



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## SARS-CoV-2 among inmates aged over 60 during a COVID-19 outbreak in a penitentiary complex in Brazil: Positive health outcomes despite high prevalence



Fernando A. Gouvea-Reis<sup>a,\*</sup>, Lairton S. Borja<sup>a</sup>, Patrícia O. Dias<sup>a</sup>, Danniely C.S. Silva<sup>a</sup>, Jadher Percio<sup>a</sup>, Cássio Peterka<sup>b</sup>, Guilherme O. Silva<sup>c</sup>, Raphael N.P. Adjuto<sup>c</sup>, Glaucia B. Tavares<sup>c</sup>, Mayana B. Cunha<sup>c,d</sup>, Claudia Feres<sup>c</sup>, Janaína de Oliveira<sup>c</sup>, Giselle Sodré<sup>c</sup>, Wallace dos Santos<sup>c</sup>, Camile de Moraes<sup>a</sup>

<sup>a</sup> Ministério da Saúde, Departamento de Saúde Ambiental, do Trabalhador e de Vigilância das Emergências em Saúde Pública, Coordenação Geral de Emergências em Saúde Pública, Programa de Treinamento em Epidemiologia Aplicada aos Serviços do Sistema Único de Saúde, Brasília, Distrito Federal, Brazil

<sup>b</sup> Secretaria de Estado da Saúde do Distrito Federal, Diretoria de Vigilância Epidemiológica, Brasília, Distrito Federal, Brazil

<sup>c</sup> Secretaria de Estado da Saúde do Distrito Federal, Diretoria Regional de Atenção Primária à Saúde, Superintendência da Região de Saúde Leste, Brasília, Distrito Federal, Brazil

<sup>d</sup> Universidade de Brasília, Brasília, Distrito Federal, Brazil

### ARTICLE INFO

#### Article history:

Received 24 February 2021

Received in revised form 23 March 2021

Accepted 25 March 2021

#### Keywords:

COVID-19

Severe acute respiratory syndrome coronavirus 2

Outbreak

Prisons

Public health

Brazil

### ABSTRACT

**Objectives:** To assess SARS-CoV-2 prevalence and health outcomes among inmates over 60 years during a COVID-19 outbreak in a major penitentiary complex in the Federal District, Brazil.

**Methods:** A mass test campaign was performed on May 13, 2020, using antibody-detection rapid tests for asymptomatic inmates and reverse transcriptase-polymerase chain reaction testing for those who were symptomatic. Those with negative results were retested on June 16. Inmates were interviewed to characterise background health conditions and the presence of symptoms.

**Results:** A total of 159 inmates were evaluated. In the first mass testing, 79.9% (127/159) of inmates had been infected, of whom 53.5% (68/127) reported symptoms. In the second testing round, 17 new cases were identified, increasing the total to 90.6% (144/159) of inmates with a positive result. Comorbidities were present in 67.3% of inmates; 2 hospitalisations and no COVID-related deaths were recorded.

**Conclusion:** More than 90% of inmates aged >60 years were infected with SARS-CoV-2 during the outbreak. Periodic health monitoring, active case finding and early care for symptomatic patients contributed to positive post-infection outcomes. Such measures must be considered essential for the surveillance of COVID-19 in environments with limited capacity to promote social distance, such as penitentiary institutions.

© 2021 The Author(s). Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

The first COVID-19 case in Brazil was reported on February 26, 2020. Brazil has registered over 10 million cases and 248 000 deaths as of February 24, 2021 (Painel Coronavírus, 2021). A COVID-19 outbreak started in a maximum-security penitentiary complex in Brasília, Federal District, on April 1, 2020. The complex comprises 4 prison units, hosting over 13 000 male inmates. There were 2064 COVID-19 confirmed cases at the complex by October 7,

2020, including 1724 inmates. The outbreak is further described elsewhere (Gouvea-Reis et al., 2021). In this report, we describe the SARS-CoV-2 prevalence among inmates aged >60 and discuss factors related to their health outcomes. This work was part of a public health surveillance action as defined by national law n°8080.IV.II.16. All individuals provided voluntary oral consent. Ethics approval was obtained under CONEP (Comissão Nacional de Ética em Pesquisa [National Research Ethics Commission], protocol number 37007220.1.0000.0008).

In the first week of April, local health and security teams initiated the transfer of all 159 inmates aged >60 into a specific block, aiming to provide better monitoring and assistance. Dedicated health and security staff were assigned to assist that

\* Corresponding author at: EpiSUS – Programa de Epidemiologia de Campo Aplicada aos Serviços do SUS, Secretaria de Vigilância em Saúde, Ministério da Saúde, Edifício PO700, 6 andar. SRTV 702, Via W 5 Norte, Brasília, Distrito Federal, Brazil.

E-mail address: [Fernando.reis@saude.gov.br](mailto:Fernando.reis@saude.gov.br) (F.A. Gouvea-Reis).

group, face masks were distributed, and periodic sanitisation of common spaces was implemented.

The first 2 COVID-19 cases among these inmates were reported on April 13; by May 12, 30 cases were confirmed in the group (18.9%). From 13 to 15 May, the local health team tested the remaining inmates in the group. Symptomatic patients were tested by reverse transcriptase-polymerase chain reaction (RT-PCR), the others were screened through immunoglobulin(Ig)M/IgG antibody-detection rapid tests (Acro Biotech, <https://www.acrobiotech.com>). RT-PCR identified 10 new COVID-19 cases, and 87 were identified through antibody rapid tests. Overall, 79.9% (127/159) had been infected by SARS-CoV-2 by May 15. All inmates were interviewed to characterise their symptoms since the beginning of the outbreak. Symptoms were reported by 53.5% (68/127) of the positive cases. Pre-existing health conditions were present in 107 (67.3%) inmates, with hypertension (54.1%) and diabetes (17.6%) being the most prevalent (Table 1).

A second mass testing campaign was performed on June 16, where the 32 inmates without a previous positive result were tested with IgM/IgG antibody-detection rapid tests (Livzon Diagnostics, <http://www.livzondiagnosics.com>). A total of 17 new positive results were found, meaning that a total of 90.6% (144/159) of inmates aged >60 had been infected by SARS-CoV-2.

The COVID-19 pandemic has raised concerns about the impact of living conditions in prison settings on patient outcomes (Sánchez et al., 2020; Burki, 2020; Kinner et al., 2020). Prisons are often overcrowded and poorly ventilated, making them an ideal environment for the introduction and spread of respiratory infectious diseases (Dolan et al., 2016). There are very few reports on the transmission dynamics and impact of COVID-19 in prisons

**Table 1**  
Characteristics of inmates aged >60 in a Penitentiary Complex, Brasília-DF, April–June 2020.

Characteristic	Population (N = 159) n (%)	Positive tests (N = 144) n (%)
Age group		
60–69	131 (82.4)	116 (80.5)
70–79	23 (14.5)	23 (16.0)
80+	5 (3.1)	5 (3.5)
Race/ethnicity		
White	31 (19.5)	30 (20.8)
Black	17 (10.7)	17 (11.8)
Mixed race	100 (62.9)	87 (60.4)
Asian	3 (1.9)	2 (1.4)
Indigenous	3 (1.9)	3 (2.1)
Not answered	5 (3.1)	5 (3.5)
Underlying health conditions		
Hypertension	86 (54.1)	79 (54.9)
Diabetes	28 (17.6)	28 (19.4)
Psychiatry disorders	22 (13.8)	20 (13.9)
Gastritis	6 (3.8)	6 (4.2)
Asthma	4 (2.5)	4 (2.8)
Hepatitis C	2 (1.3)	2 (1.4)
HIV	1 (0.6)	1 (0.7)
Presence of symptoms <sup>a</sup>		N = 127
Fever	37 (23.2)	35 (27.6)
Fatigue	34 (21.4)	34 (26.8)
Headache	29 (18.2)	26 (20.5)
Myalgia	27 (17.0)	27 (21.3)
Chills	26 (16.3)	25 (19.7)
Changes in taste or smell	25 (15.7)	24 (18.9)
Cough	21 (13.2)	19 (15.0)
Coryza	19 (11.9)	16 (12.6)
Diarrhoea	14 (8.8)	14 (11.0)
Dyspnoea	12 (7.5)	11 (8.7)
Abdominal pain	11 (6.9)	11 (8.7)
Sore throat	10 (6.3)	8 (6.3)
Nausea/vomiting	6 (3.8)	6 (4.7)

<sup>a</sup> Data related to the first mass testing, when 68/127 positive cases referred to having any symptoms.

settings. Mass testing for SARS-CoV-2 in 16 prisons and jails in the United States found viral prevalence as high as 86.8% (Hagan et al., 2020).

There was great concern from public health authorities and the local health team about patient outcomes if SARS-CoV-2 reached the block hosting inmates >60 years. In addition to advanced age, the group had other risk factors such as high levels of pre-existing comorbidities and their intrinsic vulnerability as an incarcerated population. In the Federal District of Brazil, the COVID-19 mortality rate is 5.2% for patients aged 60–69, 12.5% for 70–79 and 27.6% for ≥80. It would therefore be expected that the outbreak would pose a challenge for older inmates inside the prison unit (Secretaria de Saúde do Distrito Federal, 2021). However, despite >90% of the group being infected by SARS-CoV-2, only 2 inmates were hospitalised, and there were no COVID-19 related deaths as of October 7 (Appendix Table 1 in Supplementary material).

Such positive outcomes likely resulted from the local health and security teams' actions to prepare, prevent, and respond to the COVID-19 outbreak. Although the congregation of all inmates aged >60 years into the same block did not prevent the introduction and spread of SARS-CoV-2 in that population, it allowed a better allocation of resources in the context of increased healthcare demand. The dedicated health team provided daily monitoring of comorbidities, active case finding and early patient care upon symptoms onset. Symptomatic inmates were tested through RT-PCR, positive cases were isolated, and mass test campaigns were important to estimate the true SARS-CoV-2 prevalence, including the proportion of asymptomatic infected inmates. No off-label medication was used, but symptomatic patients were treated to relieve symptoms and, on early signs of desaturation or severity, they were referred to a local hospital.

In conclusion, >90% of inmates aged >60 were infected with SARS-CoV-2 within 2 months. Despite high levels of underlying health conditions, we found that periodic health monitoring, active case finding and early assistance for symptomatic patients were key actions that contributed to positive outcomes. Such initiatives should be considered in settings with limited social distancing capacity, such as correctional and detention facilities.

### Acknowledgements

The opinions expressed by the authors contributing to this journal do not necessarily reflect the opinions of the Ministry of Health of Brazil or the institutions with which the authors are affiliated. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. This work was part of a public health surveillance action, and therefore it is not linked to specific funding.

### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ijid.2021.03.080>.

### Transparency declaration

This article is published as part of a supplement titled, "Field Epidemiology: The Complex Science Behind Battling Acute Health Threats," which was supported by Cooperative Agreement number NU2HGH000044, managed by TEPHINET (a program of The Task Force for Global Health) and funded by the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention,

the Department of Health and Human Services, The Task Force for Global Health, Inc., or TEPHINET.

## References

- Burki T. Prisons are “in no way equipped” to deal with COVID-19. *Lancet (London, England)* 2020;395(10234):1411.
- Dolan K, Wirtz AL, Moazen B, Ndeffo-mbah M, Galvani A, Kinner SA, et al. Global burden of HIV, viral hepatitis, and tuberculosis in prisoners and detainees. *Lancet* 2016;388:1089–102.
- 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):924–7.
- Hagan LM, Williams SP, Spaulding AC, Toblin RL, Figlenski J, Ocampo J, et al. Mass testing for SARS-CoV-2 in 16 prisons and jails—six jurisdictions, United States, April–May 2020. *MMWR Morb Mortal Wkly Rep* 2020;69(33):1139.
- Kinner SA, Young JT, Snow K, Southalan L, Lopez-Acuña D, Ferreira-Borges C, et al. Prisons and custodial settings are part of a comprehensive response to COVID-19. *Lancet Public Health* 2020;5(4):e188–9.
- Painel coronavírus. Ministério da Saúde; 2021 Available from: <https://covid.saude.gov.br/>. [Cited 24 February 2021].
- Sánchez A, Simas L, Diuana V, Larouze B. COVID-19 in prisons: an impossible challenge for public health?. *Cad Saúde Pública* 2020;36(5)e00083520.
- Secretaria de Saúde do Distrito Federal. Boletim Epidemiológico No358. Emergência de Saúde Pública COVID-19 no âmbito do Distrito Federal. 2021 Available from: <http://www.saude.df.gov.br/boletinsinformativos-divep-cieves/>. [Cited 24 February 2021].

**Fernando Gouvea-Reis** is a fellow at the Field Epidemiology Training Program – Ministry of Health, Brazil. His research interests include global health, infectious diseases, and epidemiology.