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ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Epidemiological aspects of pulmonary tuberculosis in Mato Grosso do Sul, Brazil

Aspectos epidemiológicos da tuberculose pulmonar em Mato Grosso do Sul

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ABSTRACT: ***Objective:*** To describe the profile and analyze the cases of pulmonary tuberculosis reported in the state of Mato Grosso do Sul from 2001 to 2009, according to the chosen variable categories (gender, age, ethnicity, education, residing in the border area, indigenous population and individuals deprived of liberty). ***Methods:*** An ecological study was conducted from data of reported cases of TB. ***Results:*** Estimates of risk higher than the general population, and even extremely high, were obtained in three specific populations, which certainly requires priority attention from health policies and health network professionals to keep the transmission of tuberculosis under control, including in the population residing in the borders with Bolivia and Paraguay, the indigenous population and individuals deprived of liberty. ***Conclusions:*** This study sought to show the importance of discussing territoriality more adequately in Brazil. A continuous reevaluation of all health programs is needed for populations in each of the areas where they live. Then, it will be possible to correct the incidence rate of tuberculosis for specific populations in the state, taking into account populations in each place of residence and considering their specificities and differences. In conclusion, in the light of the present study, it is necessary to discuss more efficient strategies to control tuberculosis in the various territories of the state of Mato Grosso do Sul if we actually want to minimize this endemic to acceptable levels in our environment.

Keywords: Tuberculosis. Epidemiological profile. Indigenous population. Population without freedom. Borderland population. Vulnerable populations. Borderline Areas.

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RESUMO: ***Objetivo:*** Descrever o perfil e analisar os casos notificados de tuberculose pulmonar, no estado de Mato Grosso do Sul, de 2001 a 2009, segundo categorias de variáveis selecionadas (sexo, faixa etária, raça, escolaridade, domicílio em área de fronteira, população indígena e população privada de liberdade). ***Métodos:*** Realizou-se um estudo ecológico a partir dos dados de notificação de casos de TB. ***Resultados:*** Estimativas de risco mais elevadas do que a população geral, e até extremamente altas, foram obtidas em três populações específicas, o que, certamente, exige atenção prioritária das políticas de saúde ao fim de controlar a transmissão da tuberculose e de profissionais da rede de saúde, as quais incluem a população fronteiriça com a Bolívia e o Paraguai; a indígena e a população privada de liberdade. ***Conclusões:*** Buscou-se mostrar a importância de se discutir, mais adequadamente, a territorialidade no Brasil. É necessária uma constante reavaliação de todos os programas de saúde para as populações de cada espaço onde vivem. Assim, será possível corrigir a taxa de incidência de tuberculose para populações específicas no Estado, levando-se em conta populações em cada local de residência, considerando suas especificidades e diferenças. Conclui-se, com o presente estudo, que é necessário discutir estratégias mais eficientes para o controle da tuberculose nos vários territórios do estado de Mato Grosso do Sul, se quiser, de fato, minimizar essa endemia a níveis aceitáveis em nosso meio.

Palavras-chave: Tuberculose. Perfil epidemiológico. População indígena. População privada de liberdade. População fronteiriça. Populações vulneráveis. Áreas de fronteiras.

INTRODUCTION

Approximately one third of the world population is infected with tuberculosis (TB)[1]. In the World Health Organization (WHO) Global Tuberculosis report of 2010, it was estimated that there are 9.4 million incident TB cases, 14 million prevalent cases, 1.3 million deaths among people who don't have the human immunodeficiency virus (HIV) and 380,000 deaths among HIV-positive people worldwide every year[2].

In developed countries, TB resurfaces as a "re-emerging disease", with the immunodeficiency caused by HIV as its main vehicle, presenting most worrisome characteristics from the standpoint of bacterial resistance. However, emerging or re-emerging, TB has been present in Brazil as a public health problem during the last century[3].

Several reasons can be cited for the increased incidence of the disease: a deteriorating public health system; low effectiveness of control programs; economic crises; intense process of urbanization; increase in the number of people living in shelters and streets; continuous flow of immigrants coming mainly from neighboring countries, where TB is still endemic; and the emergence of an HIV infection epidemic, which puts a new group of patients at risk for TB. The living conditions of a population, such as malnutrition or living in precarious housing, are factors that are also associated with elevated incidence rates[4].

Brazil presented 94,000 new cases of TB in 2006, ranking 16th among the 22 countries with the highest numbers of reported TB cases worldwide. This disease still caused the

death of 5.1% of cases diagnosed in the country in 2006, presenting a ratio of 77% treatment success and 9% default from treatment[5].

The Directly Observed Treatment Short-course (DOTS) strategy has two distinct stages: first, the deployment and second, the sustainability of actions in the health system[6]. The effectiveness of the strategy will be achieved if there is political will, involvement of health professionals and program funding.

In 1999, the Brazilian Public Health System (SUS) implemented the DOTS strategy, stimulating greater control over the search and treatment of cases. However, a good result by the Brazilian TB Control Program (PNCT) requires, as prerequisites, a good structure, organization and function of the health system in the search for respiratory symptoms, in providing assistance to the TB patient, in the management and funding of the program and in the development of reliable information systems[7].

Thus, the PNCT is based on epidemiological surveillance, prevention and control of cases[8]. For effective surveillance, TB cases should be detected early, stimulating the active search for respiratory symptoms. It is estimated that one untreated bacillipherous patient is able to transmit the bacillus for another 10 to 15 people each year[9], and that 5 to 10% of individuals in contact with the bacillus will come to develop the disease. In efforts to control TB, the active search for cases goes through the community, health facilities in major urban centers and high-risk groups, such as the indigenous, people living in shelters, the homeless, prison system inmates and HIV/AIDS carriers[10].

Thus, the present study has two main goals: to describe the profile and analyze the cases of TB reported in the state of Mato Grosso do Sul from 2001 to 2009, according to the chosen variable categories (gender, age, education, ethnicity, municipality, current imprisonment and inclusion of household in border area) and to estimate the proportions of default and mortality, according to year of diagnosis and region of cases studied in order to support the planning of interventions aimed at better TB control in the State.

METHODS

An ecological study was conducted based on data of reported TB cases. The source of data on TB was the System for Disease Surveillance (SINAN)[11], the source of data on the populations was the Brazilian Institute of Geography and Statistics (IBGE)[12].

In the period from 2001 to 2009, 9,400 cases of TB were reported in Mato Grosso do Sul. After the exclusion of 420 cases as non-TB, for presenting a "change in diagnosis" during treatment, 1,144 TB cases with unknown clinical or only extrapulmonary conditions, and additional five cases with unknown municipality of residence, yielded a total of 7,831 cases of pulmonary TB for analysis.

Incidence rates of pulmonary TB per 100,000 inhabitants/year were calculated using the populations available and for each variable category:gender (male, female), age range, education (up to fourth year of elementary school completed; fifth to eighth

year of elementary school completed; high school or higher) and ethnicity (white, black, brown, yellow, indigenous). Municipalities were grouped into macro and microregions according to the Regionalization Plan from the Department of Health of the State of Mato Grosso do Sul[13].

The expected incidence rates were calculated according to two methods proposed by the Brazilian TB Control Program through the publication of Centro de Referência Professor Hélio Fraga (Professor Hélio Fraga Reference Center)[14]. In the first method, the largest number of cases from the last three years were selected, which, added to 10% of that value, produced the expected number of cases for the following year. In the second method, the existence of 1% of respiratory symptoms were considered in the general population of a municipality. This method also recommends that one takes into account that 4% among respiratory symptomatic patients correspond to the number of patients called "smear-positive", which are considered carriers of the bacillus. For the present study, an average of the values produced by the two methods was considered as the expected number of TB cases for each year, in each area of cases studied. The expected number of cases for the period 2007-2009 was obtained by the sum of the number of expected cases in each case one of the three years of the study.

The reference to the association of pulmonary TB with four other health conditions (AIDS, diabetes, addiction to alcohol and mental illness) was also studied.

Finally, the coverage of Directly Observed Treatment (DOT) in the various fields of study, as well as the result of developments in the case, was observed for the two most relevant categories to this article: "treatment success" or "default from treatment".

In the case of individuals deprived of their liberty in prisons or police stations, we used data on inmates from the National Penitentiary Department of the Ministry of Justice[15]. Population data on prison inmates were obtained only for the period from 2007 to 2009.

For the analyzes in this article, the software used was IBM SPSS Statistics, ver. 19.

The project was approved by the Research Ethics Committee of Universidade Federal do Mato Grosso do Sul, filed under number 1928 CAAE 0019.049.000-11.

RESULTS

Table 1, presents the estimates for the number of pulmonary TB cases expected in several areas of study in the period from 2007 to 2009, after the application of two suggested methods[14]. It is possible observe that the state of Mato Grosso do Sul as a whole showed a coverage of 92.2%, i.e., the numbers of cases observed and reported to SINAN[11] accounted for 92.2% of those expected to have been detected during the period from 2007 to 2009.

The macroregions of Dourados, with 95.3%, and Campo Grande, with 93.0%, had coverage above 90%, while the Três Lagoas showed a 77.3% coverage. Regarding the microregions, it was observed that Aquidauana, Corumbá and Ponta Porã showed coverage

slightly greater than 100%. However, the following regions presented coverage below 80%: the microregion of Nova Andradina (60.5%), the macroregion of Dourados and the microregions of Três Lagoas (79.6%) and Paranaíba (65.2%), both in the macroregion on Três Lagoas.

Table 2 presents yearly incidence rates of pulmonary TB (per 100,000 inhabitants/year), obtained for the macro and microregions of the State.

Table 3 shows the incidence rates of pulmonary TB (per 100,000 inhabitants/year) according to the chosen variable categories with confidence intervals of 95% (95%CI) and their relative risks. Results were presented by the year of occurrence of cases, gender, age,

Table 1. Number of expected# and reported pulmonary tuberculosis cases from 2007 to 2009, and coverage of the Tuberculosis Control Program, according to macro and microregions of Mato Grosso do Sul.

Macro/microregions	2007 to 2009			
	Number of cases		Coverage	Confidence interval
	Expected	Reported	%	
Campo Grande macroregion	**1,718**	**1,589**	**92.5**	**91.1 – 93.7**
Aquidauana microregion	201	197	97.9	95.0 – 99.5
Campo Grande microregion	1110	945	85.1	82.9 – 87.2
Corumbá microregion	240	251	104.8	84.3 – 100.0
Coxim microregion	100	94	94.4	87.4 – 97.8
Jardim microregion	119	102	85.6	78.1 – 91.5
Dourados macroregion	**932**	**892**	**95.7**	**94.2 – 96.9**
Dourados microregion	387	339	87.6	83.9 – 90.7
Naviraí microregion	146	150	102.8	93.3 – 99.3
Nova Andradina microregion	98	60	61.5	50.8 – 70.9
Ponta Porã microregion	354	343	97.0	94.6 – 98.4
Três Lagoas macroregion	**298**	**227**	**76.3**	**70.9 – 80.9**
Três Lagoas microregion	196	151	77.1	70.5 – 82.7
Paranaíba microregion	114	76	66.4	57.3 – 74.9
Mato Grosso do Sul	**2,948**	**2,708**	**91.9**	**90.8 – 92.8**

#number of expected cases according to methods listed in the publication from Centro de Referência Professor Hélio Fraga[14], corresponding to the simple arithmetic average of two methods: calculation by increasing case findings and estimate of the number of TB cases, through the estimated number of respiratory symptoms.

ethnicity, education and area of residence. Very low proportions of missing information were found only on the variables: sex (10 cases or 0.1%) and age (4 cases or 0.0%).

From all of the 7,831 cases of pulmonary TB reported, information on the use of the DOTS technique was only available for 2,745 cases (30%), and it was found that this technique was used in 2,124 (77.4% of cases containing this information).

The results of laboratory tests for HIV were available for only 3,799 TB cases, of which 559 (14.7%) were presented as positive.

With regard to information on default from treatment of the 7,831 cases reported, it was not available for 367 (4.7%) cases. For 569 (7.3%), there were indications that the patient was transferred to another unit for monitoring and treatment, and to 35 (0.4%), it was indicated that the patient had developed multidrug-resistant TB. Of the remaining 6,860 cases of TB, 152 deaths by TB were described, with 2.2% of lethality, and 579 (8.4%) deaths by other causes were described. Therefore, 6,129 cases have reached the end of the treatment, with 5,414 (88.3%) successes and 715 (11.7%) cases classified as

Table 2. Annual incidence rates of pulmonary tuberculosis (per 100,000 inhabitants-year), according to macro and microregions of Mato Grosso do Sul, from 2001 to 2009.

Macro and microregion	Rate per 100,000 inhabitants/year								
	2001	2002	2003	2004	2005	2006	2007	2008	2009
Campo Grande macroregion	**39.0**	**32.4**	**38.1**	**44.3**	**40.6**	**35.2**	**36.2**	**40.8**	**40.5**
Aquidauana microregion	48.7	44.9	65.0	62.7	56.6	52.2	44.1	54.8	53.1
Campo Grande microregion	29.0	27.3	26.6	35.4	33.3	27.3	26.5	36.7	35.5
Corumbá microregion	91.7	60.9	88.4	81.5	79.9	84.1	85.8	64.6	60.9
Coxim microregion	55.8	30.4	46.4	41.9	44.9	28.7	36.1	36.0	48.4
Jardim microregion	40.3	29.0	42.4	65.9	36.6	34.7	70.0	35.5	42.7
Dourados macroregion	**48.1**	**41.4**	**43.7**	**42.8**	**42.9**	**35.2**	**40.6**	**40.7**	**40.5**
Dourados microregion	52.7	35.7	32.7	35.7	30.8	30.8	40.9	35.1	31.3
Naviraí microregion	23.8	35.8	37.4	32.4	29.0	32.3	31.9	54.5	40.6
Nova Andradina microregion	17.2	21.4	25.7	26.7	13.8	14.8	16.9	27.6	15.7
Ponta Porã microregion	71.2	64.4	74.9	68.8	85.7	54.4	57.0	47.9	67.3
Três Lagoas macroregion	**32.8**	**34.0**	**30.2**	**29.7**	**33.1**	**34.2**	**30.9**	**30.7**	**26.9**
Três Lagoas microregion	42.7	44.2	33.3	33.5	46.8	36.5	37.9	36.5	26.7
Paranaíba microregion	19.4	20.1	25.8	24.5	14.3	30.9	21.2	22.6	27.0
Mato Grosso do Sul	**41.2**	**35.4**	**38.9**	**42.2**	**40.5**	**35.1**	**36.9**	**39.6**	**39.0**

"default from treatment". Recalculating the ratio for the 5,414 successful treatment cases and of the 715 cases considered as default, using the total of 7,831 cases of TB reported and analyzed in this article as a denominator, percentages obtained were 69.1 and 9.1%, respectively.

The population of individuals deprived of liberty had the following incidence rates:

- in 2007, 61 cases of TB were reported in a population of 10,863 inmates, resulting in a rate of 561.5 cases per 100,000 inhabitants;

Table 3. Number of cases, incidence rates (per 100,000 inhabitants/year) of pulmonary tuberculosis, and relative risk for the chosen sociodemographic variables, Mato Grosso do Sul, from 2001 to 2009.

Specification	n	Rate per 100,000 inhabitants/year	Confidence interval	Relative risk (95%CI)
Sex				
Male	5,385	53.4	40.2 – 69.8	2.21 (2.11 – 2.32)
Female	2,436	24.1	15.3 – 35.4	1
Age group				
Below 15 years	505	8.5	0.0 – 11.4	0.44 (0.38 – 0.50)
15 to 19 years	399	19.6	14.1 – 26.9	1
20 to 39 years	3,216	47.9	42.9 – 53.6	2.44 (2.20 – 2.71)
40 to 59 years	2,449	62.5	55.0 – 71.0	3.19 (2.87 –3.55)
60 years or above	1,258	76.9	64.2 – 91.7	3.92 (3.50 – 4.39)
Ethnicity				
White	2,542	23.0	22.1 – 23.9	1
Black	531	76.7	70.4 – 83.6	3.33 (2.48 – 4.48)
Yellow	141	89.1	75.1 – 105.2	3.84 (2.25 – 6.59)
Brown	2,128	27.7	24.1 – 31.6	1.21 (1.01 – 1.45)
Indigenous	1,278	243.8	230.7 – 257.6	10.60 (8.57 – 13.10)
Education				
Up to 4 years	3,907	35.7	22.7 – 43.6	1
5 to 8 years	2,376	63.7	33.0 – 76.6	1.60 (1.52 – 1.68)
9 years or more	1,086	38.2	17.7 – 63.4	1.10 (1.03 – 1.17)
Border area				
No	6,272	35.5	(27.4 – 45.7)	1
Yes	1,559	61.6	(36.1 – 102.6)	1.74 (1.64 – 1.83)

*The variables sex, age group, ethnicity and education show 10, 4, 1.211 and 462 cases without information, corresponding to 0.1%, 0.1%, 15.5% and 5.9% in a total of 7.831 studied cases.

- in 2008, 103 cases of TB were reported in a population of 12,753 inmates, resulting in a rate of 807.7 cases per 100,000 inhabitants;
- in 2009, 135 cases of TB were reported in a population of 10,844 inmates, resulting in a rate of 1,244.9 cases per 100,000 inhabitants;
- the average incidence rate for the triennium was 871.4 cases per 100,000 inhabitants.

Higher risk estimates were obtained in three specific populations as opposed to in the general population (Table 4).

DISCUSSION

Higher risk estimates than in the general population, and even extremely high, were obtained in three specific populations, which certainly requires priority attention of health policies and health network professionals to keep the transmission of tuberculosis under control. The three specific populations are: population living in the border with Bolivia and Paraguay; indigenous population and individuals deprived of liberty (Table 4).

These differences in incidence rates originate in different causes. As for the inmates, in which was found a relative risk of 25.2 (95%CI 22.3 – 28.5) compared to the general population of the state of Mato Grosso do Sul, it is known that confinement favors the transmission and maintenance of TB[16-18]. Indeed, overcrowding, poor ventilation and poor standards of hygiene and cleanliness put inmates in conditions of high risk for TB. This facilitation of the transmission of the disease's bacillus is especially worrisome, because it is observed that the prison population in Brazil has grown consistently, from 108.6 prisoners per 100,000 inhabitants in 1997 to 229.7 in 2007[16].

The socio-demographic composition of the Brazilian prison population indicates that Brazilians inmates are mostly men aged 20 – 29 years with little education and coming from

Table 4. Incidence rates (per 100,000 inhabitants/year) of pulmonary tuberculosis and relative risk for studied populations, Mato Grosso do Sul, from 2001 to 2009.

Selected populations	Incidence rates (per 100.000 inhabitants/year)	Relative risk (95%CI)
General	38.8	1
Border	61.6	1.74 (1.46 – 2.07)
Indigenous	243.8	7.32 (6.06 – 8.85)
Deprived of liberty[#]	871.4[#]	25.2 (22.3 – 28.5)

[#]this rate refers to the average value for the period from 2007 to 2009.

a low socioeconomic status[16]. In addition, the average length of stay in Brazilian prisons of 30 months[16] indicates high mobility, with reintegration of inmates to communities, and mobility by circulating from one prison to another, actions that facilitate the dispersal of TB. Reincarceration may also be another important mechanism in maintaining intramural transmission in prisons. It is important to note that a TB patient can come to transmit the disease to other inmates, to prison system professionals, visitors and individuals in the community, on the occasion of their release, on probation or final[16].

This situation can be even more worrisome, for example, in the state of Rio de Janeiro, which presented, in 2004, an incarceration rate of 3,137 inmates per 100,000 inhabitants/year, or 3.1 times the average in state of Mato Grosso do Sul, with 1,023 inmates per 100,000 inhabitants/year in the period from 2007 to 2009[19,20].

The indigenous population, also identified in this article with a higher risk than the general state population, with a relative risk of 7.32 (95%CI 6.1 – 8.8), has been presenting, for a long time, lower resistance to TB. Cunha, in 1992[21], argued that a typical form of the TB bacillus had not yet been found in non-acculturated Brazilian indigenous populations, and concluded that indigenous peoples could be exposed to a particularly virulent strain of *Mycobacterium tuberculosis*. The researcher also commented that there is a probability that catechist priests from colonization times were diagnosed with TB, and therefore have been responsible for the transmission of the disease among indigenous populations. These early historical events and the currently prevailing conditions in the indigenous populations' lives may have contributed to these differences in prevalence.

The health of indigenous populations is facing a problem of major consequence since TB control involves the detection and treatment of alcoholics, because of the importance of this condition in curing TB. In a study conducted in Carapicuíba, São Paulo, it was found that alcoholism was the most prevalent comorbidity to TB, associated with default from treatment[22]. This study indicates that alcoholism may be the most important risk factor for poor prognosis and a favorable outcome of the disease treatment[23-27].

A survey conducted by Marques and Cunha[28], with the indigenous population of Dourados, Mato Grosso do Sul, confirms the extreme poverty that afflicts the indigenous populations, resulting in, among other health conditions, malnutrition, which entails a greater illness by depressing the cellular immunity mechanism. The researchers claim that, associated with malnutrition, this population is in horrible living conditions in densely populated households, with a single room, without ventilation, which would result in a higher infectious load. In addition, the indigenous population has a higher incidence rate among children and adolescents, which reveals recent infection by contact with individuals with bacilliferous TB and shows the need for greater control. It is observed that outpatient treatment associated with domiciliary assisted treatment has produced promising results.

Finally, in the border areas, there was a relative risk of 1.74 (95%CI 1.46 – 2.07), lower than in inmates and indigenous populations, but statistically higher than in the general population of the state of Mato Grosso do Sul. These populations are really more open and

near the general population, since their only special characteristic is that its inhabitants live in municipalities near the border with Paraguay and Bolivia.

In fact, a higher incidence of TB in these areas is linked, most likely, to the import of active cases, and therefore transmitters, from foreigners who are in Brazil, either as new residents or just showing some more intense coexistence, which is sufficient for the occurrence of transmission, with production of new TB cases detected by health services. There may have also been errors in the information on residence of reported cases, which were counted as residents in Brazil although they were really resident in municipalities in Paraguay or Bolivia. There may even be individuals who have chosen to go through the TB treatment in Brazil.

It is also possible that Brazilians have been infected in other South American countries, where they work and live and where the prevalence of TB may be higher or even has less epidemiologic surveillance of cases, as well as less detection and treatment offer.

An important aspect in the discussion of TB at the border is a necessary focus on control programs in the three countries. Brazil, Paraguay and Bolivia have huge social inequalities, with increased poverty, lack of access to services, population growth and urban concentration, which impact negatively on endemic diseases, including TB, and result in major challenges in the field of infectious diseases. A serious problem includes the emergence of resistance to existing TB treatment drugs, emergence of multidrug resistant forms (MDR-TB) and, more recently, in 2006, the form called extensively drug-resistant TB (XDR-TB)[29].

Data on genre were obtained from 7,821 TB cases, with 2,436 cases occurring in females (31.1%) and 5,385 in males (68.9%), values close to those found in research conducted in hospital care (30.1 and 69.9%) and in the basic health network (33.8 and 66.2%) of the city of São Paulo[30]. These researchers also found, in the 20-59 years age group, the majority of TB cases, with 81.4% in hospitalized patients and 80.8% in outpatients, slightly higher values than those found for Mato Grosso do Sul in this study, 72.4% (Table 3).

With regard to education, Falcão[31] found a higher rate of TB among individuals with less than eight years of education, which, among patients undergoing supervised treatment, corresponded to 70.9%, and among those undergoing self-administered treatment, accounted for 71.7%. In the present study, for the two modes of treatment, 85.3% of the cases in Mato Grosso do Sul accounted for this level of education.

This article presents a spatial reorganization since the state has very small municipalities, where rates would be unstable. We chose to work with micro and macroregions in order to better stabilize the estimates. In fact, many times, this fact could be observed.

In the general population, and also in some specific populations, TB cases may go unnoticed. In this study, it was expected that this had occurred exactly in the most affected populations: indigenous populations, inmates and border populations. This potential underestimation, however, would indicate that the problem can be much more severe than what was found in this article, and would require more efficient strategies for TB control in our environment. An active search for respiratory symptoms, through surveys and health education activities, would be crucial to detect cases and decrease the disease's occult prevalence, in the search for disease control by health services.

Thus, the results obtained for these three populations analyzed, of course, do not reflect the entirety of cases in the state. We recognize the existence of a national problem and, when analyzing the difference between the numbers of reported and expected cases, one can observe an underreporting of cases. The proposed process for estimating the number of TB cases expected to be detected in a given year of study can present problems. However, ruling out problems in these estimates, it is possible to question whether a smaller number of cases have occurred solely by faults in the information registry system, which must have occurred, but at an insufficient degree to explain all the observed differences between the number of expected and detected cases by the TB control program[32].

This study sought to show the importance of discussing territoriality more adequately in Brazil. It would require a constant reevaluation of all health programs is needed for populations in each of the areas where they live. Then, it will be possible to correct the incidence rate of TB for specific populations in the state of Mato Grosso do Sul, taking into account populations in each place of residence and considering their specificities and differences. In conclusion, in the light of the present study, it is necessary to discuss more efficient strategies to control tuberculosis in the various territories of the state of Mato Grosso do Sul if we actually want to minimize this endemic to acceptable levels in our environment.

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