DkwNDIwLTQ0NGMtNDNmNy05MWYyLTRiO-GRhNmJmZThlMSJ9>

16. Conselho Nacional de Justiça (CNJ). Portaria Conjunta nº 2, de 28 de abril de 2020. Estabelece procedimentos excepcionais para sepultamento de corpos durante a situação de pandemia do Coronavírus, com a utilização da Declaração de Óbito emitida pelas unidades notificadores de óbito, na hipótese de ausência de familiares, de pessoa não identificada, de ausência de pessoas conhecidas do obituado e em razão de exigência de saúde pública, e dá outras providências [Internet]. 2020. [acessado 2023 abr 10]. Disponível em: <https://www.cnj.jus.br/wp-content/uploads/2022/08/portaria-conjunta-28-abril-2020-cnj.pdf>
17. Secretaria de Estado de Polícia Civil do Rio de Janeiro. Resolução Conjunta SEPOL/SEAP nº 10, de 23 de março de 2020. Disciplina o procedimento a ser adotado por ocasião de óbitos ocorridos no interior de unidades prisionais hospitalares durante a emergência de importância internacional decorrente do enfrentamento do Coronavírus. *Diário Oficial do Estado do Rio de Janeiro* 2023; 25 mar.
18. Brasil. Ministério da Saúde (MS), Ministério da Justiça (MJ). Portaria Interministerial nº 1, de 2 de janeiro de 2014 Institui a Política Nacional de Atenção Integral à Saúde das Pessoas Privadas de Liberdade no Sistema Prisional (PNAISP) no âmbito do Sistema Único de Saúde (SUS). *Diário Oficial da União* 2014; 3 jan.
19. Brasil. Ministério da Justiça e Segurança Pública do Brasil. Departamento Penitenciário Nacional. Painéis de Monitoramento dos Sistemas Prisionais [Internet]. [acessado 2022 jul 7]. Disponível em: <https://www.gov.br/depen/pt-br/assuntos/acoes-contrapandemia/painel-de-monitoramento-dos-sistemas-prisionais>
20. Minayo MCS, Constantino P. Condições de saúde e qualidade de vida dos presos idosos do Estado do Rio de Janeiro – Sumário Executivo [Internet]. 2021. [acessado 2023 mar 10]. Disponível em: <https://www.researchgate.net/publication/357128824>
21. Camargo Jr. KR, Coeli CM. RECLINK: aplicativo para o relacionamento de banco de dados implementando o método probabilistic record linkage, versão: 3.1.6.3160. Rio de Janeiro; 2007.
22. World Health Organization (WHO). WHO COVID-19: case definitions: updated in Public health surveillance for COVID-19, 22 July 2022 [Internet]. 2022. [cited 23 fev 10]. Available from: https://www.who.int/publications/i/item/WHO-2019-nCoV-Surveillance_Case_Definition-2022-1
23. Abramson JH. WINPEPI updated: computer programs for epidemiologists, and their teaching potential. *Epidemiol Perspect Innov* 2011; 8(1):1.
24. Brasil. Ministério da Saúde (MS). Secretaria de Vigilância em Saúde e Ambiente. *Boletim Epidemiológico de Tuberculose 2023 – número especial* [Internet]. 2023. [acessado 2023 abr 2]. Disponível em: <https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/boletins/epidemiologicos/especiais/2023/boletim-epidemiologico-de-tuberculose-numero-especial-mar.2023/view>
25. Marquez N, Ward JA, Parish K, Saloner B, Dolovich S. COVID-19 Incidence and Mortality in Federal and State Prisons Compared with the US Population, April 5, 2020, to April 3, 2021. *JAMA* 2021; 326(18):1865-1867.
26. Saloner B, Parish K, Ward JA, DiLaura G, Dolovich S. COVID-19 Cases and Deaths in Federal and State Prisons. *JAMA* 2020; 324(6):602-603.
27. Conselho Nacional de Justiça (CNJ). Recomendação nº 62, de 17 de março de 2020. Recomenda aos Tribunais e magistrados a adoção de medidas preventivas à propagação da infecção pelo novo coronavírus – COVID-19 no âmbito dos sistemas de justiça penal e socioeducativo [Internet]. 2020. [acessado 2023 abr 4]. Disponível em: <https://www.cnj.jus.br/wp-content/uploads/2020/03/62-Recomenda%C3%A7%C3%A3o.pdf>
28. Diuana FA, Diuana V, Constantino P, Larouze B, Sanchez A. COVID-19 in prisons: what telejournalism (not) showed - a study on the criteria for newsworthiness during the pandemic. *Cien Saude Colet* 2022; 27(9):3559-3570.
29. Brasil. Conselho Nacional de Justiça (CNJ). Monitoramento GMFs/Tribunais de Justiça. Boletim de 16 de setembro de 2020, edição 7 [Internet]. 2020. [acessado 2021 set 21]. Disponível em: <https://www.cnj.jus.br/wp-content/uploads/2020/09/Monitoramento-CNJ-GMFs-Covid-19-16.09.20.pdf>
30. Brasil. Ministério da Saúde (MS). Secretaria de Vigilância em Saúde. Plano Nacional de Operacionalização da Vacinação contra a COVID-19 [Internet]. 2021. [acessado 2021 set 21]. Disponível em: https://www.conasems.org.br/wp-content/uploads/2021/04/PLANONACIONALDEVACINACAOCOVID19_ED06_V3_28.04.pdf
31. Barroso BW. O sistema prisional em 2020-2021: entre a COVID-19, o atraso na vacinação e a continuidade dos problemas estruturais. In: Fórum Brasileiro de Segurança Pública. *Anuário Brasileiro de Segurança Pública*. São Paulo: Fórum Brasileiro de Segurança Pública; 2021. p. 206-213.
32. Dzinamarira T, Murewanhema G, Chitungo I, Ngara B, Nkambule SJ, Madziva R, Herrera H, Mukwenha S, Cuadros DF, Iradukunda PG, Mashora M, Tungwarara N, Rwibasira GN, Musuka G. Risk of mortality in HIV-infected COVID-19 patients: a systematic Review and meta-analysis. *J Infect Public Health* 2022; 15(6):654-661.
33. Cooper TJ, Woodward BL, Alom S, Harky A. Coronavirus disease 2019 (COVID-19) outcomes in HIV/AIDS patients: a systematic review. *HIV Med* 2020; 21(9):567-577.
34. Amon JJ. COVID-19 and Detention: Respecting Human Rights. *Health Hum Rights J.* 2020; 22(1):367-370.

Article submitted 04/05/2023

Approved 20/10/2023

Final version submitted 22/10/2023

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva