

# Epidemiological profile of tuberculosis in São Paulo municipality from 2006 to 2013

## *Perfil epidemiológico da tuberculose no município de São Paulo de 2006 a 2013*

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**ABSTRACT:** *Background:* Tuberculosis is a serious public health problem that still persists in the world and in Brazil. The municipality of São Paulo, Brazil, is among the prioritized ones in the country for disease control. *Objective:* To describe the epidemiological profile of all new tuberculosis cases in São Paulo municipality reported between the years 2006 and 2013. *Methods:* The variables selected for the study were: socioeconomic, demographic and clinical-epidemiologic obtained through the online information system TB-WEB. A descriptive analysis of the data was performed to undertake the comparison among the years. To study the historical series, linear trend analysis was held. *Results and discussion:* There was an increase in the tuberculosis incidence rate in children under 15 years and in homeless people. The cure rate has improved as the proportion of completion of supervised treatment and the proportion of cases diagnosed by primary care clinics. The disease is unevenly distributed within the municipality of São Paulo and there are districts that were not able to improve the tuberculosis control. *Conclusion:* The municipal tuberculosis program control needs to target the vulnerable groups and the regions of the city where the incidence rates are higher.

**Keywords:** Tuberculosis. Epidemiology. Public health. Health evaluation. Epidemiological surveillance. Large cities.

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**RESUMO:** *Introdução:* A tuberculose é um grave problema de saúde que ainda persiste no mundo e no Brasil. O município de São Paulo é considerado prioritário para o controle da doença. *Objetivo:* Descrever o perfil epidemiológico de todos os casos novos de tuberculose no município de São Paulo notificados entre os anos de 2006 e 2013. *Métodos:* As variáveis selecionadas para o estudo foram as socioeconômicas, demográficas e as clínico-epidemiológicas obtidas através do sistema de informação online TB-WEB. Foi realizada uma análise descritiva dos dados e feita a comparação entre os anos. Para estudo da série histórica realizou-se análise de tendência linear. Um mapa temático foi confeccionado para visualizar a distribuição da doença no espaço urbano da cidade. *Resultados e discussão:* Houve um aumento da taxa de incidência-ano da tuberculose em menores de 15 anos e em moradores de rua. A taxa de cura melhorou, bem como a proporção de realização do tratamento supervisionado e a proporção dos diagnósticos feitos pela Atenção Básica. A doença está desigualmente distribuída no espaço do município, sendo que há distritos administrativos que não estão conseguindo progredir com relação ao seu controle. *Conclusão:* O programa municipal de controle da tuberculose necessita envidar esforços para os grupos vulneráveis para a tuberculose identificados e para as regiões da cidade com maior taxa de incidência-ano da doença. *Palavras-chave:* Tuberculose. Epidemiologia. Saúde pública. Avaliação em saúde. Vigilância epidemiológica. Grandes cidades.

## INTRODUCTION

Despite being preventable and curable, tuberculosis (TB) remains one of the most serious threats to global public health, being the second leading cause of death among infectious diseases<sup>1</sup>.

In Brazil, the disease is associated with vulnerable populations, poverty and agglomerated urban areas with high population density<sup>2</sup>.

The municipality of São Paulo, a priority for the control of TB<sup>3</sup>, is a large metropolis permeated by social inequalities, where an important part of the population is inserted in the urban space in a precarious way and difficult access to public goods<sup>4</sup>.

Considering the relevance of TB in the MSP, and that the disease acts as an indicator of public health and the efficiency of health services<sup>5</sup>, the objective of this study was to describe the epidemiological profile of all new TB cases reported between 2006 and 2013.

## METHODS

Descriptive epidemiological study carried out in the MSP between the years of 2006 and 2013. All new TB cases residing in the municipality and reported within the period were included in the analysis. The definition for a new case was considered to be a patient who was diagnosed with the disease and that had never undergone anti-TB treatment, or had done so for up to 30 days<sup>6</sup>. Patients with a change of diagnosis and detainees were excluded.

The data were extracted from the TB-WEB, an online information system of the state of São Paulo (SSP) that stores the records of the TB notification form. The year 2006 was chosen as the initial year since it was the definitive implementation of this system.

Access to secondary data was possible after authorization from the Tuberculosis Control Group of the Center for Epidemiological Surveillance (CES) and approval of the Scientific Committee of the Department of Collective Health of the School of Medical Sciences of Santa Casa de São Paulo. There is no conflict of interests of the authors in relation to the subject studied.

The variables used in the study were based on the items of the TB notification form standardized by CES of the SSP, namely: sex, age, race/color, type of address, disease classification, type of treatment, tests performed, type of discovery and outcome situation.

The incidence rates of TB per 100,000 inhabitants/year were calculated using the population extracted from the Foundation State System of Data Analysis (SEADE) website.

EpiInfo 7 was used for frequency analysis, linear trend test,  $\chi^2$  test, and 95% confidence interval (95%CI). A statistical significance level of 0.05 was established.

Regarding to the spatial distribution, thematic maps were prepared with the annual TB incidence rate by administrative district for the years 2006, 2010 and 2013 using the free code software QGIS.

## RESULTS

In the study period, the incidence rate of TB per 100,000 inhabitants/year went from 52.6 in 2006 to 49.5 in 2013 (Graph 1); however, the reduction was not statistically significant ( $p = 0.078$ ).

The annual incidence rate of the disease among men seems to remain stable ( $p = 0.267$ ) (Graph 2), and in 2013 it was 2.03 times higher than that of women (95%CI 1.98 - 2.06). There was a trend towards an increase in the annual incidence of TB among children aged 0 to 14 years ( $p = 0.007$ ), and a tendency of reduction in the age groups of 15 to 59 years ( $p = 0.022$ ) and 60 years and over ( $p = 0.047$ ) (Graph 3). The proportion of TB patients without fixed residence increased from 2.7% in 2006 to 5.5% in 2013 ( $p < 0.001$ ).

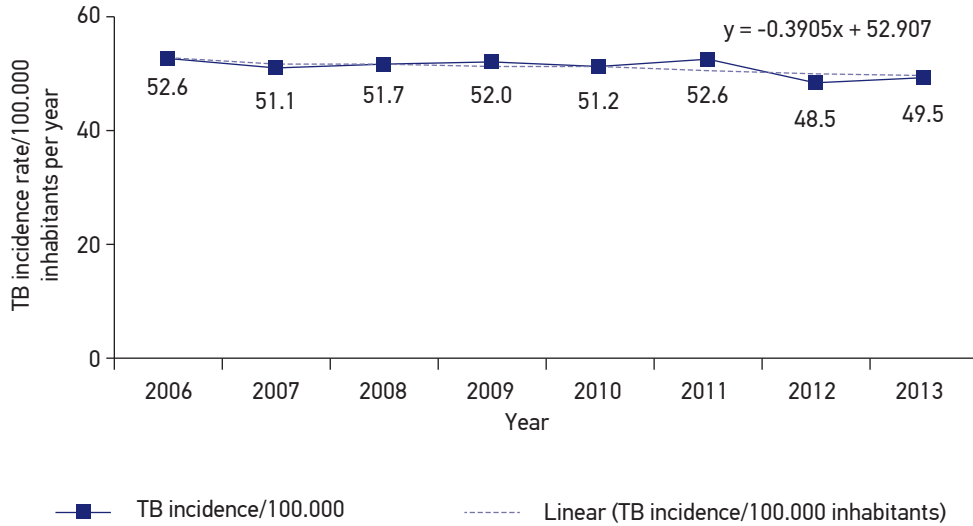
Indigenous people represented the highest annual TB incidence rate in the MSP in 2010, being 724.9 cases per 100,000 inhabitants/year, representing a relative risk of 19.0 (95%CI 15.5 - 23.4) when compared to the annual incidence rate in white people. Black people also had a high annual incidence rate: 87.0 per 100,000 inhabitants/year.

The pulmonary clinical form remained predominant. There was a greater targeting of the diagnoses for Primary Care (outpatient demand and active search/contact investigation) and improvement in the cure rate within the study period (Table 1).

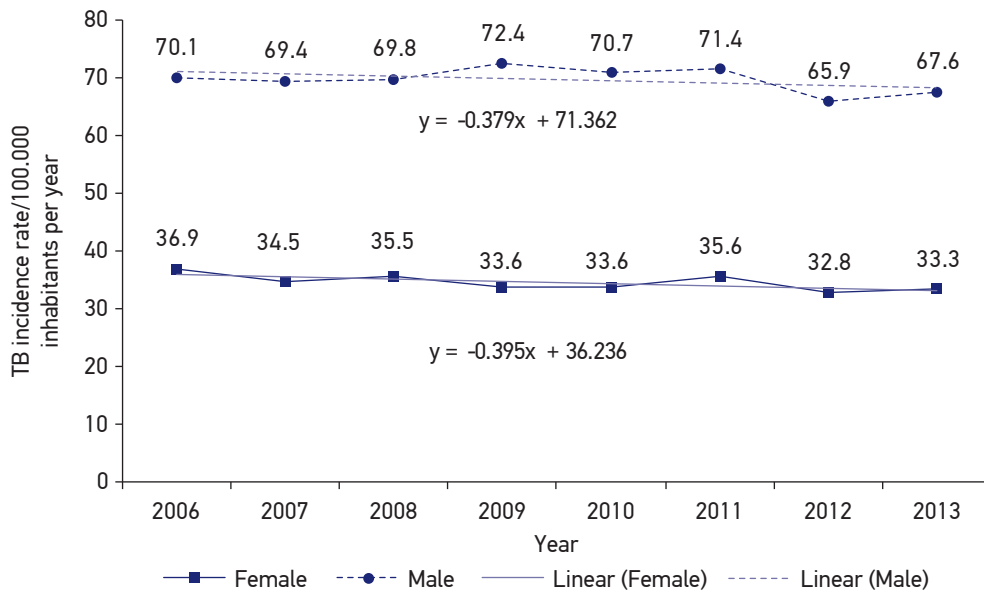
Chest X-ray demand decreased in the period (Table 1) and testing for human immunodeficiency virus (HIV) increased. The expansion of supervised treatment improved, and it was adopted for 60.5% (95%CI 59.2 - 61.7) of TB patients in 2013 (Table 1).

Improvement in information and data collection was observed for all studied variables, with emphasis on type of treatment and race/color.

The TB incidence rate/year is distributed in a very diversified way in the geographical space of the MSP, and the administrative districts that presented high incidence rates/



Graph 1. Tuberculosis incidence rate per 100,000 inhabitants/year, municipality of São Paulo, 2006 to 2013.



Graph 2. Tuberculosis incidence rate per 100,000 inhabitants/year according to sex, municipality of São Paulo, 2006 to 2013.

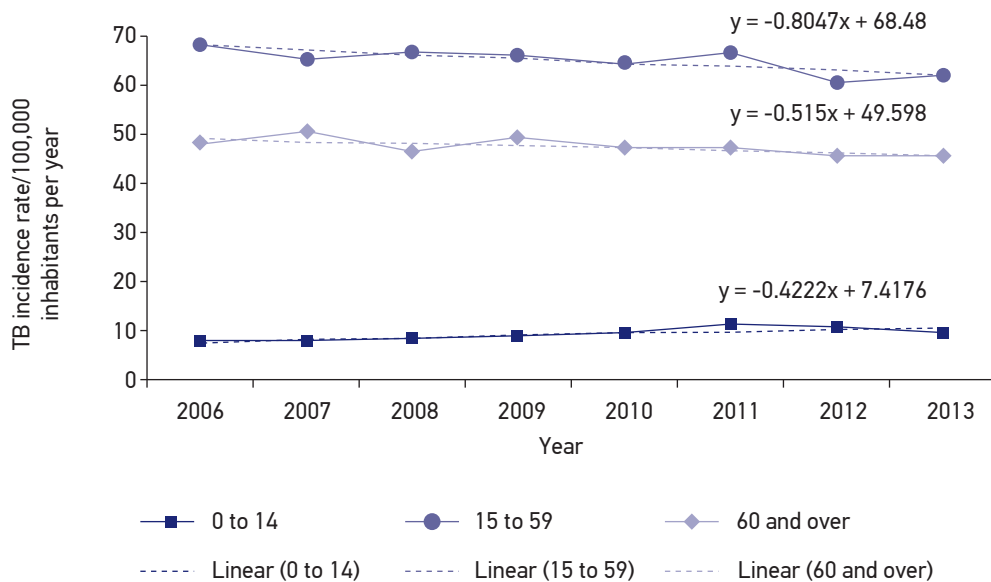
year for the whole period of the study were: Bom Retiro, República, São Miguel, Lajeado, Brasilândia, Barra Funda, Belém, Brás and Pari (Figure 1).

## DISCUSSION

The reduction of the incidence of TB in the MSP has been occurring slowly, as has been observed in other regions with high disease burden<sup>7</sup>. This study allowed to identify that some groups increased their participation in the context of the disease, especially the children and the homeless people.

Infant TB represents a sentinel event within a community, indicating recent transmission, the source of which is an infectious adult with pulmonary TB<sup>8</sup>. The increase in TB among children demonstrates, therefore, that health services are not performing the early diagnosis<sup>9</sup> and the adequate treatment of smear-positive cases in adults<sup>10</sup>.

A high number of cases of TB among homeless people has also been demonstrated in other studies<sup>11,12</sup>, including in the state of São Paulo<sup>13</sup>. This population is considered an important source of infection<sup>11</sup>, and its illness is associated with the presence of other morbidities (such as HIV, liver diseases, mental illness and substance dependence), and difficult access to health services. In addition, this group presents a high proportion of death due to TB<sup>12</sup> and a strong relation with treatment failure<sup>13</sup>.



Graph 3. Tuberculosis incidence rate per 100,000 inhabitants/year according to age group, municipality of São Paulo, 2006 to 2013.

Table 1. Clinical aspects of tuberculosis patients: comparison between the years 2006 and 2013, municipality of São Paulo.

Variable	2006		2013		p-value
Classification	n	%	n	%	
Pulmonary	4366	75,9	4321	76,4	0,237
Extrapulmonary/disseminated	1147	19,9	1072	19,0	
Pulmonary and extrapulmonary	243	4,2	265	4,7	
Total*	5756	100,0	5658	100,0	
Type of discovery					
Outpatient demand	2362	42,5	2506	44,5	< 0,001
Urgency/emergency	1776	32,0	1538	27,3	
Diagnostic elucidation during hospitalization	1038	18,7	999	17,7	
Discovery after death	213	3,8	91	1,6	
Active search/Contact research	164	3,0	503	8,9	
Total*	5553	100,0	5637	100,0	
Outcome situation					
Cure	4002	70,9	4185	77,0	< 0,001
Abandonment	829	14,7	719	13,2	
Other	817	14,5	530	9,8	
Total*	5648	100,0	5434	100,0	
Sputum smear microscopy**					
Positive	2954	69,5	3087	67,6	0,05
Negative	1298	30,5	1482	32,4	
Total*	4252	100,0	4569	100,0	
Chest X-ray****					
Suspected tuberculosis	3707	87,4	3571	79,4	< 0,001
Normal/other disease	216	5,1	209	4,7	
Unrealized	318	7,5	715	15,9	
Total*	4241	100,0	4495	100,0	
HIV testing					
Yes	3993	77,2	4779	84,7	< 0,001
No	1181	22,8	861	15,3	
Total*	5174	100,0	5640	100,0	
Type of Treatment****					
Supervised	2001	34,7	3427	60,5	-
Self-administered	1368	23,8	1930	34,0	
Ignored	2392	41,5	312	5,5	
Total	5761	100,0	5669	100,0	

\*The total values vary due to the exclusion of the ignored ones; \*\*for the smear microscopy variable only patients older than 15 years were considered; \*\*\*Chest X-ray was only considered for patients with pulmonary tuberculosis; \*\*\*\*for the variable type of treatment, a statistical test was not performed due to the large amount of ignored in 2006.

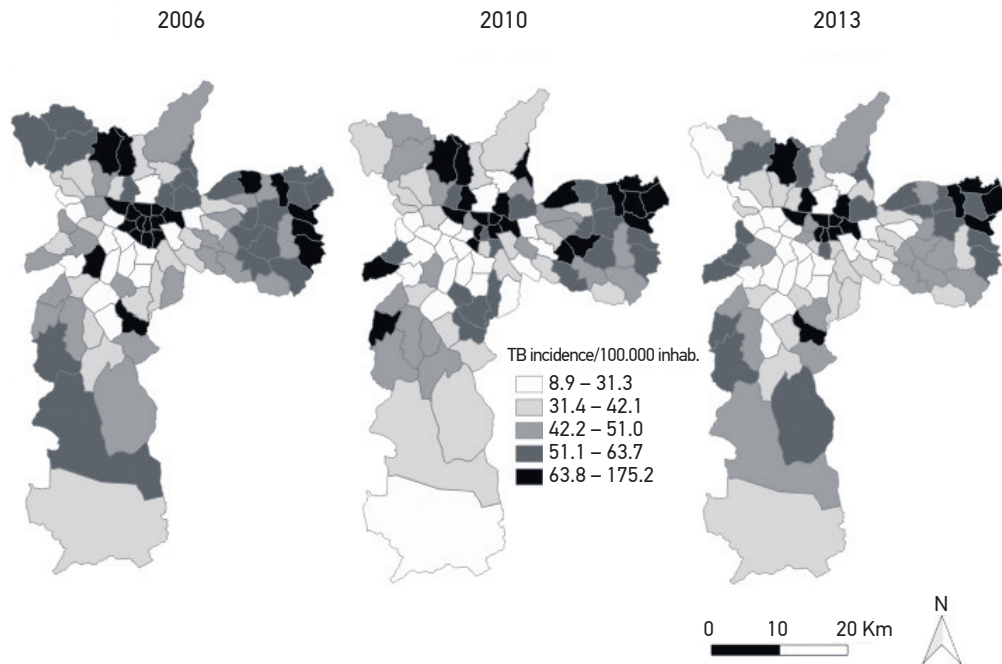


Figure 1. Distribution of tuberculosis incidence rate per 100,000 inhabitants/year according to administrative district, municipality of São Paulo, 2006, 2010 and 2013.

As was observed in this study, TB in Brazil is also associated with black and indigenous people, since these groups face discriminatory barriers both to use the health care network and to obtain better income opportunities<sup>2</sup>.

If, on the one hand, the clinical profile of the disease did not change, the proportion of diagnoses performed by the different services changed, and the chest radiography request decreased. The lower participation of emergency and hospital services in the diagnosis of TB may explain part of the decrease in requests for pulmonary imaging<sup>14</sup>.

The increase in diagnosis through active case search and contact investigation was verified in this study. Such actions are feasible and efficient to improve case detection and thus reduce transmission and incidence of TB, especially when targeted at at-risk groups, including children who are contacts of TB patients with positive smear microscopy<sup>15,16</sup>. However, it is worth mentioning that hospital and emergency services still represent an important part of the responsibility for diagnosing TB in the MSP.

Despite the improvements seen in increasing HIV testing and higher TB cure rates, advances need to be made to test all TB patients for HIV, and treat more than 85% of them, as recommended by the World Health Organization<sup>1</sup>.

The expansion of the supervised treatment perceived in this study is a very positive advance for the control of TB in the MSP, since this strategy promotes increase of cure rates

among vulnerable populations, improves adherence to treatment and protects TB patients from negative outcomes of disease<sup>17</sup>.

The significant variation in the annual incidence rate of TB per administrative district in the MSP shows that the distribution of the disease is uneven in its urban space. It can be said that the disease is more strongly located in the central and peripheral regions of the city, areas with greater crowding of people and presence of social vulnerability. In the city of Vitória (Espírito Santo), the highest incidence rate for TB also occurred in the poorest areas of the city<sup>18</sup>.

As in any study with secondary data, the gaps found in completing the information were a limitation for the present study. In spite of this fragility, it was possible to reach the proposed objective and, even, to observe the progress regarding the quality of information throughout the years of study.

## CONCLUSION

This study made possible the knowledge of the epidemiological profile of TB in the MSP from 2006 to 2013. Advances were made in the treatment of the disease, verified through higher cure rates and greater reach of supervised treatment. The diagnosis of the infection was also positively favored, since it has been more accomplished by Primary Care. However, it is worth mentioning the increase in cases among children and homeless people, and the permanence of the disease in certain regions of the city, suggesting the need to target the TB surveillance actions for these groups, in order to achieve better results in the control of the disease.

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