

# BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email [info.bmjopen@bmj.com](mailto:info.bmjopen@bmj.com)

# BMJ Open

## Health morbidity in Brazilian prisons: A cross-sectional study from national databases

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-026853
Article Type:	Research
Date Submitted by the Author:	26-Sep-2018
Complete List of Authors:	Job Neto, Francisco; Universidade Federal do Espirito Santo, Programa de Pós-Graduação em Doenças Infecciosas Miranda, Raquel; Universidade Federal do Espirito Santo Coelho, Ronaldo; Ministerio da Saude Gonçalves, Cinthya; Universidade Federal do Espirito Santo Zandonade, Eliana; Universidade Federal do Espirito Santo, Programa de Pós-Graduação em Saúde Coletiva Miranda, Angelica; Universidade Federal do Espirito Santo, Department of Social Medicine
Keywords:	Surveillance, Prisoners, Notified diseases, Brazil

SCHOLARONE™  
Manuscripts

Peer Review Only

1  
2  
3 **Health morbidity in Brazilian prisons: A cross-sectional study from national**  
4 **databases**  
5  
6  
7

8  
9 **Authors:**

10 Francisco Job Neto

11 Universidade Federal do Espírito Santo, Vitória, Brazil

12 Raquel Barbosa Miranda

13 Universidade Federal do Espírito Santo, Vitória, Brazil

14 Cinthya Paiva Gonçalves

15 Universidade Federal do Espírito Santo, Vitória, Brazil

16 Ronaldo Coelho

17 Eliana Zandonade

18 Ministério da Saúde, Brasília, Brazil

19 Universidade Federal do Espírito Santo, Vitória, Brazil

20 Angélica Espinosa Miranda

21 Universidade Federal do Espírito Santo, Vitória, Brazil

22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39 **Corresponding author:**

40 Dr. Angelica Espinosa Miranda

41 Av. Marechal Campos, 1468. Maruípe – Vitória – ES

42 ZC: 29040-091 - Brasil

43 E-mail: [espinosa@ndi.ufes.br](mailto:espinosa@ndi.ufes.br)

44  
45  
46  
47  
48  
49  
50  
51  
52 **Word count:** 4516 words, including abstract and strengths and limitations of the  
53 study.  
54  
55  
56  
57  
58  
59  
60

## Abstract

**Objective:** The purpose of this study was to explore the surveillance data about notified diseases of prisoners in Brazil and its historical trend analysis.

**Design:** Quantitative study, including ecological and cross-sectional studies.

**Setting:** Nationwide representative data of Brazilian prisoners obtained from 2007-2014 health and prison information systems database were analyzed. These data are carried out by units identified as prison health facilities.

**Primary outcome measures:** Diseases diagnosis and individual data were available at the National System of Disease Notification (SINAN), Mortality Information System (SIM) and Prison Registration Systems (INFOPEN and GEO prisons). Analyses of the notification data performed in the SINAN at the national level. SINAN was consolidated with SIM, INFOPEN, and GEO prison data.

**Results:** A total of 23,235 cases of compulsory disease notification causing morbidity were reported in prison units in Brazil; of these cases, 20,003 (85.6%) were men and 3,362 (14.4%) were women. Over time, the proportion of prisoners increased from 1.92 per 1,000 inhabitants in 2007 to 2.77 per 1,000 inhabitants in 2014 (rising trend). From a total of 27 states, 12 of them presented a growth in disease notifications, 14 were stable, and in only one state was there a decrease in notifications. There was an increase in notifications in the country as a whole.

Tuberculosis (64.4%), dengue (9.1%), AIDS (9.0%), and viral hepatitis (5.9%) were among the most frequently reported diseases during the study period.

**Conclusion:** Despite showing stable tendencies, our results show high rates of diseases in Brazilian prisons. Prison health services should not be isolated but integrated into regional and national health and justice systems.

1  
2  
3 **Keywords:** Surveillance; Prisoners; Notified diseases; Brazil.  
4  
5  
6  
7  
8  
9

10  
11 **STRENGTHS AND LIMITATIONS OF THIS STUDY**  
12

- 13 • It is the first study including nationwide representative health data of Brazilian  
14 prisoners.  
15
- 16 • The presented data are about notified diseases of prisoners in Brazil and its  
17 historical trend analysis.  
18
- 19 • The use of multiple sources to retrieve the information of disease cases in the  
20 prison systems helps considerably but does not replace the most accurate  
21 picture of the situation.  
22
- 23 • These data were carried out by all units identified as prison health facilities in  
24 Brazil.  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## Introduction

The United Nations Standard Minimum Rules for the Treatment of Prisoners, known as the Nelson Mandela Rules, is a resolution adopted by the General Assembly on December 17, 2015, which recommends regarding health care services that: *(a) The provision of health care for prisoners is a State responsibility. Prisoners should enjoy the same standards of health care that are available in the community, and should have access to necessary health care services free of charge without discrimination based on their legal status; and (b) Health care services should be organized in close relationship with the general public health administration in a way that ensures continuity of treatment and care, including HIV, tuberculosis, and other infectious diseases as well as drug dependence*<sup>1</sup>. In other words, the fact that individuals are in prison does not mean that they have reduced rights to adequate health care. Despite finding themselves deprived of their liberty, prisoners are still entitled to have their fundamental rights protected and the prison system must have the proper infrastructure to offer them rights such as health, education, work, and other needs that in general should not be suppressed by the court's ruling. Those rights if fulfilled, will contribute to the process of social rehabilitation<sup>2, 3</sup>.

In Brazil, this paradox is aggravated by the adverse conditions found in prisons, such as the precariousness of physical spaces, scarcity of specialized human resources, lack of adequate health care, and presence of structural violence practices<sup>4,5,6</sup>. In the specific case of health conditions, instead of being in an environment able to safeguard physical and mental health, distress is often faced with an unhygienic and unhealthy environment. It facilitates the spread of communicable diseases, injuries related to violence, and mental disorders<sup>2,7</sup>. Communicable diseases are frequently transmitted among prisoners, and the rates of

1  
2  
3 HIV, hepatitis, and tuberculosis are much higher and complicated to deal with that of  
4 the general population<sup>8,9,10,11,12,13</sup>. There is also a high prevalence of mental health  
5 problems, including substance abuse disorders, and a higher prevalence of non-  
6 communicable diseases<sup>14, 15, 16</sup>.  
7  
8  
9  
10

11 Historically in Brazil, the concern regarding health care for prisoner  
12 populations has been low, fragmented, and vertical; insofar, as policies developed  
13 they were limited to aspects that focused on isolated health problems and  
14 diseases<sup>4,5</sup>. In 2014, the Brazilian Ministry of Health formulated the “National Policy  
15 for Integral Attention to the Health of Incarcerated Persons in the Prison System” in  
16 order to organize health activities and services for prisons within the scope of the  
17 national primary care model<sup>17</sup>. This initiative extended the effective coverage of the  
18 National Health System (SUS) to this particularly vulnerable population, seeking to  
19 achieve the universality of the SUS while guarantying the constitutional right to health  
20 with equity and integrality for prisoners.  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32

33 Since the expansion of effective coverage of SUS for incarcerated people in  
34 Brazil, the epidemiological profile of this public health system considered one of the  
35 largest in the world has been alarming. Available data are scarce, fragmented, and  
36 related to certain types of injuries which makes difficult to understand the whole  
37 situation. There is some information available in the official information systems from  
38 the Ministry of Health and the Ministry of Justice, but it is usually incomplete. The  
39 purpose of this study was to explore the surveillance data about notified diseases  
40 and its historical trend analysis in prisoners from Brazil.  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51

## 52 **Methods**

### 53 **Type of study**

1  
2  
3 This was a quantitative study, including ecological and cross-sectional evaluation,  
4 conducted using secondary data from compulsory notification of diseases provided  
5 by units identified as prison's health facilities in the National Health System database.  
6  
7 Diseases diagnosis and individual data were available at the National System of  
8  
9 Disease Notification (SINAN), Mortality Information System (SIM), and Prison  
10  
11 Registration Systems (INFOPEN and GEO prisons). These databases belong to the  
12  
13 Brazilian government. The study population was data from the incarcerated  
14  
15 population in Brazil from 2007 to 2014. These data can implement the health  
16  
17 strategies for this population.  
18  
19  
20  
21  
22  
23

### 24 **Variables**

25  
26 The following variables were studied: state of origin and year of notification, gender,  
27  
28 age, ethnicity, schooling, and notified diseases following the International  
29  
30 Classification of Diseases, version 10 (ICD-10). After performing descriptive analysis  
31  
32 the following indicators were proposed: (a) Proportion of prison population by state  
33  
34 population according to the Brazilian Institute for Geography and Statistics (IBGE)  
35  
36  $[(\text{prison population per year}/\text{IBGE population in December per year}) * 1,000]$ ; (b)  
37  
38 Proportion of reported cases per state, geographical region, and year  $[(\text{cases}$   
39  
40  $\text{reported per year}/\text{prison population in December per year}) * 1,000]$ ; (c) Proportion of  
41  
42 notified diseases in relation to denominator prison population  $[(\text{diseases notified per}$   
43  
44  $\text{year}/\text{prison population in December per year}) * 10,000]$ .  
45  
46  
47  
48  
49

### 50 **Data analysis**

51  
52 To gather epidemiological data on notified diseases in the incarcerated population,  
53  
54 analyses of SINAN notification data at the national level were performed. SINAN data  
55  
56  
57  
58  
59  
60



1  
2  
3 was consolidated with SIM, INFOPEN, and GEO prison data. Quantitative data were  
4  
5 analyzed using the Statistical Package for the Social Sciences (SPSS, version 20.0)  
6  
7 and Stata statistical software, version 11.2. A descriptive analysis was performed  
8  
9 including frequency distribution for qualitative variables. Figures were prepared from  
10  
11 the historical series and linear regression models of the variables observed  
12  
13 throughout the study years were estimated. In addition, we presented the regression  
14  
15 model found and the value of R<sup>2</sup>, which indicates the portion of the variability  
16  
17 explained by the linear trend; p-value of F-test was also estimated, as well as the  
18  
19 classification of the trend as stable (no trend), increasing, or decreasing. The level of  
20  
21 significance was set at 5%.  
22  
23

### 24 25 26 **Ethical procedures**

27  
28 This study was carried out with authorization from the Ministry of Health, which  
29  
30 released the database without disclosing individual identification data. The proposal  
31  
32 of this study was submitted to the Ethics Committee of the Health Sciences Center in  
33  
34 UFES and approved under number 1.058.616/2015, as recommended by Resolution  
35  
36 No.466/2012 of the Brazilian National Health Council.  
37  
38  
39  
40

### 41 **RESULTS**

42  
43 Within the period of study, a total of 23,235 cases of compulsory notification  
44  
45 diseases were reported in prison units in Brazil, of which 20,003 (85.6%) cases were  
46  
47 men and 3,362 (14.4%) were women. Over time, the proportion of prisoners  
48  
49 increased from 1.92 per 1,000 inhabitants in 2007 to 2.77 per 1,000 inhabitants in  
50  
51 2014 (rising trend); data are shown in Figure 1. This estimation was done using the  
52  
53 prison population per year/IBGE population in December per year\* 1,000. The prison  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 population in Brazil was 364,676 people in December 2007 and 563,526 in  
4  
5 December 2014.

6  
7 The southeastern region is the geographic area with the largest number of  
8  
9 prisoners in Brazil and that which reported the highest number of cases of disease  
10  
11 notifications, a total of 13,149 (56.3%) cases; São Paulo state had the highest  
12  
13 number of notifications. Subsequently, the south and northeast regions reported  
14  
15 more cases, with 3,231 (13.82%) and 3,213 (13.75%) cases, respectively. In general,  
16  
17 it was observed that the number of notifications increased over the years, which may  
18  
19 represent a greater access to health services. Figure 2 shows the proportions of  
20  
21 disease reports in Brazil per year, by the prison population per 1,000 inhabitants.  
22  
23

24 Table 1 presents the proportions of the number of cases in the incarcerated  
25  
26 population in Brazil per Federation Unit (UF) and year of notification. Linear  
27  
28 regression models were used to measure trends in the proportion of cases reported  
29  
30 in each UF and in the general total of Brazil between years 2007 and 2014. This  
31  
32 table presents the model found and the value of R<sup>2</sup>, which indicates the proportion of  
33  
34 the variability explained by the linear trend; p-value of the F-test is also shown, as  
35  
36 well as the classification of the trend as stable (no trend), increasing or decreasing.  
37  
38 According to the results, it was observed that from the total of 27 UF, 12 of them  
39  
40 presented a growth in disease notifications, 14 were stable, and only one presented  
41  
42 a decrease in disease notifications. For Brazil, in general, there was an increase in  
43  
44 disease notifications. For Brazil, in general, there was an increase in  
45  
46 disease notifications.  
47

48 Tuberculosis (64.4%), dengue (9.1%), AIDS (9.0%), and viral hepatitis (5.9%)  
49  
50 are among the most frequently reported diseases during the study period (Table 2).  
51  
52 Table 3 describes the results of the linear regression model to measure the trends in  
53  
54 the proportion of cases reported between the years 2007 and 2014, according to  
55  
56  
57  
58  
59  
60

1  
2  
3 health problems notified. Only the anti-rabies human vaccine demand and the  
4  
5 exanthema lesions showed a decrease during these years.  
6  
7

## 8 9 **DISCUSSION**

10  
11 The main contribution of this study was to identify the frequency of notified  
12  
13 diseases in Brazilian prisons. A more pronounced increase in disease notifications  
14  
15 was found following the increase of prisons' population in the country. These data are  
16  
17 critical to assess the quality of the health system's response and evaluate the  
18  
19 vulnerability of the incarcerated population in relation to accessing health care. This  
20  
21 information is critical for properly developing public policies, once priorities are  
22  
23 determined, they can guide the planning and accomplishment of the Public Health  
24  
25 System actions<sup>6</sup>. The report of diseases increased in the majority of Brazilian states  
26  
27 and main notified diseases were stable during the study period. These results can be  
28  
29 explained by improvements in the surveillance system and because of the presence  
30  
31 of health care teams inside prisons.  
32  
33  
34

35  
36 Most of the data published in Brazil concerning the incarcerated population  
37  
38 have focused on HIV/AIDS, viral hepatitis, and tuberculosis<sup>10, 11, 12</sup>. However, it is  
39  
40 necessary to analyze the situation of this population from a larger perspective/scope,  
41  
42 since other health problems are present, such as dengue, with changes in behavior  
43  
44 during epidemic peaks, requiring specific approaches.  
45

46  
47 Planning and executing health care programs for the prison population is a  
48  
49 global concern. Prisoners also have high levels of mental disorders, chronic disease,  
50  
51 and drug use, above those of their populations of origin<sup>6,18</sup>. Health problems resulting  
52  
53 from other conditions of confinement have not been the object of health care actions,  
54  
55 which would allow incarcerated people to have access to health care in an integral  
56  
57  
58  
59  
60

1  
2  
3 and effective way. In addition to these problems, this population has the right to  
4 private visitation, which results in the circulation of pathogens between the prison  
5 system and the community surrounding it<sup>19</sup>. It is also important to highlight that  
6 prisoners worldwide have substantial mental health needs, but the efficacy of  
7 psychological therapy in prisons is unknown. Mindfulness-based therapies are  
8 modestly effective in prisoners with depression and anxiety<sup>20</sup>.  
9  
10  
11  
12  
13  
14

15  
16 The use of secondary data presents some limitations, that is, the use of  
17 information contained in systems such as SINAN, SIM, INFOPEN, and GEO Prisons,  
18 may not reflect the magnitude of diseases among prisoners. The problem of  
19 underreporting and inadequacy of data completeness is known; however, the  
20 information contained in these information systems can provide an initial basis for  
21 monitoring and analyzing the health situation in a population that has no other data  
22 sources. This information originates in health care units and data can take a long  
23 time to arrive at the Ministry of Health. The use of multiple sources to retrieve the  
24 information of disease cases in the prison systems helps considerably but does not  
25 replace the most accurate picture that could have been available if follow-up  
26 information of all exposed individuals was available. Therefore, although currently  
27 available data may be underestimating the real magnitude of health problems in  
28 Brazilian prisons, it is the best we have and can help in planning appropriate  
29 prevention and health care strategies addressed to a vulnerable population that does  
30 not have adequate access to health care services and neither is reached by the  
31 health care system. The use of SINAN as a monitoring tool is of great relevance for  
32 planning health care strategies in Brazil, and this applicability must be transferred to  
33 the prison system since it will allow reorienting attention to policies concerning the  
34 health of incarcerated people.  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 The National Policy for Integral Attention to the Health of Incarcerated Persons  
4 in the Prison System<sup>17</sup> foresees the implementation of primary health units in prisons  
5 with more than 100 people, and the incorporation of a multi-professional team  
6 composed at least of five professionals (physician, nurse, psychologist, social  
7 worker, and dentist) and one undergraduate professional (nursing technician). In  
8 prisons with up to 100 prisoners, health care must be performed by a health team  
9 designated by the local Municipal Health Department. Access to complex levels of  
10 health care provided for the National Policy requires to be agreed on and defined  
11 within each state government<sup>17</sup>. The urgency to implement a public policy of social  
12 inclusion focused on promoting human rights for this population indicates the  
13 importance of reorienting the health care model. The formulation of the National  
14 Health Policy in the Penitentiary System in Brazil is an initiative aimed to guarantee  
15 the constitutional rights of health care and access to the National Health System for  
16 prisoners with equity, integrality, and universality; additionally, this policy will  
17 contribute to organizing actions and health services.

18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
Public health must be combined with to criminal justice to offer medical care to  
prison populations, because, generally, they come from areas of society with  
significant levels of deficient health and social exclusion<sup>19, 21</sup>. Prisoners tend to have  
poorer physical, mental, and social health compared to the general population<sup>19, 22, 23</sup>.  
Their lifestyles are more likely to put them at risk of ill health. Many prisoners have  
had little or no regular contact with health services before entering prison. Mental  
illness, drug dependence, and communicable diseases are the prevailing health  
problems among prisoners<sup>22, 24</sup>. Caring for prisoners is an essential task and its main  
activities are critical. However, a full primary care service also includes elements of  
disease prevention and health promotion and should be accomplished by an

1  
2  
3 interdisciplinary team with sufficient qualified personnel acting in full clinical  
4  
5 independence<sup>1, 22</sup>.

6  
7 Measures to implement synchronized information between the criminal justice  
8  
9 and public health organizations could generate improvements on the access to  
10  
11 health care and medical information of prisoners facilitating the transition of care  
12  
13 between the health care during imprisonment and after prisoners' releasing<sup>3</sup>. It is  
14  
15 important to ensure that medical files are transferred to health care services of the  
16  
17 accepting institutions upon assignment of a prisoner, as well as subject to medical  
18  
19 confidentiality<sup>1</sup>.

## 20 21 22 23 24 **Conclusions**

25  
26 Physicians and other health care professionals working in the prison  
27  
28 environment should be included in strategies to reduce health disparities in this  
29  
30 population; these professionals should receive continuous training to better  
31  
32 understand the peculiarities of health care in prisons, the prison environment, and  
33  
34 different types of prison unities (closed, semi-open, and open regimes). Prison health  
35  
36 services should not be isolated but integrated into the regional and national health  
37  
38 and justice systems.

## 39 40 41 42 43 **Competing interests**

44  
45 The authors declare that they have no competing interests.

## 46 47 48 49 **Authors' contributions**

50  
51 FJN, contributed to the study design, data collection and revised the final version of  
52  
53 the manuscript. RBM and CPG contributed to the questionnaire, data and revised the  
54  
55

1  
2  
3 final version of the manuscript. EZ and RC conducted the data analysis, and  
4  
5 contributed to the results section and revised the final version of the manuscript.  
6  
7 AEM designed the study, supervised the design of the questionnaire and data  
8  
9 collection, the writing and revised the final version of the manuscript. All authors read  
10  
11 and approved the final manuscript.  
12  
13  
14

15  
16 **Funding:** Brazilian Ministry of Health provided funding support for this study:  
17  
18 Cooperation term #181/2013, Process #25000.184518/2013-41.  
19  
20  
21

## 22 **References**

- 23  
24 1. United Nations. United Nations Standard Minimum Rules for the Treatment of  
25  
26 Prisoners (the Nelson Mandela Rules). Adopted and proclaimed by General  
27  
28 Assembly resolution 70/175 on the Seventieth session, agenda item 106, 08  
29  
30 January 2016. New York, United Nations. 2016. Accessed 02 September 2013.  
31  
32 Available at: [https://www.unodc.org/documents/justice-and-prison-](https://www.unodc.org/documents/justice-and-prison-reform/Brochure_on_the_UN_SMRs.pdf)  
33  
34 [reform/Brochure\\_on\\_the\\_UN\\_SMRs.pdf](https://www.unodc.org/documents/justice-and-prison-reform/Brochure_on_the_UN_SMRs.pdf)  
35  
36  
37 2. WHO (2013). Good governance for prison health in the 21st century. A policy brief  
38  
39 on the organization of prison health. Copenhagen, WHO Regional Office for Europe,  
40  
41 2013. Accessed 20 July 2017. Available at  
42  
43 [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0017/231506/Good-governance-for-](http://www.euro.who.int/__data/assets/pdf_file/0017/231506/Good-governance-for-prison-health-in-the-21st-century.pdf)  
44  
45 [prison-health-in-the-21st-century.pdf](http://www.euro.who.int/__data/assets/pdf_file/0017/231506/Good-governance-for-prison-health-in-the-21st-century.pdf)  
46  
47  
48 3. Rich JD, Chandler R, Williams BA, Dumont D, Wang EA, Taxman FS, et al. How  
49  
50 health care reform can transform the health of criminal justice-involved individuals.  
51  
52 *Health Aff (Millwood)*. 2014;33(3):462-7. doi: 10.1377/hlthaff.2013.1133. Review.  
53  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3 4. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de  
4 Ações Programáticas Estratégicas. Plano Nacional de Saúde no Sistema  
5 Penitenciário / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento  
6 de Ações Programáticas Estratégicas. – 2. ed. – Brasília: Editora do Ministério da  
7 Saúde, 2005. 64 p  
8
- 9  
10 5. Fernandes LH, Alvarenga CW, Santos LL, Pazin Filho A. The need to improve  
11 health care in prisons. *Rev Saude Publica*. 2014; 48(2):275-83.  
12
- 13 6. Barcellos AP. Sanitation rights, public law litigation, and inequality: a case study  
14 from Brazil. *Health Hum Rights*. 2014 Dec 11;16(2):E35-46.  
15
- 16 7. Møller L, Stöver H, Jürgens R, Gatherer A, Nikogosian H. editors. Health in  
17 prisons: a WHO guide to the essentials in prison health. Copenhagen, Denmark:  
18 World Health Organization, Europe. 2007 pages: 7-13. Accessed 20 August 2017.  
19 Available at: <http://www.who.int/hiv/topics/idu/prisons/e90174.pdf>.  
20
- 21 8. Todrys KW, Amon JJ, Malembeka G, Clayton M. Imprisoned and imperiled:  
22 access to HIV and TB prevention and treatment, and denial of human rights, in  
23 Zambian prisons. *J Int AIDS Soc*; 2011, 14:8. doi: 10.1186/1758-2652-14-8.  
24
- 25 9. Telisinghe L, Charalambous S, Topp SM, Herce ME, Hoffmann CJ, Barron P, et al.  
26 HIV and tuberculosis in prisons in sub-Saharan Africa. *Lancet*. 2016,  
27 388(10050):1215-27. doi: 10.1016/S0140-6736(16)30578-5.  
28
- 29 10. Carbone AS, Paião DS, Sgarbi RV, Lemos EF, Cazanti RF, Ota MM, et al. Active  
30 and latent tuberculosis in Brazilian correctional facilities: a cross-sectional study.  
31 *BMC Infect Dis*. 2015, Jan 22;15:24.  
32
- 33 11. Sgarbi RV, Carbone AS, Paião DS, Lemos EF, Simionatto S, Puga MA, et al. A  
34 Cross-Sectional Survey of HIV Testing and Prevalence in Twelve Brazilian  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3 Correctional Facilities. PLoS One. 2015 Oct 14; 10(10):e0139487. doi:  
4 10.1371/journal.pone.0139487.  
5

6  
7 12. Puga MA, Bandeira LM, Pompilio MA, Croda J, Rezende GR, Dorisbor LF, et al.  
8  
9 Prevalence and Incidence of HCV Infection among Prisoners in Central Brazil. PLoS  
10  
11 One. 2017 Jan 6;12(1):e0169195. doi: 10.1371/journal.pone.0169195.  
12

13  
14 13. Sander G, Lines R. HIV, Hepatitis C, TB, harm reduction, and persons deprived  
15  
16 of liberty: What standards does international human rights law establish? Health Hum  
17  
18 Rights; 2016, 18(2):171-182.  
19

20  
21 14. Fazel S, Seewald K. Severe mental illness in 33,588 prisoners worldwide:  
22  
23 Systematic review and meta-regression analysis. The British Journal of Psychiatry,  
24  
25 2012; 200, 364–373. 10.1192/bjp.bp.111.096370.  
26

27  
28 15. Rosen DL, Hammond WP, Wohl DA, Golin CE. Disease prevalence and use of  
29  
30 health care among a national sample of black and white male state prisoners. J  
31  
32 Health Care Poor Underserved; 2012, 23(1):254-72. doi: 10.1353/hpu.2012.0033.  
33

34  
35 16. Wakeman SE, Rich JD. Addiction Treatment Within U.S. Correctional Facilities:  
36  
37 Bridging the Gap Between Current Practice and Evidence-Based Care. J Addict Dis;  
38  
39 2015, 34(2-3):220-5. doi: 10.1080/10550887.2015.1059217.  
40

41  
42 17. Brasil (2014). Portaria Interministerial n. 1, de 02 de janeiro de 2014. Institui a  
43  
44 Política Nacional de Atenção Integral à Saúde das Pessoas Privadas de Liberdade  
45  
46 no Sistema Prisional (PNAISP) no âmbito do Sistema Único de Saúde (SUS). Diário  
47  
48 Oficial da União, Brasília, DF, n. 2, Seção 1, p. 18-21. Available at  
49  
50 [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2014/pri0001\\_02\\_01\\_2014.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2014/pri0001_02_01_2014.html)  
51

52  
53 18. Sparrow N. Health care in secure environments. Br J Gen Pract; 2006,  
54  
55 56(530):724-725.  
56  
57  
58  
59  
60

- 1  
2  
3 19. Binswanger IA, Redmond N, Steiner JF, Hicks LS. Health disparities and the  
4 criminal justice system: an agenda for further research and action. *J Urban Health*;  
5 2012, 89(1):98-107. doi: 10.1007/s11524-011-9614-1.  
6  
7  
8  
9 20. Yoon IA, Slade K, Fazel S. Outcomes of psychological therapies for prisoners  
10 with mental health problems: A systematic review and meta-analysis. *J Consult Clin*  
11 *Psychol*; 2017, 85(8):783-802. doi: 10.1037/ccp0000214.  
12  
13  
14  
15 21. Coyle A. Standards in prison health: the prisoner as a patient. In Møller L, Stöver  
16 H, Jürgens R, Gatherer A, Nikogosian H, editors. *Health in prisons: a WHO guide to*  
17 *the essentials in prison health*. Copenhagen, Denmark: World Health Organization,  
18 Europe. 2007, pages: 7-13. Accessed 20 August 2017. Available at:  
19  
20  
21  
22 <http://www.who.int/hiv/topics/idu/prisons/e90174.pdf>.  
23  
24  
25  
26 22. Viggiani N. Unhealthy prisons: exploring structural determinants of prison health.  
27 *Sociology of Health and Illness*, 2007, 29(1):115–135.  
28  
29  
30  
31 23. Viggiani N. Creating a healthy prison: developing a system wide approach to  
32 public health within an English prison. *Prison Service Journal*, 2012, 202:12–19.  
33  
34  
35 24. Hayton P, van den Bergh B, Møller L. Health protection in prisons. The Madrid  
36 Recommendation. *Public Health*, 2010, 124(11):635–636.  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 Figure 1: Historical series of the proportion of prisons' population by the annual  
4 population per 1,000 people, Brazil, 2007-2014  
5  
6  
7  
8  
9  
10  
11  
12

13 Figure 2: Trends of compulsory notification diseases reported among prisons'  
14 population in Brazil, 2007-2014  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Table 1. Linear regression model with the proportion of cases reported by geographical regions and states of Brazil, 2007-2014.

Region	State	Model	R2	P-value	Trends
Total	Brazil	-6.60 + 1.61*year	0.798	0.003	Increased
North	Acre	0.082 + 1.206*year	0.708	0.009	Increased
	Amazonas	-1.231 + 1.489*year	0.633	0.018	Increased
	Amapá	-0.516 + 0.192*year	0.677	0.012	Increased
	Pará	-0.845 + 0.352*year	0.656	0.015	Increased
	Rondônia	1.539 + 1.149*year	0.324	0.082	Stable
	Roraima**	-	-	-	Stable
	Tocantins	1.782 - 0.047*year	0.005	0.865	Stable
Northeast	Alagoas	2.795 + 0.118*year	0.012	0.799	Stable
	Bahia	18.874 - 0.818*year	0.222	0.238	Stable
	Ceará	0.974 + 1.043*year	0.620	0.020	Increased
	Maranhão**	-	-	-	Stable
	Paraíba	-1.279 + 0.549*year	0.504	0.048	Increased
	Pernambuco	-1.176 + 1.377*year	0.762	0.003	Increased
	Piauí*	-	-	-	Stable
	Rio Grande do Norte**	-	-	-	Stable
Sergipe	-0.316 + 0.12*year	0.579	0.028	Increased	
Southeast	Espírito Santo	2.472 + 0.197*year	0.040	0.634	Stable
	Minas Gerais	5.410 + 0.165*year	0.008	0.836	Stable
	Rio de Janeiro	36.011 - 3.713*year	0.867	0.001	Decreased
	São Paulo	5.830 - 0.113*year	0.048	0.602	Stable
Midwest	Distrito Federal	-0.948 + 1.390*year	0.643	0.017	Increased
	Goiás	15.375 - 0.291*year	0.018	0.749	Stable
	MatoGrossoSul	0.093 + 0.467*year	0.177	0.299	Stable
	MatoGrosso	-0.750 + 3.413*year	0.923	0.001	Increased
South	Paraná	0.075 + 0.008*year	0.008	0.838	Stable
	Rio Grande Sul	4.982 + 2.015*year	0.541	0.037	Increased
	Santa Catarina	-0.271 + 0.095*year	0.546	0.036	Increased

\*\*All values were equal to zero.

Table 2. Disease cases reported in Brazilian prisons by year, 2007-2014 (n=23235)

Notified diseases	2007	2008	2009	2010	2011	2012	2013	2014	Total	%
Tuberculosis	1083	1385	1679	1944	2384	2275	2526	1691	14967	64.4
Dengue fever	77	106	139	574	152	81	800	177	2106	9.1
AIDS	270	297	207	223	305	226	343	212	2083	9.0
Viral hepatitis	92	112	107	123	257	313	265	98	1367	5.9
Anti-rabies vaccine	130	143	149	92	109	127	127	53	930	4.0
Syphilis	2	0	0	9	61	63	201	151	487	2.1
Leprosy	27	30	33	73	44	32	101	47	387	1.7
Male urethral discharge	2	4	3	11	61	55	70	44	250	1.1
Varicella	26	7	18	33	20	26	20	3	153	0.7
Lesions caused by violence	0	0	2	17	38	12	18	7	94	0.4
Leptospirosis	7	12	5	7	10	17	16	3	77	0.3
Chagas' disease	0	0	0	1	5	20	32	14	72	0.3
Syphilis in pregnancy	1	2	2	6	3	13	11	8	46	0.2
American cutaneous leishmaniasis	0	3	2	3	2	0	14	20	44	0.2
Exanthema lesions	20	7	4	3	3	2	3	1	43	0.2
Meningitis	7	2	5	2	2	1	7	9	35	0.2
Accident by venomous animals	24	1	1	2	0	1	3	2	34	0.1
Schistosomiasis	15	0	0	0	5	1	4	3	28	0.1
Adverse effects after vaccination	0	0	0	0	2	4	2	5	13	0.1
Visceral leishmaniasis	0	0	2	1	2	2	0	0	7	0.0
Pertussis (whooping cough)	0	0	0	0	0	0	4	2	6	0.0
HIV in pregnant women	0	0	0	0	0	1	1	0	2	0.0
Exogenous intoxications	0	0	0	0	0	0	0	1	1	0.0
Malaria	1	0	0	0	0	0	0	0	1	0.0
<b>Total</b>	<b>1784</b>	<b>2111</b>	<b>2358</b>	<b>3125</b>	<b>3465</b>	<b>3272</b>	<b>4569</b>	<b>2551</b>	<b>23235</b>	<b>100.0</b>

Table 3. Linear regression model of reported diseases proportion and its trends, 2007-2014.

Notified diseases	Model	R2	P-value	Trends
Tuberculosis	38.098 + 0.538* year	0.032	0.670	Stable
Dengue fever	2.861 + 0.579*year	0.078	0.504	Stable
AIDS	7.909 – 0.457*year	0.463	0.063	Stable
Viral hepatitis	2.831 + 0.180*year	0.079	0.501	Stable
Leprosy	0.810 + 0.049*year	0.074	0.514	Stable
Varicella	0.640 - 0.047*year	0.244	0.214	Stable
Lesions caused by violence	0.054 + 0.041*year	0.139	0.363	Stable
Leptospirosis	0.245 - 0.007*year	0.029	0.689	Stable
Meningitis	0.106 - 0.002*year	0.008	0.832	Stable
Pertussis (whooping cough)	- 0.019 + 0.007*year	0.441	0.072	Stable
Schistosomiasis	0.189 - 0.024*year	0.175	0.303	Stable
Accident by venomous animals	0.338 - 0.051*year	0.316	0.147	Stable
HIV in pregnant women	- 0.003 + 0.002*year	0.249	0.209	Stable
Exogenous intoxications	-0.004 + 0.001*year	0.333	0.134	Stable
Visceral leishmaniasis	0.019 - 0.002*year	0.001	0.981	Stable
Malaria	0.014 - 0.002*year	0.333	0.134	Stable
Anti-rabies vaccine	4.330 - 0.368*year	0.752	0.005	Decreased
Exanthema lesions	0.385 - 0.055*year	0.593	0.025	Decreased
Syphilis	-1.073 + 0.49*year	0.767	0.004	Increased
Male urethral discharge	-0.182 + 0.176*year	0.623	0.020	Increased
Chagas's disease	- 0.146 + 0.070*year	0.620	0.020	Increased
American cutaneous leishmaniasis	-0.061 + 0.037*year	0.509	0.047	Increased
Syphilis in pregnancy	0.006 + 0.024*year	0.553	0.034	Increased
Adverse effects after vaccination	- 0.027 + 0.013*year	0.725	0.007	Increased
<b>Total</b>	<b>57.320+ 1.196*year</b>	<b>0.056</b>	<b>0.574</b>	<b>Stable</b>

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

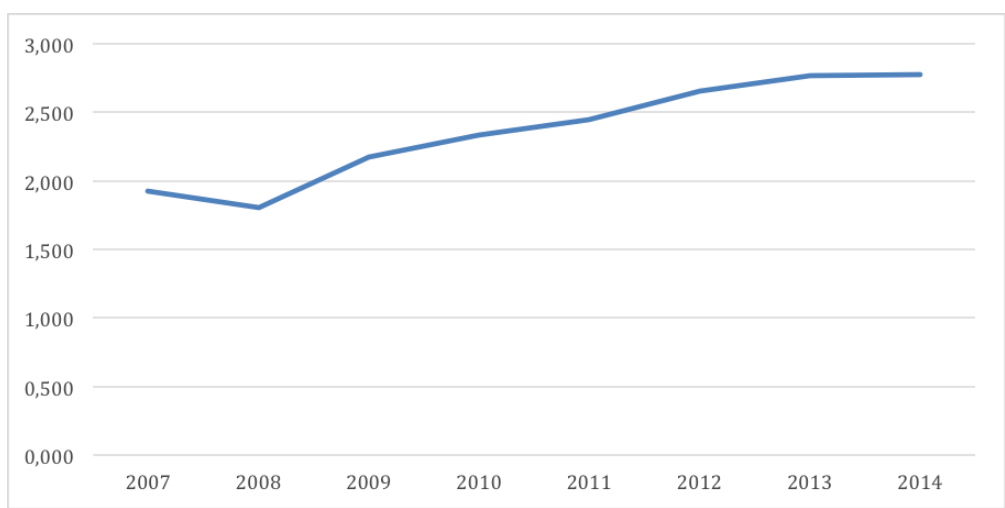


Figure 1: Historical series of the proportion of prisons' population by the annual population per 1,000 people, Brazil, 2007-2014

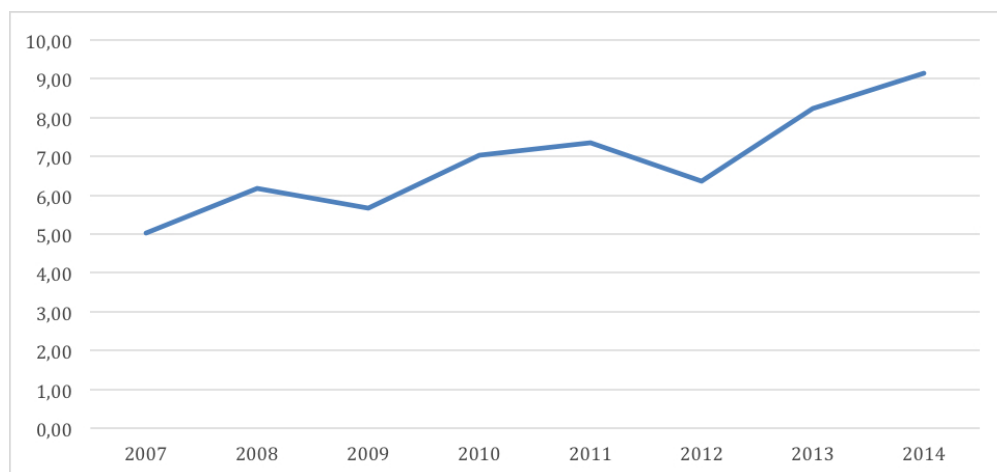


Figure 2: Trends of compulsory notification diseases reported among prisoners' population in Brazil, 2007-2014



STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of cross-sectional studies

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2 and 3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6-7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	Not applicable
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	7
<b>Results</b>			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	7
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-8
		(b) Report category boundaries when continuous variables were categorized	7-8
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Health morbidity in Brazilian prisons: A time trends study from national databases

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-026853.R1
Article Type:	Research
Date Submitted by the Author:	21-Jan-2019
Complete List of Authors:	Job Neto, Francisco; Universidade Federal do Espirito Santo, Programa de Pós-Graduação em Doenças Infecciosas Miranda, Raquel; Universidade Federal do Espirito Santo Coelho, Ronaldo; Ministerio da Saude Gonçalves, Cinthya; Universidade Federal do Espirito Santo Zandonade, Eliana; Universidade Federal do Espirito Santo, Programa de Pós-Graduação em Saúde Coletiva Miranda, Angelica; Universidade Federal do Espirito Santo, Department of Social Medicine
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Epidemiology, Health policy
Keywords:	Surveillance, Prisoners, Notified diseases, Brazil

SCHOLARONE™  
Manuscripts

1  
2  
3 **Health morbidity in Brazilian prisons: A time trends study from national**  
4  
5 **databases**  
6  
7  
8  
9

10 **Authors:**

11 Francisco Job Neto

12 Universidade Federal do Espírito Santo, Vitória, Brazil

13 Raquel Barbosa Miranda

14 Universidade Federal do Espírito Santo, Vitória, Brazil

15 Ronaldo Coelho

16 Ministério da Saúde, Brasília, Brazil

17 Cinthya Paiva Gonçalves

18 Universidade Federal do Espírito Santo, Vitória, Brazil

19 Eliana Zandonade

20 Universidade Federal do Espírito Santo, Vitória, Brazil

21 Angélica Espinosa Miranda

22 Universidade Federal do Espírito Santo, Vitória, Brazil

23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42 **Corresponding author:**

43 Dr. Angelica Espinosa Miranda

44 Av. Marechal Campos, 1468. Maruípe – Vitória – ES

45 ZC: 29040-091 - Brasil

46 E-mail: [espinosa@ndi.ufes.br](mailto:espinosa@ndi.ufes.br)

47  
48  
49  
50  
51  
52  
53  
54  
55  
56 **Word count:** 5726 words, including abstract, strengths and limitations of the study  
57  
58 and references.  
59  
60

## Abstract

**Objective:** The goal of this study was to explore the surveillance data about mandatory reporting diseases, included in the official information systems, and evaluate the historical trend analysis in prisoners in Brazil.

**Design:** A time trends study was performed using secondary data from prisons' health units.

**Setting:** Nationwide representative data of Brazilian prisoners obtained from 2007-2014 health and prison information systems database were analyzed. These data are carried out by units identified as prison health facilities.

**Primary outcome measures:** Diseases diagnosis and individual data were available at the National System of Disease Notification (SINAN), Mortality Information System (SIM) and Prison Registration Systems (INFOPEN and GEO prisons). Analyses of the notification data performed in the SINAN at the national level. SINAN was consolidated with SIM, INFOPEN, and GEO prison data.

**Results:** A total of 23,235 cases of compulsory disease notification causing morbidity were reported in prison units in Brazil; of these cases, 20,003 (85.6%) were men and 3,362 (14.4%) were women. Over time, the proportion of prisoners increased from 1.92 per 1,000 inhabitants in 2007 to 2.77 per 1,000 inhabitants in 2014 (rising trend). From a total of 27 states, 12 of them presented a growth in disease notifications, 14 were stable, and in only one state was there a decrease in notifications. There was an increase in notifications in the country as a whole.

Tuberculosis (64.4%), dengue (9.1%), AIDS (9.0%), and viral hepatitis (5.9%) were among the most frequently reported diseases during the study period.

1  
2  
3 **Conclusion:** Despite showing stable tendencies, our results show high rates of  
4 diseases in Brazilian prisons. Prison health services should not be isolated but  
5 integrated into regional and national health and justice systems.  
6  
7  
8  
9

10  
11  
12 **Keywords:** Surveillance; Prisoners; Notified diseases; Brazil.  
13  
14  
15  
16  
17  
18  
19  
20

### 21 **STRENGTHS AND LIMITATIONS OF THIS STUDY**

- 22 • This study was nationwide representative and included data about mandatory  
23 reporting diseases cases that were notified in prisons units in Brazil.
- 24 • These data presented an eight years trend analysis of notified diseases in  
25 Brazilian prisons' units.
- 26 • The use of secondary data presented some limitations but it represented the  
27 best information where there was not other source of data.
- 28 • These data were carried out from all units identified as prison health facilities  
29 in Brazil.
- 30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## Introduction

The United Nations Standard Minimum Rules for the Treatment of Prisoners, known as the Nelson Mandela Rules, is a resolution adopted by the General Assembly on December 17, 2015, which recommends regarding health care services that: *(a) The provision of health care for prisoners is a State responsibility. Prisoners should enjoy the same standards of health care that are available in the community, and should have access to necessary health care services free of charge without discrimination based on their legal status; and (b) Health care services should be organized in close relationship with the general public health administration in a way that ensures continuity of treatment and care, including HIV, tuberculosis, and other infectious diseases as well as drug dependence*<sup>1</sup>. In other words, the fact that individuals are in prison does not mean that they have reduced rights to adequate health care. Despite finding themselves deprived of their liberty, prisoners are still entitled to have their fundamental rights protected and the prison system must have the proper infrastructure to offer them rights such as health, education, work, and other needs that in general should not be suppressed by the court's ruling. Those rights if fulfilled, will contribute to the process of social rehabilitation<sup>2, 3</sup>.

In Brazil, this paradox is aggravated by the adverse conditions found in prisons, such as the precariousness of physical spaces, scarcity of specialized human resources, lack of adequate health care, and presence of structural violence practices<sup>4,5,6</sup>. In the specific case of health conditions, instead of being in an environment able to safeguard physical and mental health, distress is often faced with an unhygienic and unhealthy environment. It facilitates the spread of communicable diseases, injuries related to violence, and mental disorders<sup>2,7</sup>.

1  
2  
3 Communicable diseases are frequently transmitted among prisoners, and the  
4 rates of HIV, viral hepatitis, and tuberculosis are much higher and complicated to  
5 deal with when compared to the general population<sup>8,9,10,11,12,13</sup>. International and  
6 national studies also report a high prevalence of mental health problems, including  
7 substance abuse disorders, and a higher prevalence of non-communicable diseases  
8 among prisoners<sup>14,15,16,17</sup>.

9  
10  
11  
12  
13  
14  
15  
16  
17 Historically in Brazil, the concern regarding health care for prisoner  
18 populations has been low, fragmented, and vertical; insofar, as policies have been  
19 developed they were limited to aspects that focused on isolated health problems and  
20 specific diseases<sup>5</sup>. In 2014, the Brazilian Ministry of Health formulated the “National  
21 Policy for Integral Attention to the Health of Incarcerated Persons in the Prison  
22 System” in order to organize health activities and services for prisons within the  
23 scope of the national primary care model<sup>4</sup>. This initiative extended the effective  
24 coverage of the National Health System (SUS) to this particularly vulnerable  
25 population, seeking to achieve the universality of the SUS while guarantying the  
26 constitutional right to health with equity and integrality for prisoners.  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39

40 The imprisonment organization in Brazil is a responsibility of each federal  
41 state, producing different profiles depending of the state administration. According to  
42 the most recent report of the National Prison Monitoring Database of the National  
43 Justice Council<sup>18</sup>, the total population of inmates in Brazil is 630,092 inmates  
44 distributed in 1.423 state prisons units and four federal prisons units, 95% are men  
45 and 5% are women. Since the expansion of effective coverage of SUS for prisoners  
46 in Brazil, the epidemiological profile of this public health system, considered one of  
47 the largest in the world, has been alarming. Available data are scarce, fragmented,  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3 and related to certain types of injuries, which makes difficult to understand the whole  
4  
5 situation.  
6  
7

8 The only available information is about the mandatory reporting diseases that  
9  
10 are in the official information systems from the Ministry of Health and the Ministry of  
11  
12 Justice, but it is usually incomplete. The goal of this study was to explore the  
13  
14 surveillance data about mandatory reporting diseases, included in the official  
15  
16 information systems, and evaluate the historical trend analysis in prisoners from  
17  
18 Brazil.  
19  
20  
21  
22  
23

## 24 **Methods**

### 25 **Type of study**

26  
27 This study was a time trends evaluation, conducted using secondary data, from  
28  
29 mandatory reporting diseases cases from the incarcerated population in Brazil from  
30  
31 2007 to 2014. Diseases diagnosis and individual data were available at the National  
32  
33 System of Disease Notification (SINAN), Mortality Information System (SIM), and  
34  
35 Prison Registration Systems (INFOPEN and GEO prisons). The units identified as  
36  
37 prison's health facilities in the National Health System sent the information to the  
38  
39 official information systems.  
40  
41  
42  
43  
44  
45  
46

### 47 **Patient and Public Involvement**

48  
49 Databases used in this study were obtained from the Ministry of Health,  
50  
51 Ministry of Justice and the National Council of Justice. They will have access to the  
52  
53 results of this study to be able to implement health access strategies for this  
54  
55 population. Patients and public were not directly involved in the study.  
56  
57  
58  
59  
60

## Variables

The following variables were studied: state of origin and year of notification (the majority of prisons facilities are administrated by states), gender, age, ethnicity, schooling, and notified diseases following the International Classification of Diseases, version 10 (ICD-10). In Brazil, the notified diseases are included in the list of mandatory reporting diseases. They are selected through criteria such as magnitude, dissemination potential, social transcendence, vulnerability, availability of control measures and international commitment with eradication programs obliging and universalizing reporting. The reports are important for the rapid control of those events that require prompt intervention<sup>19</sup>.

After performing descriptive analysis the following indicators were proposed: (a) Proportion of prison population by state population according to the Brazilian Institute for Geography and Statistics (IBGE) [(prison population per year/IBGE population in December per year)\*1,000]; (b) Proportion of reported cases per state, geographical region, and year [(cases reported per year/prison population in December per year)\*1,000]; (c) Proportion of notified diseases in relation to denominator prison population [(diseases notified per year/prison population in December per year)\*10,000].

## Data analysis

To gather epidemiological data on mandatory reporting diseases in the incarcerated population, analyses of SINAN notification data at the national level were performed. SINAN data was consolidated with SIM, INFOPEN, and GEO prison data. Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 20.0) and Stata statistical software, version 11.2. A

1  
2  
3 descriptive analysis was performed including frequency distribution for qualitative  
4 variables. Figures were prepared from the historical series and linear regression  
5 models of the variables observed throughout the study years were estimated. In  
6 addition, we presented the regression model and the value of R<sup>2</sup>, which indicates the  
7 portion of the variability explained by the linear trend; p-value of F-test was also  
8 estimated, as well as the classification of the trend as stable (no trend), increasing, or  
9 decreasing. The level of significance was set at 5%.

### 21 **Ethical procedures**

22 This study was carried out with authorization from the Ministry of Health, which  
23 released the databases without disclosing individual identification data. This study  
24 was submitted to the Ethics Committee of the Health Sciences Center in the Federal  
25 University of Espirito Santo and it was approved under number 1.058.616/2015.

### 35 **RESULTS**

36 Within the period of study, a total of 23,235 cases of mandatory reporting  
37 diseases were notified in prison units in Brazil, of which 20,003 (85.6%) cases were  
38 in men and 3,362 (14.4%) in women. Over time, the proportion of prisoners  
39 increased from 1.92 per 1,000 inhabitants in 2007 to 2.77 per 1,000 inhabitants in  
40 2014 (rising trend); data are shown in Figure 1. This estimation was done using the  
41 prison population per year/IBGE population in December per year\* 1,000. The prison  
42 population in Brazil was 364,676 people in December 2007 and 563,526 in  
43 December 2014.

44 The southeastern region is the geographic area with the largest number of  
45 prisoners in Brazil and that which reported the highest number of cases of disease  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 notifications, a total of 13,149 (56.3%) cases; São Paulo state had the highest  
4 number of notifications. Subsequently, the south and northeast regions reported  
5 more cases, with 3,231 (13.8%) and 3,213 (13.8%) cases, respectively. In general, it  
6 was observed that the number of diseases notifications increased over the years,  
7 which may represent a greater access to health services. Figure 2 shows the  
8 proportions of disease reports in Brazil per year, by the prison population per 1,000  
9 inhabitants.

10  
11  
12  
13  
14  
15  
16  
17  
18  
19 Table 1 presents the linear regression model with the proportion of cases  
20 reported by geographical regions and states of Brazil in the incarcerated population.  
21 The regression models were used to measure trends in the proportion of cases  
22 reported in each state and in the general total of Brazil between years 2007 and  
23 2014. This table presents the model and the value of R<sup>2</sup>, which indicates the  
24 proportion of the variability explained by the linear trend. According to the results, it  
25 was observed that from the total of 27 states, 12 of them presented a growth in  
26 disease notifications, 10 were stable, only one presented a decrease in disease  
27 notifications and four states (one from the North and three from the Northeast  
28 Regions) did not notify any case of disease during the period. These four states  
29 present less disadvantage economical conditions. For Brazil, in general, there was  
30 an increase in disease notifications.

31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47 Most mandatory reporting diseases are communicable diseases. Tuberculosis  
48 (70.1%), AIDS (7.5%), syphilis (5.6%), dengue (4.5%), and viral hepatitis (3.5%) are  
49 among the most frequently reported diseases in 2014 and also during all the study  
50 period. It is also interesting to note the presence of anti-rabies vaccine (2.1%) among  
51 the frequent ones (Table 2).

1  
2  
3 Table 3 describes the results of the linear regression model to measure the  
4 trends in the proportion of cases reported between the years 2007 and 2014,  
5 according to the mandatory reporting disease. The cases notification increased in  
6 this period for syphilis and syphilis in pregnancy, male urethral discharge, Chaga's  
7 disease, American cutaneous leishmaniasis and adverse effects after vaccination.  
8 Only the anti-rabies human vaccine demand and the exanthema lesions decreased  
9 during the study years.  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20

## 21 **DISCUSSION**

22  
23 It is the first study including nationwide representative health data of prisoners  
24 in Brazil. The main contribution of this study was to identify the frequency of  
25 mandatory reporting diseases in Brazilian prisons and its trends. The mandatory  
26 reporting of diseases increased in the majority of Brazilian states and main notified  
27 diseases were stable during the study period, independent of the geographical  
28 region. In general, these results can be explained by improvements in the  
29 surveillance system and because of the presence of health care teams inside  
30 prisons.  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41

42 Tuberculosis, AIDS, Dengue fever, and viral hepatitis were the most frequent  
43 notified diseases in the period. These data are in agreement with other studies that  
44 show high rates of tuberculosis in Brazilian prisons<sup>20,21</sup>. Regarding HIV, a study in the  
45 central-west region of São Paulo state found 1.6% of infection in 12 prisons<sup>11</sup>. A  
46 literature review on HIV and tuberculosis in sub-Saharan African prisons identified  
47 data from only 24 of the 49 countries in the region. In countries where data were  
48 available, they were frequently of low quality and hardly nationally representative.  
49 The prevalence of HIV infection ranged from 2.3% to 34.9%, and of tuberculosis from  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 0.4 to 16.3% in prisoners; they nearly always had a higher prevalence of both  
4 diseases than did the non-incarcerated population in the same country<sup>9</sup>. A wide-  
5 ranging literature review, including data published between 2005 and 2015, aimed to  
6 understand the global epidemiology of these infections in prisoners and found that  
7 3.8% had HIV, 15.1% had HCV, 4.8% had chronic HBV, and 2.8% had active  
8 tuberculosis. The authors found higher rates in prison populations when compared to  
9 general population, mainly because of the criminalization of drug use and the  
10 detention of people who use drugs<sup>22</sup>.

21 Syphilis and male urethral discharge were among the infections that presented  
22 increased notification rates in the study period. It is important to highlight that the  
23 number of syphilis cases among adults in Brazil has been consistently increasing,  
24 mainly in the vulnerable population, since 2010<sup>23</sup>. The situation is not different among  
25 prisoners in the country, who present even a higher rate of the infection<sup>24</sup>. Prisons  
26 are known to be high-risk settings for the spread of sexually transmitted infections  
27 (STIs). A study from Ghana described high prevalence rates of HIV (5.9%), syphilis  
28 (16.5%), and HBsAg (25.5%) among inmates<sup>25</sup>. Also, a study from Indiana (USA)  
29 described higher rates of STIs in a cohort of individuals released from prison than in  
30 the general population, with rates in the one-year after setting free being 2 to 7 times  
31 higher for chlamydia, 5 to 24 times higher for gonorrhoea, and 19 to 32 times higher  
32 for syphilis compared to rates in the general population. Inmates, whether they enter  
33 the correctional system with STIs or contract them while in prison, become a risk to  
34 public health once they are released<sup>26</sup>. The correctional system should be deeply  
35 committed to STIs testing and STIs reduction techniques in prisons, because the STI  
36 epidemic continues to be part of reality in several prisons<sup>2,7</sup>.

1  
2  
3 Historically in Brazil, health care for inmates has been performed in  
4 fragmented and vertical programs (routine immunization, screening for tuberculosis,  
5 prevention of HIV and other sexually transmitted infections) <sup>6,7</sup>. There is not an  
6 infectious or chronic diseases prevention program in Brazilian prisons. The country  
7 does not have a general picture of the situation and most of the published data in  
8 Brazil concerning the incarcerated population have mainly focused on HIV/AIDS, viral  
9 hepatitis, and tuberculosis and are from specific states or regions<sup>10,11,12</sup>. It is  
10 necessary to analyze the situation of this population from a larger perspective/scope,  
11 since other health problems are present, such as dengue, with changes in behavior  
12 during epidemic peaks, requiring specific approaches.  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

26 Planning and executing health care programs for the prison population is a  
27 global concern. Prisoners also have high levels of mental illness, chronic disease,  
28 and drug use, above those of their populations of origin<sup>6,7</sup>. Health problems resulting  
29 from other conditions of confinement have not been the object of health care actions,  
30 which would allow incarcerated people to have access to health care in an integral  
31 and effective way. In Brazil, these diseases are not included in the list of mandatory  
32 reporting diseases. In addition to these facts, the prisoners' conjugal visits can result  
33 in the circulation of pathogens between the prison system and the community  
34 surrounding it<sup>27</sup>.  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46

47 The use of secondary data presents some limitations, that is, the use of  
48 information contained in systems such as SINAN, SIM, INFOPEN, and GEO Prisons,  
49 may not reflect the magnitude of diseases among prisoners. The problem of  
50 underreporting and inadequacy of data completeness is known; however, the  
51 information contained in these information systems can provide an initial basis for  
52 monitoring and analyzing the health situation in a population that has no other data  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 sources available. This information originates in health care units and data can take a  
4 long time to arrive at the Ministry of Health what can cause delayed notification. The  
5 use of multiple sources to retrieve the information of disease cases in the prison  
6 systems helps considerably to diminish the problems but does not replace the most  
7 accurate picture that could have been available if follow-up information of all exposed  
8 individuals was available.  
9

10  
11  
12  
13  
14  
15  
16  
17 Therefore, although currently available data may be underestimating the real  
18 magnitude of health problems in Brazilian prisons, it is the best available and can  
19 help for planning appropriate prevention and health care strategies addressed to this  
20 vulnerable population. Prisoners in Brazil do not have adequate access to health  
21 care services and neither is properly reached by the health care system. The use of  
22 SINAN as a monitoring tool is of great relevance for planning health care strategies in  
23 Brazil, and this applicability must be transferred to the prison system since it will  
24 allow reorienting attention to policies concerning the health of incarcerated people.  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34

35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The increase of diseases notification among prisoners is a signal of the improvement of the health care for this population and can contribute for the better quality of care. These data are critical to assess the quality of the health system's response and evaluate the vulnerability of the incarcerated population for accessing health care<sup>6</sup>. The National Policy for Integral Attention to the Health of Incarcerated Persons in the Prison System in Brazil<sup>4</sup> foresees the implementation of primary health units in prisons with more than 100 people, and the incorporation of a multi-professional team composed at least of five professionals (physician, nurse, psychologist, social worker, and dentist) and one undergraduate professional (nursing technician). In prisons with up to 100 prisoners, a health team designated by the local Municipal Health Department must perform health care. Access to complex



1  
2  
3 levels of health care provided for the National Policy requires to be agreed on and  
4 defined within each state government<sup>4</sup>. The urgency to implement a public policy of  
5 social inclusion focused on promoting human rights for this population indicates the  
6 importance of reorienting the health care model. The formulation of the National  
7 Health Policy in the Penitentiary System in Brazil is an initiative aimed to guarantee  
8 the constitutional rights of health care and access to the National Health System for  
9 prisoners with equity, integrality, and universality; additionally, this policy will  
10 contribute to organizing actions and health services.

11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
Public health must be combined with to criminal justice to offer medical care to  
prison populations, because, generally, they come from areas of society with  
significant levels of deficient health and social exclusion<sup>27, 28</sup>. Prisoners tend to have  
poorer physical, mental, and social health compared to the general population<sup>27, 29, 30</sup>.  
Many prisoners have had little or no regular contact with health services before  
entering prison. Mental illness, drug dependence, and communicable diseases are  
the prevailing health problems among prisoners<sup>29,31</sup>. Health caring for prisoners is an  
essential task and its main activities are critical. However, a full primary care service  
also includes elements of disease prevention and health promotion and should be  
accomplished by an interdisciplinary team with sufficient qualified personnel acting in  
full clinical independence<sup>1, 29</sup>.

Measures to implement synchronized information between the criminal justice  
and public health organizations could generate improvements on the access to  
health care and medical information of prisoners facilitating the transition of care  
between the health care during imprisonment and after prisoners' releasing<sup>3</sup>. It is  
important to ensure that medical files are transferred to health care services of the

1  
2  
3 accepting institutions upon assignment of a prisoner, as well as subject to medical  
4 confidentiality<sup>1</sup>.  
5  
6  
7  
8  
9

## 10 **CONCLUSIONS**

11  
12 Data regarding the health situation in prisons are important for properly  
13 developing public policies; determine priorities; guiding the planning and  
14 accomplishment of the Public Health System actions. Physicians and other health  
15 care professionals working in the prison environment should be included in strategies  
16 to reduce health disparities in this population; these professionals should receive  
17 continuous training to better understand the peculiarities of health care in prisons, the  
18 diseases notification system, the prison environment, and different types of prison  
19 unities (closed, semi-open, and open regimes). Prison health services should not be  
20 isolated but integrated into the regional and national health and justice systems.  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

### 37 **Competing interests**

38 The authors declare that they have no competing interests.

39  
40  
41  
42  
43  
44 **Data sharing statement:** Database used in this paper belongs to the Brazilian  
45 Ministry of Health. Data can be available upon request after contacting Ronaldo  
46 Coelho at [ronaldo.coelho@aids.gov.br](mailto:ronaldo.coelho@aids.gov.br)  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

### 54 **Authors' contributions**

55 FJN, contributed to the study design, data collection and revised the final version of  
56 the manuscript. RBM and CPG contributed to the literature review, database revision  
57  
58  
59  
60

1  
2  
3 and revised the final version of the manuscript. EZ and RC conducted the data  
4  
5 analysis, and contributed to the results section and revised the final version of the  
6  
7 manuscript. AEM designed the study, supervised the design of the questionnaire  
8  
9 plan and data collection, the writing and revised the final version of the manuscript.  
10  
11  
12 All authors read and approved the final manuscript.  
13  
14  
15  
16

17 **Funding:** Brazilian Ministry of Health provided funding support for this study:  
18  
19 Cooperation term #181/2013, Process #25000.184518/2013-41.  
20  
21  
22

## 23 REFERENCES

- 24  
25  
26 1. United Nations. United Nations Standard Minimum Rules for the Treatment of  
27  
28 Prisoners (the Nelson Mandela Rules). Adopted and proclaimed by General  
29  
30 Assembly resolution 70/175 on the Seventieth session, agenda item 106, 08  
31  
32 January 2016. New York, United Nations. 2016. Accessed 02 September 2013.  
33  
34 Available at: [https://www.unodc.org/documents/justice-and-prison-](https://www.unodc.org/documents/justice-and-prison-reform/Brochure_on_the_UN_SMRs.pdf)  
35  
36 reform/Brochure\_on\_the\_UN\_SMRs.pdf  
37  
38  
39 2. WHO (2013). Good governance for prison health in the 21st century. A policy brief  
40  
41 on the organization of prison health. Copenhagen, WHO Regional Office for Europe,  
42  
43 2013. Accessed 20 July 2017. Available at  
44  
45 [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0017/231506/Good-governance-for-](http://www.euro.who.int/__data/assets/pdf_file/0017/231506/Good-governance-for-prison-health-in-the-21st-century.pdf)  
46  
47 prison-health-in-the-21st-century.pdf  
48  
49  
50 3. Rich JD, Chandler R, Williams BA, Dumont D, Wang EA, Taxman FS, et al. How  
51  
52 health care reform can transform the health of criminal justice-involved individuals.  
53  
54 Health Aff (Millwood). 2014;33(3):462-7. doi: 10.1377/hlthaff.2013.1133. Review.  
55  
56  
57  
58  
59  
60

- 1  
2  
3 4. Brasil (2014). Portaria Interministerial n. 1, de 02 de janeiro de 2014. Institui a  
4  
5 Política Nacional de Atenção Integral à Saúde das Pessoas Privadas de Liberdade  
6  
7 no Sistema Prisional (PNAISP) no âmbito do Sistema Único de Saúde (SUS). Diário  
8  
9 Oficial da União, Brasília, DF, n. 2, Seção 1, p. 18-21. Available at  
10  
11 [http://bvsms.saude.gov.br/bvs/saudelegis/gm/2014/pri0001\\_02\\_01\\_2014.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2014/pri0001_02_01_2014.html)  
12  
13
- 14 5. Fernandes LH, Alvarenga CW, Santos LL, Pazin Filho A. The need to improve  
15  
16 health care in prisons. *Rev Saude Publica*. 2014; 48(2):275-83.  
17  
18
- 19 6. Barcellos AP. Sanitation rights, public law litigation, and inequality: a case study  
20  
21 from Brazil. *Health Hum Rights*. 2014 Dec 11;16(2):E35-46.  
22  
23
- 24 7. Møller L, Stöver H, Jürgens R, Gatherer A, Nikogosian H. editors. Health in  
25  
26 prisons: a WHO guide to the essentials in prison health. Copenhagen, Denmark:  
27  
28 World Health Organization, Europe. 2007 pages: 7-13. Accessed 20 August 2017.  
29  
30 Available at: <http://www.who.int/hiv/topics/idu/prisons/e90174.pdf>.  
31  
32
- 33 8. Todrys KW, Amon JJ, Malembeka G, Clayton M. Imprisoned and imperiled:  
34  
35 access to HIV and TB prevention and treatment, and denial of human rights, in  
36  
37 Zambian prisons. *J Int AIDS Soc*; 2011, 14:8. doi: 10.1186/1758-2652-14-8.  
38  
39
- 40 9. Telisinghe L, Charalambous S, Topp SM, Herce ME, Hoffmann CJ, Barron P, et al.  
41  
42 HIV and tuberculosis in prisons in sub-Saharan Africa. *Lancet*. 2016,  
43  
44 388(10050):1215-27. doi: 10.1016/S0140-6736(16)30578-5.  
45  
46
- 47 10. Carbone AS, Paião DS, Sgarbi RV, Lemos EF, Cazanti RF, Ota MM, et al. Active  
48  
49 and latent tuberculosis in Brazilian correctional facilities: a cross-sectional study.  
50  
51 *BMC Infect Dis*. 2015, Jan 22;15:24.  
52  
53
- 54 11. Sgarbi RV, Carbone AS, Paião DS, Lemos EF, Simionatto S, Puga MA, et al. A  
55  
56 Cross-Sectional Survey of HIV Testing and Prevalence in Twelve Brazilian  
57  
58  
59  
60

- 1  
2  
3 Correctional Facilities. PLoS One. 2015 Oct 14; 10(10):e0139487. doi:  
4  
5 10.1371/journal.pone.0139487.  
6  
7  
8 12. Puga MA, Bandeira LM, Pompilio MA, Croda J, Rezende GR, Dorisbor LF, et al.  
9  
10 Prevalence and Incidence of HCV Infection among Prisoners in Central Brazil. PLoS  
11  
12 One. 2017 Jan 6;12(1):e0169195. doi: 10.1371/journal.pone.0169195.  
13  
14  
15 13. Sander G, Lines R. HIV, Hepatitis C, TB, harm reduction, and persons deprived  
16  
17 of liberty: What standards does international human rights law establish? Health Hum  
18  
19 Rights; 2016, 18(2):171-182.  
20  
21  
22 14. Fazel S, Yoon IA, Hayes AJ. Substance use disorders in prisoners: an updated  
23  
24 systematic review and meta-regression analysis in recently incarcerated men and  
25  
26 women. Addiction. 2017;112(10):1725-1739. doi: 10.1111/add.13877.  
27  
28  
29 15. Rosen DL, Hammond WP, Wohl DA, Golin CE. Disease prevalence and use of  
30  
31 health care among a national sample of black and white male state prisoners. J  
32  
33 Health Care Poor Underserved; 2012, 23(1):254-72. doi: 10.1353/hpu.2012.0033.  
34  
35  
36 16. Wakeman SE, Rich JD. Addiction Treatment Within U.S. Correctional Facilities:  
37  
38 Bridging the Gap Between Current Practice and Evidence-Based Care. J Addict Dis;  
39  
40 2015, 34(2-3):220-5. doi: 10.1080/10550887.2015.1059217.  
41  
42  
43 17. Mendes dos Santos M, Quintana MI, Moreira FG, Taborda JG, Mari JJ, Andreoli  
44  
45 SB. Drug-related disorders and the criminal and clinical background of the prison  
46  
47 population of Sao Paulo State, Brazil. PLoS One. 2014;9:e113066.  
48  
49  
50 18. Brazil 2018. Prisoners' National Registry. National Data Bank of Arrest Warrants  
51  
52 – BNMP. CNJ. Accessed 16 January 2019. Available at:  
53  
54 [http://www.cnj.jus.br/files/conteudo/arquivo/2018/08/57412abdb54eba909b3e1819fc](http://www.cnj.jus.br/files/conteudo/arquivo/2018/08/57412abdb54eba909b3e1819fc4c3ef4.pdf)  
55  
56 [4c3ef4.pdf](http://www.cnj.jus.br/files/conteudo/arquivo/2018/08/57412abdb54eba909b3e1819fc4c3ef4.pdf)  
57  
58  
59  
60

- 1  
2  
3 19. WHO. International health regulations (2005) - 3rd ed. Accessed at  
4 <http://apps.who.int/iris/bitstream/handle/10665/246107/9789241580496->  
5 [eng.pdf;jsessionid=E2AA8453D931DF8FD4E9D4868E65F9A9?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/246107/9789241580496-eng.pdf;jsessionid=E2AA8453D931DF8FD4E9D4868E65F9A9?sequence=1)  
6  
7  
8  
9  
10 20. Valença MS, Scaini JL, Abileira FS, Gonçalves CV, von Groll A, Silva PE.  
11 Prevalence of tuberculosis in prisons: risk factors and molecular epidemiology. *Int J*  
12 *Tuberc Lung Dis* 2015; 19(10):1182-1187.  
13  
14  
15  
16 21. Sánchez A, Larouzé B. Tuberculosis control in prisons, from research to action:  
17 the Rio de Janeiro, Brazil, experience. *Ciênc. saúde coletiva* [Internet]. 2016 July  
18 [cited 2019 Jan 18] ; 21( 7 ): 2071-2080. <http://dx.doi.org/10.1590/1413->  
19 [81232015217.08182016](http://dx.doi.org/10.1590/1413-81232015217.08182016).  
20  
21  
22  
23  
24  
25 22. Dolan K, Wirtz AL, Moazen B, Ndeffo-Mbah M, Galvani A, Kinner SA, et al.  
26 Global burden of HIV, viral hepatitis, and tuberculosis in prisoners and detainees.  
27 *Lancet*. 2016 Sep 10; 388(10049):1089-1102. doi: 10.1016/S0140-6736(16)30466-4.  
28  
29  
30  
31  
32 23. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de  
33 DST, Aids e Hepatites Virais. *Bol Epidemiol sífilis*. 2017. Brasília (DF) Available from:  
34 <http://www.aids.gov.br/pt-br/pub/2017/boletim-epidemiologico-de-sifilis-2017>.  
35  
36  
37  
38  
39 24. Correa ME, Croda J, Castro ARCM, Oliveira SMV, Pompilio MA, Souza RO, et al.  
40 High Prevalence of *Treponema pallidum* Infection in Brazilian Prisoners. *Am. J. Trop.*  
41 *Med. Hyg.*, 97(4), 2017, pp. 1078–1084. doi:10.4269/ajtmh.17-0098.  
42  
43  
44  
45 25. Adjei AA, Armah HB, Gbagbo F, Ampofo WK, Boamah I, Adu-Gyamfi C, et al.  
46 Correlates of HIV, HBV, HCV and syphilis infections among prison inmates and  
47 officers in Ghana: A national multicenter study. *BMC Infect Dis*. 2008 Mar 7;8:33. doi:  
48 10.1186/1471-2334-8-33.  
49  
50  
51  
52 26. Wiehe SE, Barai N, Rosenman MB, Aalsma MC, Scanlon ML, Fortenberry JD.  
53 Test positivity for chlamydia, gonorrhea, and syphilis infection among a cohort of  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 individuals released from jail in Marion County, Indiana. *Sex Transm Dis.* 2015  
4  
5 Jan;42(1):30-6. doi: 10.1097/OLQ.0000000000000224.  
6

7  
8 27. Binswanger IA, Redmond N, Steiner JF, Hicks LS. Health disparities and the  
9  
10 criminal justice system: an agenda for further research and action. *J Urban Health;*  
11  
12 2012, 89(1):98-107. doi: 10.1007/s11524-011-9614-1.  
13

14  
15 28. Coyle A. Standards in prison health: the prisoner as a patient. In Møller L, Stöver  
16  
17 H, Jürgens R, Gatherer A, Nikogosian H, editors. *Health in prisons: a WHO guide to*  
18  
19 *the essentials in prison health.* Copenhagen, Denmark: World Health Organization,  
20  
21 Europe. 2007, pages: 7-13. Accessed 20 August 2017. Available at:  
22  
23 <http://www.who.int/hiv/topics/idu/prisons/e90174.pdf>.  
24  
25

26  
27 29. Viggiani N. Unhealthy prisons: exploring structural determinants of prison health.  
28  
29 *Sociology of Health and Illness*, 2007, 29(1):115–135.

30  
31 30. Viggiani N. Creating a healthy prison: developing a system wide approach to  
32  
33 public health within an English prison. *Prison Service Journal*, 2012, 202:12–19.  
34

35  
36 31. Hayton P, van den Bergh B, Møller L. Health protection in prisons. The Madrid  
37  
38 Recommendation. *Public Health*, 2010, 124(11):635–636.  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 Figure 1: Historical series of the proportion of prisons' population by the annual  
4 population per 1,000 people, Brazil, 2007-2014  
5  
6  
7  
8  
9  
10  
11  
12  
13

14 Figure 2: Trends of compulsory notification diseases reported among prisons'  
15 population in Brazil, 2007-2014  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

For peer review only



Table 1. Linear regression model with the proportion of cases reported by geographical regions and states of Brazil, 2007-2014.

Region	State	Model	R2	P-value	Trends
Total	Brazil	-6.60 + 1.61*year	0.798	0.003	Increased
North	Acre	0.082 + 1.206*year	0.708	0.009	Increased
	Amazonas	-1.231 + 1.489*year	0.633	0.018	Increased
	Amapá	-0.516 + 0.192*year	0.677	0.012	Increased
	Pará	-0.845 + 0.352*year	0.656	0.015	Increased
	Rondônia	1.539 + 1.149*year	0.324	0.082	Stable
	Tocantins	-0.782 - 0.047*year	0.005	0.865	Stable
	Roraima*	-	-	-	-
Northeast	Ceará	0.974 + 1.043*year	0.620	0.020	Increased
	Paraíba	-1.279 + 0.549*year	0.504	0.048	Increased
	Pernambuco	-1.176 + 1.377*year	0.762	0.003	Increased
	Sergipe	-0.316 + 0.12*year	0.579	0.028	Increased
	Alagoas	2.795 + 0.118*year	0.012	0.799	Stable
	Bahia	18.874 - 0.818*year	0.222	0.238	Stable
	Maranhão*	-	-	-	-
	Piauí*	-	-	-	-
	Rio Grande do Norte*	-	-	-	-
Southeast	Espírito Santo	2.472 + 0.197*year	0.040	0.634	Stable
	Minas Gerais	5.410 + 0.165*year	0.008	0.836	Stable
	São Paulo	5.830 - 0.113*year	0.048	0.602	Stable
	Rio de Janeiro	36.011 - 3.713*year	0.867	0.001	Decreased
Midwest	Distrito Federal	-0.948 + 1.390*year	0.643	0.017	Increased
	Mato Grosso	-0.750 + 3.413*year	0.923	0.001	Increased
	Goiás	15.375 - 0.291*year	0.018	0.749	Stable
	Mato Grosso Sul	0.093 + 0.467*year	0.177	0.299	Stable
South	Rio Grande Sul	4.982 + 2.015*year	0.541	0.037	Increased
	Santa Catarina	-0.271 + 0.095*year	0.546	0.036	Increased
	Paraná	0.075 + 0.008*year	0.008	0.838	Stable

\*One state from the North Region and 3 states from the Northeast region did not notify any case of disease during the period.

Table 2. Cases of diseases reported by information health systems in Brazilian prisons by year, 2007-2014

Notified diseases	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)	2012 n (%)	2013 n (%)	2014 n (%)
Tuberculosis	1083 (60.71)	1385 (65.61)	1679 (71.17)	1944 (62.21)	2384 (68.8)	2275 (69.53)	2526 (55.29)	3062 (70.12)
Dengue fever	77 (4.32)	106 (5.02)	139 (5.89)	574 (18.37)	152 (4.39)	81 (2.48)	800 (17.51)	198 (4.53)
AIDS	270 (15.13)	297 (14.07)	207 (8.77)	223 (7.14)	305 (8.80)	226 (6.91)	343 (7.51)	326 (7.47)
Viral hepatitis	92 (5.16)	112 (5.30)	107 (4.54)	123 (3.94)	257 (7.42)	313 (9.56)	265 (5.80)	154 (3.53)
Anti-rabies vaccine	130 (7.29)	143 (6.78)	149 (6.32)	92 (2.94)	109 (3.15)	127 (3.88)	127 (2.78)	91 (2.08)
Syphilis	2 (0.11)	0 (0.00)	0 (0.00)	9 (0.29)	61 (1.76)	63 (1.93)	201 (4.40)	245 (5.61)
Leprosy	27 (1.51)	30 (1.42)	33 (1.40)	73 (2.34)	44 (1.27)	32 (0.98)	101 (2.21)	82 (1.88)
Male urethral discharge	2 (0.11)	4 (0.19)	3 (0.13)	11 (0.35)	61 (1.76)	55 (1.68)	70 (1.53)	70 (1.60)
Varicella	26 (1.46)	7 (0.33)	18 (0.76)	33 (1.06)	20 (0.58)	26 (0.79)	20 (0.44)	11 (0.25)
Lesions caused by violence	0 (0.00)	0 (0.00)	2 (0.08)	17 (0.54)	38 (1.09)	12 (0.37)	18 (0.39)	9 (0.21)
Leptospirosis	7 (0.39)	12 (0.57)	5 (0.21)	7 (0.22)	10 (0.29)	17 (0.52)	16 (0.35)	5 (0.11)
Chagas' disease	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.03)	5 (0.14)	20 (0.61)	32 (0.70)	15 (0.34)
Syphilis in pregnancy	1 (0.06)	2 (0.09)	2 (0.08)	6 (0.19)	3 (0.09)	13 (0.40)	11 (0.24)	14 (0.32)
American cutaneous leishmaniasis	0 (0.00)	3 (0.14)	2 (0.08)	3 (0.10)	2 (0.06)	0 (0.00)	14 (0.31)	39 (0.89)
Exanthema lesions	20 (1.12)	7 (0.33)	4 (0.17)	3 (0.10)	3 (0.09)	2 (0.06)	3 (0.06)	3 (0.07)
Meningitis	7 (0.39)	2 (0.09)	5 (0.21)	2 (0.06)	2 (0.06)	1 (0.03)	7 (0.15)	23 (0.53)
Accident by venomous animals	24 (1.35)	1 (0.05)	1 (0.04)	2 (0.06)	0 (0.00)	1 (0.03)	3 (0.06)	3 (0.07)
Schistosomiasis	15 (0.84)	0 (0.00)	0 (0.00)	0 (0.00)	5 (0.14)	1 (0.03)	4 (0.09)	4 (0.09)
Adverse effects after vaccination	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.06)	4 (0.12)	2 (0.04)	9 (0.21)
Visceral leishmaniasis	0 (0.00)	0 (0.00)	2 (0.08)	1 (0.03)	2 (0.06)	2 (0.06)	0 (0.00)	0 (0.00)
Pertussis (whooping cough)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (0.09)	3 (0.07)
HIV in pregnant women	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.03)	1 (0.02)	0 (0.00)
Exogenous intoxications	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.02)
Malaria	1 (0.06)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
<b>Total</b>	<b>1784 (100.00)</b>	<b>2111 (100.00)</b>	<b>2358 (100.00)</b>	<b>3125 (100.00)</b>	<b>3465 (100.00)</b>	<b>3272 (100.00)</b>	<b>4569 (100.00)</b>	<b>4367 (100.00)</b>

Table 3. Linear regression model of reported diseases proportion and its trends, 2007-2014.

Notified diseases	Model	R2	P-value	Trends
Syphilis	-1.073 + 0.49*year	0.767	0.004	Increased
Male urethral discharge	-0.182 + 0.176*year	0.623	0.020	Increased
Chagas's disease	- 0.146 + 0.070*year	0.620	0.020	Increased
American cutaneous leishmaniasis	-0.061 + 0.037*year	0.509	0.047	Increased
Syphilis in pregnancy	0.006 + 0.024*year	0.553	0.034	Increased
Adverse effects after vaccination	- 0.027 + 0.013*year	0.725	0.007	Increased
Tuberculosis	38.098 + 0.538* year	0.032	0.670	Stable
Dengue fever	2.861 + 0.579*year	0.078	0.504	Stable
AIDS	7.909 – 0.457*year	0.463	0.063	Stable
Viral hepatitis	2.831 + 0.180*year	0.079	0.501	Stable
Leprosy	0.810 + 0.049*year	0.074	0.514	Stable
Varicella	0.640 - 0.047*year	0.244	0.214	Stable
Lesions caused by violence	0.054 + 0.041*year	0.139	0.363	Stable
Leptospirosis	0.245 - 0.007*year	0.029	0.689	Stable
Meningitis	0.106 - 0.002*year	0.008	0.832	Stable
Pertussis (whooping cough)	- 0.019 + 0.007*year	0.441	0.072	Stable
Schistosomiasis	0.189 - 0.024*year	0.175	0.303	Stable
Accident by venomous animals	0.338 - 0.051*year	0.316	0.147	Stable
HIV in pregnant women	- 0.003 + 0.002*year	0.249	0.209	Stable
Exogenous intoxications	-0.004 + 0.001*year	0.333	0.134	Stable
Visceral leishmaniasis	0.019 - 0.002*year	0.001	0.981	Stable
Malaria	0.014 - 0.002*year	0.333	0.134	Stable
Anti-rabies vaccine	4.330 - 0.368*year	0.752	0.005	Decreased
Exanthema lesions	0.385 - 0.055*year	0.593	0.025	Decreased
<b>Total</b>	<b>57.320+ 1.196*year</b>	<b>0.056</b>	<b>0.574</b>	<b>Stable</b>

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

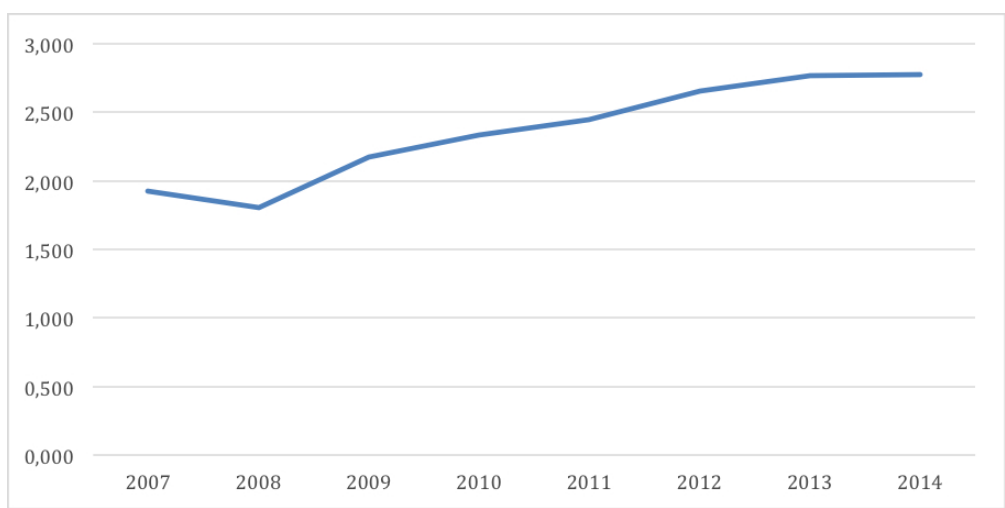


Figure 1: Historical series of the proportion of prisons' population by the annual population per 1,000 people, Brazil, 2007-2014

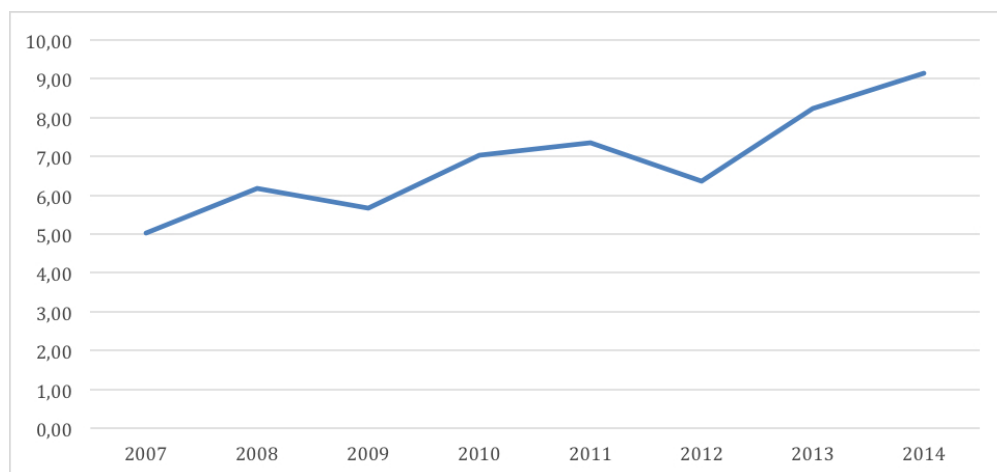


Figure 2: Trends of compulsory notification diseases reported among prisoners' population in Brazil, 2007-2014

**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

Section/Topic	Item #	Recommendation	Reported on page #
<b>Title and abstract</b>	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2 and 3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6-7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	Not applicable
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	7
<b>Results</b>			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	7
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7-8
		(b) Report category boundaries when continuous variables were categorized	7-8
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).